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FOREWORD

This issue of the Scientific Papers of the Silesian University of Technology, The Organization and Management series contains articles and results of research conducted by various universities in Poland and abroad. The presented articles focus on a variety of topics embedded in the social sciences, including articles on organization and management, pedagogy and education, artificial intelligence, environmental issues, innovation management, finance, sustainable development, business ethics, smart cities, human resources management, local government management, media, including social media, security management, and others. The diversity of topics demonstrates the multidimensionality of the scientific reflection undertaken during the conference. A holistic approach best illustrates the various aspects of sustainable development. The authors of individual articles containing individual illustrations are responsible for the quality and consent to publish illustrations by other authors.

Aleksandra Kuzior

LEADING FOR PERFORMANCE

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Purpose: Aim of this paper is to conceptualize result-oriented leadership as a multidimensional phenomenon that integrates cognitive, behavioral, and organizational mechanisms to influence employee performance and productivity. The study seeks to systematize the main theoretical approaches and to identify how specific leader characteristics and actions affect productivity at individual, team, and organizational levels.

Design/methodology/approach: The paper adopts a theoretical and conceptual approach based on an integrative review of classical and contemporary leadership theories. The analysis synthesizes trait, behavioral, situational, transformational, authentic, and adaptive leadership models with the emergent paradigm of result-oriented leadership. Particular attention is paid to cognitive orientations and behavioral patterns that enable leaders to act as performance catalysts.

Findings: The study demonstrates that leadership affects performance through complex psychological, behavioral, and organizational mechanisms. Effective leaders create performance-oriented environments by aligning strategic goals with employee development, fostering psychological safety, and modeling effective behavior. The paper also outlines a typology of leadership models focused on results and highlights their mechanisms of influence.

Research limitations/implications: As a conceptual paper, the study is limited by the lack of empirical testing. Future research should focus on operationalizing the identified mechanisms and verifying their impact employee productivity using quantitative and qualitative methods in various organizational contexts.

Practical implications: The findings can inform leadership development programs, HRM practices, and organizational design by emphasizing the cognitive and behavioral capacities of leaders that foster performance. Organizations can use these insights to assess and develop leadership competencies aligned with strategic performance goals.

Social implications: By promoting leadership approaches that support employee well-being, autonomy, and engagement, the study contributes to building healthier organizational cultures and more sustainable models of performance management.

Originality/value: This paper provides an integrative theoretical framework for understanding result-oriented leadership and its role in activating performance. It offers value to scholars in organizational behavior and leadership studies, as well as to practitioners interested in performance-driven management approaches.

Keywords: leadership, result-oriented leadership, performance, organizational effectiveness, management.

Category of the paper: Research paper.

1. Introduction

Research on leadership issues occupies an essential place in modern management science. Changes in the structure of organizations, digital transformation, the growth of environmental dynamics, and the strengthening of the role of human capital have led to a revision of traditional ideas about leadership and the actualization of new approaches focused on achieving specific results. In this regard, there is a need for a systematic analysis of the concept of leadership aimed at results, which integrates strategic thinking, personnel development, and a focus on measurable performance indicators.

In the theoretical discourse, a gradual transition to comprehensive approaches is observed that considers cognitive, emotional, and behavioral factors of leadership interaction. Within the framework of this transition, concepts are formed that reflect various aspects of the holistic impact of a leader on the productivity of employees and the organization as a whole.

At the same time, the scientific literature remains fragmented in highlighting the mechanisms through which leadership is transformed into specific results. The relationship between a leader's cognitive and behavioral characteristics, management interaction style, and performance metrics remains understudied. Of particular interest is the need to operationalize concepts related to leadership effectiveness, taking into account not only quantitative but also qualitative, emotional, and psychological indicators. In this context, it is appropriate to study leadership in depth as a multilevel process that combines the desire to achieve results with the formation of a favorable environment for the disclosure of the potential of employees, professional development, and organizational sustainability.

2. Methodology

The study is theoretical and conceptual in nature and is based on an integrative review of classical and contemporary approaches to the study of leadership. The methodological framework combines elements of systematic and narrative analysis, which makes it possible to comprehensively examine the relationship between leadership and performance.

At the first stage, a critical review of the literature was conducted, covering the main paradigms of leadership. This enabled tracing the evolution of scholarly perspectives on leadership and its impact on organizational effectiveness.

The second stage involved the integration of diverse theoretical approaches into a unified analytical framework that explains how leaders' cognitive orientations, behavioral patterns, and organizational practices contribute to the creation of a result-oriented environment. Particular attention was paid to psychological, behavioral, and organizational mechanisms of influence.

The third stage focused on the conceptualization of performance indicators at three levels: individual, team, and organizational. This required an interdisciplinary approach that encompassed research in management, organizational behavior, and psychology. Both quantitative and qualitative criteria of performance were considered in the analysis.

Thus, the methodological strategy combines critical analysis of scholarly sources, integrative synthesis of theoretical models, and the construction of a conceptual framework that can serve as a basis for future empirical validation of the leadership-performance nexus.

3. Results

3.1. Theoretical foundations of results-oriented leadership

The concept of leadership has evolved from attempts to identify the personality traits of a leader to the recognition of the multidimensional nature of this phenomenon, in which social, emotional, cognitive, and behavioral factors are intertwined. Historically, leadership research from the 1940s to the 1990s focused on trait theories, which suggested that effective leadership is determined by innate personality characteristics (Stogdill, 1948; Kirkpatrick, Locke, 1991). Although these approaches laid the foundation for further research, they have been criticized for their limited predictive power and for neglecting contextual variables.

In the 1950s to 1970s, researchers focused on behavioral and situational theories. The behavioral approach, presented in the Ohio State Studies (Stogdill, Coons, 1957) and the University of Michigan Studies (Likert, 1961), distinguished leadership behavior along the axes of "task orientation" and "people orientation." In turn, situational models (Hersey, Blanchard, 1969; Fiedler, 1967) proposed that a leader's effectiveness depends on adapting their style to the maturity level of subordinates or to the situational context.

In the 1980s and 1990s, there was a shift toward transformational leadership, which is based on the leader's ability to inspire, motivate, develop followers, and form a shared vision (Burns, 1978; Bass, 1985). This approach initiated a new paradigm: leadership as a tool for the internal transformation of organizations. Later, the concepts of authentic (Avolio, Gardner, 2005), emotional (Goleman, 1998), servant (Greenleaf, 1977), and adaptive (Heifetz, 1994) leadership emerged — each of which reveals specific aspects of the leader's interaction with the team: trust, emotional competence, ethics, and adaptability.

In the early 21st century, the concept of result-oriented leadership has gained relevance due to digitalization and rising performance expectations. This approach emphasizes creating added value for the organization by achieving goals, meeting KPIs, delivering innovative results, or contributing to sustainable development (Zenger, Folkman, 2009; Irma Kue et al., 2023). Such leaders focus on results through people, combining a clear vision, effective communication, and the development of employee potential.

The prerequisites for changes in leadership paradigms lie not only in the development of academic thought but also in the transformation of the organizational context - from stable hierarchical structures to dynamic, adaptive environments. For clarity, Figure 1 illustrates the stages in the evolution of leadership approaches, reflecting shifts in theories and practices.



Made with Napkin

Figure 1. Timeline of the evolution of leadership concepts (1900-present).

Source: Developed by the author using the Napkin tool (<https://app.napkin.ai/>).

As shown in Figure 1, scholarly thought has gradually shifted from a focus on the personality of the leader to more comprehensive models that consider context, behavior, emotional intelligence, and value orientations. Results-oriented leadership integrates previous approaches but subordinates them to strategic integrity and achieving measurable results, reflecting the pragmatic demands of the modern world. Thus, modern leadership is a purposeful process dominated by a practical focus on results, but relies on empathy and intellectual integration.

In modern management discourse, a leader is increasingly viewed not as a symbol of status or control, but as an agent who creates the conditions for achieving high performance through the engagement, inspiration, and development of others' potential (Deloitte, 2023; Xiong, 2022). This approach is grounded in the recognition that organizational performance reflects the quality of the leader's interaction with followers and their ability to activate the team's intellectual, emotional, and operational capacities.

When considering leadership as a factor influencing productivity, it is necessary to move beyond generalized models and focus on analyzing the individual characteristics of leaders that enable their effectiveness within the organizational environment. Ultimately, it is the leader's cognitive orientations and behavioral patterns that shape the context in which others' potential is realized.

Figure 2 illustrates the cognitive and behavioral specificities of an effective leader who acts as a catalyst for productivity.

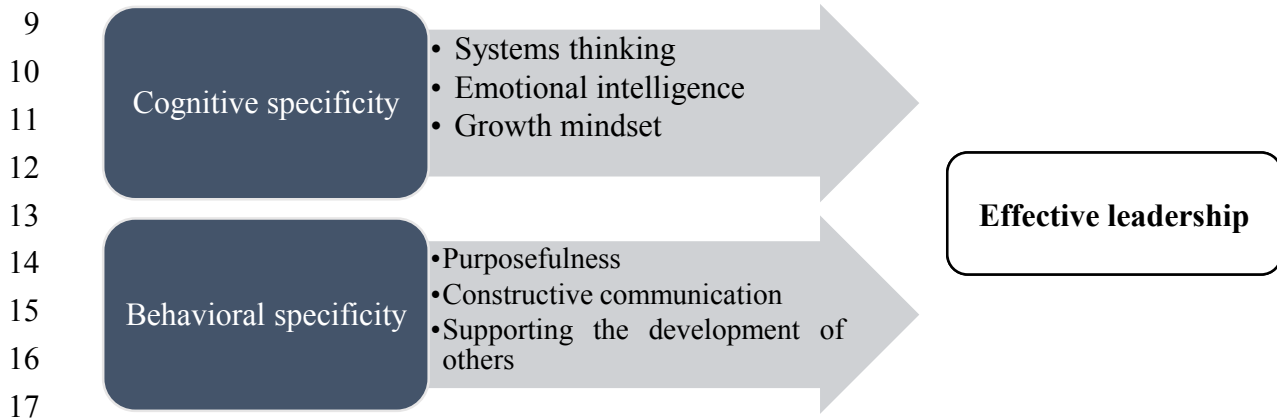


Figure 2. Cognitive and Behavioral Specificities of an Effective Leader.

Source: Developed by the author.

Empirical studies (Antonakis et al., 2016; Adnan et al., 2022) show that the cognitive component of leadership is of great importance in making strategic decisions, adapting to change, and solving complex problems. Intellectual competence strongly predicts leader effectiveness in the modern organizational environment. The basic cognitive characteristics of an effective leader include systems thinking, emotional intelligence, and growth-oriented thinking. *Systems thinking* involves the leader's ability to consider complex phenomena in their interrelationships, analyze the causes and consequences of management decisions, and model possible scenarios for the development of situations. This approach allows for forming a long-term vision and adopting strategic decisions, taking into account the complexity of the organizational environment. *Emotional intelligence* encompasses emotional awareness, empathy, self-regulation, and the ability to manage the emotional state of a team (Goleman, 1998), which directly affects the quality of interpersonal interaction, the level of trust, and the psychological climate in the team. Another essential characteristic is a *growth mindset*, which is manifested in a willingness to learn, openness to mistakes as a resource for development, and the ability to rethink one's own experience and quickly adapt to change. The combination of these cognitive resources allows a leader to act effectively in conditions of uncertainty.

A leader's behavioral patterns directly shape the organizational environment and influence motivation, engagement, and ultimately team performance (Hemshorn de Sanchez et al., 2021; Mugira, 2022). The behavior of an effective leader is characterized by *purposefulness*, which is manifested in a focus on results, the ability to maintain the pace of change, and maintaining stability in moving towards strategic goals. No less critical is *constructive communication* about achievements and expectations, which ensures transparency, predictability, and mutual accountability in the team. Highly effective leaders also demonstrate behavior aimed at *developing others*, manifested in coaching, mentoring, delegating with trust, and creating conditions for employees' professional growth. In this sense, a leader is not only a coordinator of processes but an active moderator of purposefulness in the team, who, through their behavior, transmits standards of effectiveness, support, and development.

Modern management literature interprets leadership not as a hierarchical role but as a process that reveals and scales the team's potential. In this context, a synonymous series of concepts has emerged, representing similar ideas through different analytical lenses. In the scientific literature, these approaches are presented as a set of related concepts, among which the following stand out:

- *Performance-Driven Leadership* emphasizes that all leadership actions should be subordinated to the achievement of clearly defined results (individual, team, and organizational). Holton and Lynham (2000) interpret this as a systemic approach to leader development, with productivity as the central goal. Botelho (2023) also demonstrates that leaders who cultivate a performance-driven culture enhance the effectiveness of assessment and feedback systems. Such a leader is the architect of an environment where performance becomes a cultural norm.
- *Results-Based (Result-Oriented) Leadership* focuses on the leader's attention to final outcomes and the methods to achieve them. This approach is widely represented in the classic works of Ulrich, Zenger, and Smallwood (1999), where performance is regarded as the primary legitimation of leadership. Later studies (Speckbacher, 2023) further develop this approach by integrating value-based perspectives with performance management. Results-Based Leadership entails a transparent system in which the leader not only inspires but also translates results into specific KPIs that serve as guidelines for the team.
- *Leader as a Driver of Performance* considers the leader as a behavioral driver of team effectiveness. The leader stimulates motivation, shapes the emotional climate, and personalizes interactions. Goleman, Boyatzis, and McKee (2009) describe the leader as a hidden driver of performance who influences through emotional intelligence and the development of trust. Recent empirical research (Jufrizen et al., 2024) shows that high-quality Leader-Member Exchange (LMX) interactions increase employee engagement and, consequently, productivity. Thus, the leader becomes not merely a commander but a creator of an environment that enhances others' functionality.

- *Leadership as a Productivity Multiplier* depicts the leader as a “productivity multiplier”
 - someone who does not add productivity alone but multiplies it by activating others. The leader facilitates the team’s potential by creating conditions for autonomy, initiative, and responsibility. Siraj et al. (2022) demonstrate that effective leadership indirectly boosts productivity through high-quality HRM practices. The concept of the Multiplier Effect, proposed by Nosbuch and Bernaden (2012), follows a similar logic: the leader generates a multiple effect - the effect of presence - that transforms the team at a systemic level.

Despite specific differences in these approaches, the described concepts share a common philosophy: an effective leader is not only a strategist but also a moderator who activates development mechanisms within the team. Table 1 presents a comparative description of these synonymous leadership concepts focused on results.

Table 1.

Synonymous series of concepts of leadership as a driver of productivity

Concept	Focus of influence	Leader's mechanism of action	Key tools
Performance-Driven Leadership	Productivity as a strategic goal	Building a Results-Oriented Culture	Assessment systems, training, KPI
Results-Based (Result-Oriented) Leadership	Achieving measurable results	Strategic results management through goals	Goals, standards, performance metrics
Leader as a Driver of Performance	Behavioral influence	Emotional intelligence, engagement, LMX	Emotional intelligence, psychological climate of the team
Leadership as a Productivity Multiplier	Multiplying effectiveness through others	Influence through HRM, delegation, trust	Engagement, autonomy, organizational support

Source: Developed by the author.

As can be seen from Table 1, each concept has its own operational focus and implementation mechanism. Still, they all agree on recognizing the role of the leader in activating organizational productivity. Suppose the Performance-Driven and Results-Based approaches emphasize strategic and institutional aspects. In that case, the concepts of Leader as a Driver of Performance and Leadership as a Productivity Multiplier emphasize psychological and behavioral mechanisms of influence. Thus, there are grounds for considering leadership as a multifactorial and multilevel process, within which the leader influences not only through managerial actions, but also through creating an appropriate environment, a system of interaction, and stimulation of internal motivation. The proposed theoretical framework can become the basis for further analysis of the influence of leadership on employee productivity in modern organizations.

3.2. Employee productivity as a result of managerial influence

The concept of productivity is multidimensional and context-dependent. The scientific literature defines it as the degree of achievement of goals, the level of effective use of resources, and the effectiveness of activities within the limits of specified criteria (Armstrong, 2020; Suprayitno, 2024).

Individual productivity is considered an employee's behavior that directly or indirectly contributes to achieving organizational goals (Campbell, Wiernik, 2015; Bass, 1982). Team productivity is described as the ability of a group to effectively interact, coordinate, achieve common goals, and solve problems (Jordan, Troth, 2004; Kozlowski, Ilgen, 2006). Research emphasizes the importance of social capital and psychological safety in ensuring team productivity (Edmondson, 2019). Organizational productivity is considered the totality of the entire organization's activities, demonstrating the efficiency of using resources to achieve strategic goals (Richard et al., 2009; Kaplan, Norton, 1996). Thus, productivity is not only the result of an action but also a systemic characteristic of efficiency at different levels, each of which has its parameters and methods of assessment. Its measurement is a task of modern management, which requires a comprehensive approach and consideration of both quantitative and behavioral and qualitative components.

For a holistic understanding of productivity, it is important to assess it using qualitative metrics, but in modern research, they are successfully operationalized in quantitative form:

- *Job-Related Outcomes* are direct results of an employee's activities, evaluated against established organizational goals, standards, and job responsibilities. These include the effectiveness of task performance, meeting deadlines, quality of decisions made, individual productivity, and achievement of performance indicators (KPI, OKR) (Song, Chen, 2021; Hur et al., 2015).
- *Well-being* is an integral indicator of an employee's psychological and social functioning, reflecting their overall health, life satisfaction, energy level, and ability to adapt to professional demands. Well-being is a determinant of long-term work capacity and organizational sustainability (Tov, 2018; Park et al., 2023).
- *Job Satisfaction* is an employee's assessment of their work, including emotional attitudes toward the content of the work, conditions, interaction with colleagues, and opportunities for professional development. It acts as an affective and cognitive component of motivation, directly related to engagement, productivity, and organizational loyalty (Spector, 2022; Judge et al., 2020).
- *Stress Levels* refer to the physiological and psychological strain an employee experiences in response to work demands, pressure, uncertainty, or interpersonal conflicts. Increased stress levels deplete the employee's resources and can lead to health issues. A healthy environment promotes sustainable productivity (Ong et al., 2014; Ziegele, Zerfass, 2021).

- *Organizational Behavior* refers to the voluntary actions of employees that are not part of formal job duties but contribute to the effective functioning of the organization. This includes helping colleagues, taking initiative, showing responsibility, and being loyal to organizational goals (Banks et al., 2021; Schermerhorn et al., 2011).
- *Emotional Response to Leadership* is an employee's reaction to a leader's style, which affects trust levels, psychological safety, desire to remain in the organization, and work effectiveness. Positive emotional connections with the leader significantly enhance both individual and team performance (Gooty et al., 2010; Coronado-Maldonado et al., 2023).

Thus, the presented range of metrics demonstrates that productivity in modern management is considered not only in terms of task performance effectiveness but as a complex systemic phenomenon that integrates cognitive, emotional, behavioral, and social factors. This approach allows organizations not only to assess employee effectiveness more accurately but also to better understand organizational interaction dynamics, track early signs of professional burnout, formulate strategies for developing human capital, and increase team resilience to change. When combined with leadership impact analysis, it forms a solid basis for measuring performance in the dynamic environment of modern organizations.

3.3. Mechanisms of interaction between leadership and performance

The relationship between leadership and performance is not linear or unidimensional. Current research suggests that leadership influences performance through several mediated psychological, behavioral, and organizational mechanisms that shape the microclimate, values, and conditions for staff functioning (Lin, Wu, 2022; Siraj et al., 2022).

The *psychological mechanisms* that leadership influences performance are motivation, trust, and psychological safety. Leaders who demonstrate emotional intelligence and authenticity can create an environment where employees feel supported and engaged. Such an atmosphere promotes the development of intrinsic motivation (Deci, Ryan, 2000) and the activation of self-regulatory resources, which positively affect cognitive and behavioral performance. Psychological safety, determined by leadership style, is directly related to the level of initiative, willingness to take risks, and the search for innovative solutions, which drive productive behavior in a dynamic environment (Edmondson, Lei, 2014).

Behavioral mechanisms of leadership influence consist of forming patterns of individual and collective behavior that support productive interaction in the team. We are talking about role modeling through personal example, a style in which the leader demonstrates purposefulness, responsibility, and openness to feedback, which is transmitted to employees and becomes a behavioral norm (Behrendt et al., 2017). This forms a culture of imitative models and contributes to developing intrinsic motivation.

Organizational mechanisms for leadership to influence productivity include structuring work processes, prioritizing, delegating tasks, and creating a system of expectations and standards for interaction. This reduces functional uncertainty, improves coordination, and allows for more efficient resource allocation (Dimick, 2015). Leaders also create a communicative environment where employees receive timely information, a clear understanding of goals, and feedback mechanisms.

4. Conclusions

The research confirms that result-oriented leadership increases individual, team, and organizational productivity. It is not limited to achieving performance indicators but encompasses a complex system of relationships between the leader's cognitive resources, behavioral strategies, and the organizational context. The proposed theoretical framework conceptualizes the leader as an active facilitator of change who creates an environment of psychological safety, stimulates the development of employees' potential, and ensures the achievement of desired outcomes in conditions of dynamism and uncertainty.

The results of the analysis indicate that the productivity of a modern employee is determined not only by the quantitative parameters of their activity but also by emotional involvement, job satisfaction, stress levels, and the quality of interaction with their manager. At the same time, leadership influence is exerted through a combination of psychological (motivation, trust, safety), behavioral (modeling standards, providing support), and organizational (structuring processes, delegation, feedback) mechanisms.

These findings underscore the need for a multifactorial approach to assessing the effectiveness of management practices.

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HUMAN RESEARCH ETHICS COMMITTEES (HREC) AT POLISH TECHNICAL UNIVERSITIES

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Purpose: Human Research Ethics Committees (HRECs) are becoming an increasingly important element in improving research methodology, including at technical universities, despite the fact that their functioning is not currently regulated by Polish law. Research involving human subjects in fields other than biomedicine, such as computer science, management, and engineering, increasingly requires ethical assessment in line with international ethical standards and the requirements of scientific publishers. The aim of this article is to examine the role, functions and organisational practices of HREC committees operating at technical universities in Poland and to analyse their impact on the organisation of research involving human subjects.

Design/methodology/approach: Two studies were conducted to achieve the intended objective. The first study analysed research projects carried out at a selected technical university (Wrocław University of Science and Technology) in terms of their involvement in research involving human subjects subject to review by a committee. The second study analysed the activities of three ethics committees of universities involving human subjects at the Wrocław University of Science and Technology, the Poznań University of Technology, and the Silesian University of Technology. This study consisted of an analysis of documentation and available information on the application evaluation processes and in-depth interviews with members of the ethics committees at all three universities mentioned above.

Findings: Approximately 5% of the research projects analysed at technical universities involve human participation, but the number of applications submitted to the Ethics Committee for Research Involving Human Subjects is significantly lower. HREC committees perform functions that go beyond traditional ethical assessments – they support young researchers, standardise research methods, ensure compliance with regulations (e.g. GDPR), and shape an ethical academic culture. The committees differ in terms of organisation, but their activities have a positive impact on the quality and reliability of the research conducted.

Human Research Ethics Committees (HREC) are an essential part of research procedures at technical universities. Their role goes beyond the formal evaluation of projects, as they improve scientific methods and support the development of social responsibility of the university. Nevertheless, it is necessary to develop common standards of operation and legal regulations

that clearly define their competences and place in the system of ethical research assessment in Poland.

Keywords: Human Research Ethics Committees (HRECs), technical universities in Poland, improving research methodology.

Category of the paper: Research paper.

1. Introduction

Research ethics committees play a key role in overseeing research involving human subjects, ensuring compliance with ethical standards, and protecting the rights and well-being of participants. These bodies, often referred to as Human Research Ethics Committees (HRECs), assess the ethical acceptability of research projects based on principles such as autonomy, justice, beneficence and non-maleficence (Mehta et al., 2023; Muralidharan, Schaefer, 2022). They act as independent bodies assessing the relationship between risks and potential benefits, ensuring that the rights and safety of participants take precedence over scientific and social interests (Lecuona, 2011). Their role often goes beyond ethical assessment alone, for example by ensuring public trust in the ethical conduct of research (Riva, Petrini, 2024).

In recent years, the function of ethics committees has also been recognised at technical universities, where it is undergoing significant evolution. Initially, research ethics was mainly associated with clinical research and projects involving biological material or direct experiments on humans. However, with the development of research methodologies, especially in fields such as management and quality sciences, data analysis, and user-centred ergonomic design, increasing importance is being attached to ethical issues that go beyond the traditional biomedical approach. Issues such as safety, psychological wellbeing, data privacy, and informed consent in digital environments are now much more highly valued in terms of ethical requirements. As a result, researchers from non-medical fields, who were previously rarely required to follow formal ethical procedures, must now obtain approval from ethics committees to conduct research involving human subjects. This change brings new challenges, including the need to adapt research projects to previously unknown ethical requirements. This particular situation of HRECs also applies to Polish technical universities, most of which established committees in 2020-2021 (Małek-Orłowska, Jach, 2022, p. 25). The problems faced by newly established committees are primarily related to the lack of uniform standards for issuing opinions and a general lack of regulation in this area.

From the perspective of Polish law, medical experimental research, conducted by medical doctors and positively assessed by relevant bioethics committees, is subject to mandatory prospective ethical review (Czarkowski, 2012). Such a narrow scope of regulation deviates from accepted international standards, which is also an important reason for establishing

HRECs in universities to assess research that requires human participation but does not fall within the category of medical experiments (Małek-Orłowska, Jach, 2022).

The lack of uniform regulation is one of the reasons for the absence of a commonly accepted standard for the establishment, functioning, and organisation of HREC committees at technical universities, which also contributes to the lack of uniform standards for the assessment and management of research risk. This also applies to more specific issues, such as the problem of remuneration for research participants (Różyńska, 2022).

Research on the functioning of HRECs has not yet had a long tradition. This issue has so far been addressed primarily in relation to medical, clinical and bioethical research. In this regard, standards and tools for self-assessment of ethics/bioethics committees have been developed (Sleem et al., 2010). Some researchers argue that the activities of ethics committees should be an integral part of every scientific process, rather than a separate process of external evaluation (Anderson et al., 2023). Others emphasise that ethics committees have not received the attention they deserve (e.g. Bain, 2017). Although this conclusion was made several years ago, it still seems to be valid today.

In technical universities, it is also important to broaden the perspective of research in basic and engineering sciences to include social issues. Obtaining a positive opinion from the HREC provides a kind of guarantee that the proposed research design not only meets the criteria of scientific correctness, but is also exemplary in terms of ethics. From this point of view, ethical excellence, understood as compliance with the principles of scientific integrity, loyalty to research participants and the usefulness of results (Galewicz, 2009), is an element of scientific excellence.

The authors of this paper assume that, in both research risk management and research management in general, consideration of the ethical perspective is an important element of analysis from a management perspective. Only by taking both perspectives into account will it be possible to formulate a model for the organisation and structure of an HREC at a technical university that fully meets the requirements of social responsibility.

2. Research methodology and results

The study consists of two stages: in the first stage, the number of research projects involving human subjects conducted at a selected technical university was estimated using the competent judges method, and in the second stage, the activities of three HRECs were analysed on the basis of a quantitative description and interviews with committee members.

2.1. Estimated number of research involving human subjects

An analysis of 1594 projects carried out at the Wrocław University of Science and Technology between 2007 and 2022, using the competent judges method, identified 87 research projects involving human subjects. Among these, the dominant forms were surveys (50 projects) and prototype testing (28 projects). In addition, 9 projects involved the use of personal data, 8 concerned the participation of protected groups, and 7 were classified as invasive research.

These projects were mainly carried out at the Faculty of Fundamental Problems in Technology (28 projects) and the Faculty of Computer Science and Management (also 28 projects, with a predominance of surveys). The Faculty of Mechanical Engineering was responsible for 10 projects, in which prototype testing predominated.

Therefore, the analysis shows that approximately 5% of all research carried out at Wrocław University of Science and Technology in the period under review involved human subjects. However, it is to be expected that the number of such studies will gradually increase (Małek-Orłowska, Jach, 2022, p. 32). In the case of the HREC at Wrocław University of Science and Technology, this thesis was confirmed already in the initial period of the committee's operation.

2.2. Research evaluated by HREC

Statistics from Wrocław University of Science and Technology (Wrocław Tech), Poznań University of Technology (PUT) and Silesian University of Technology (SUT) for the years 2022-2024 were used to estimate the number of studies reviewed by HRECs.

Table 1.

Number of reviewed studies in 2022-2024

Science Discipline	Management	Biomedical engineering	Computer science	Architecture	Education	Other	Total
Wrocław Tech	20	116	23	6	6	5	176
PUT	20	0	6	10	0	6	42
SUT	2	3	1	1	0	3	10
Total	42	119	30	17	6	14	228

Source: own study.

According to these data, almost 66% of cases at Wrocław Tech concerned the review of research in the field of biomedical engineering, with optics being the most common area. This is probably due to both the specific nature of the research and the long-standing habit of researchers at to review research in this area. Before the establishment of HREC at Wrocław Tech, researchers from this discipline reviewed research in other committees, e.g. the Bioethics Committee of the Medical University, despite the various difficulties this entailed. Research from other disciplines included Computer Science (13.1%), Management (11.4%), Architecture (3.4%), projects related to academic teaching (3.4%). Other research (2.8%) were conducted in Mechanical Engineering, Environmental Engineering and Health.

In PUT, most of the cases concern Management studies (47.6%), Architecture (23.8%) and Computer Science (14.3%), as well as other disciplines (14.3%) like Environmental Engineering, Automatics and Electronics and the quality assessment of psychological counselling. Biomedical Engineering is not a discipline taught at PUT.

The SUT received the fewest applications. Three applications were submitted in Biomedical Engineering, two in Management, one in Computer Science, one in Architecture and three in Environmental Engineering.

Even with such large differences in the number of applications in individual committees, certain trends emerged, indicating which disciplines practised at technical universities most often undertake research involving human subjects. These can be considered to be: Biomedical engineering, Management, Computer science, Architecture, and Environmental engineering.

The percentage distribution of research in different disciplines is shown in Figure 1.

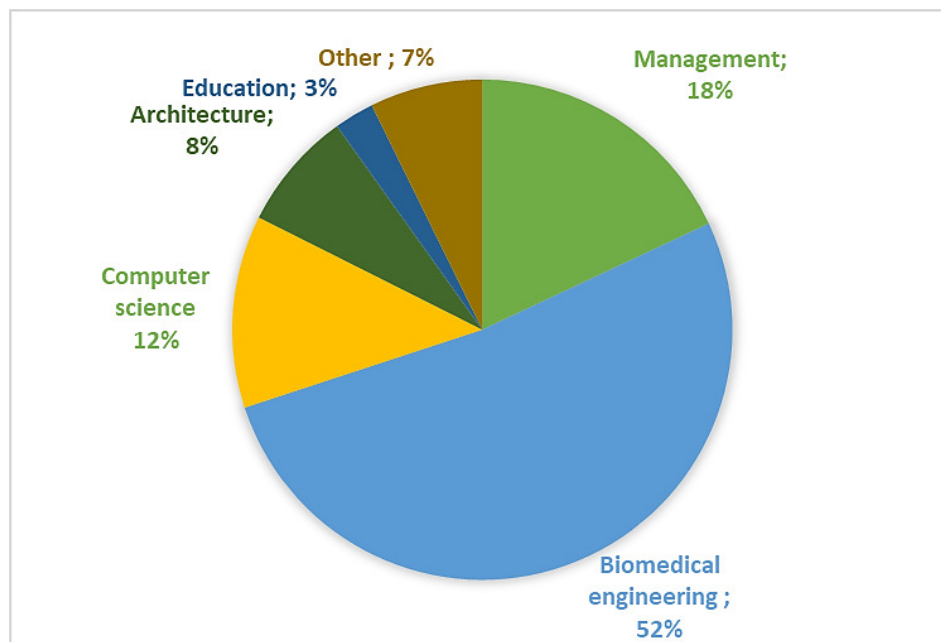


Figure 1. The percentage distribution of research in different disciplines.

Source: own study.

The number of proceedings conducted at both universities is incomparable due to different systems. PUT reviews applications until the desired result is achieved, so individual cases are returned to the committee multiple times. In contrast, at HREC at Wroclaw Tech, different solutions are acceptable. Of the 176 cases reviewed, less than half received approval for research (83; 47.2%), 39 (22.2%) received conditional consent, 34 (19.3%) did not receive consent and 20 (11.4%) were rejected. The reasons for rejection were mainly errors made by researchers, such as submitting to the HREC for review a research that had already been conducted, or research that did not fall within the scope of the committee's activities, such as invasive research involving humans or research involving animals.

In the case of the SUT, the situation appears to be similar to that of the PUT committee. Between 2022 and 2024, 10 applications were processed, of which 1 was ultimately rejected and 9 were approved, including one conditional approval, which means that the authors were required to make corrections.

2.3. Organisation of the HREC work

The Wrocław Tech Committee initially met on an ad hoc basis, depending on demand, according to the applications submitted. According to the first version of the regulations, the committee could make positive or negative decisions. After initial experience, a change was made to the regulations and the possibility of issuing conditional positive decisions was introduced. Due to the increasing number of applications, the Committee planned further work on a weekly basis. The Committee adopted a procedure whereby, in the event of a negative opinion, the applicant is informed of this together with the reasons, and after correction, a new application is submitted.

The PUT Commission also meets as needed, with work beginning immediately after an application is received, after it has been administratively checked for correctness, and then sent to the designated commission for the preparation of a preliminary opinion. A different system of issuing opinions has been adopted than in Wrocław Tech: applications that have been given a preliminary opinion are sent to the applicants for correction and, after they have been resubmitted, are considered by a designated working group of the committee. This iterative process continues until a positive opinion can be issued on the proposed research methodology. For this reason, the committee approved almost all applications, as in two cases it decided not to issue an opinion. This was in accordance with the committee's rules of procedure (there are no negative opinions, only positive ones, or no opinion). This procedure meant that some cases required several iterations, with most being concluded after three exchanges of correspondence.

The SUT Commission met as needed. However, there were relatively few applications. Upon receipt of an application, the chair of the commission asked the members of the commission to review the documentation, and then, during the meeting, the commission made a positive, negative, or conditionally positive decision, depending on the findings. The applicant could amend the application according to the recommendations of the committee. In the event of a negative decision, the applicant receives a full justification of the decision with the possibility of amending the application, which is then returned to the committee for reconsideration. If the application is not brought into line with the committee's recommendations, it is again rejected. The resolution of the committee is a binding document. In the case of a conditional positive decision, compliance with the committee's recommendations is required, but it is not necessary for the application to be resubmitted to the committee for reconsideration. The chairperson checks that the amendments made are in line with the committee's recommendations. If they are, the procedure is successfully completed.

2.4. Typical problems identified by the HREC

According to committee members, the problems identified by the HREC in the application review process are primarily due to errors made by applicants. The most common ones include:

- Problems related to the wording of consent to the processing of personal data – lack of a GDPR clause in the research, lack of consent to the processing of personal data in the research, lack of a clear description of how personal data will be processed.
- Problems related to the method of data processing, e.g. insufficient description or inappropriate method of data anonymization.
- Incorrect submission of requests.
- Formal and logical errors in the substantive content of the research, e.g. questionnaires with inseparable questions – although these are errors that theoretically fall outside the scope of the committee's opinion, they are often noticed by the committee.
- Requests for opinions on research that has already begun or completed.

Other identified problems related to issues specifically related to the planned research. These included, for example, the lack of a psychologist on a research team studying the use of smart wear technology while simultaneously conducting psychological tests on participants, or the absence of information regarding who would supervise underage participants.

In conclusion, the main source of problems was errors related to participant safety, particularly with regard to personal data protection. However, in many cases, the opinion of the HREC allowed researchers to identify shortcomings and improve their study design.

3. Discussion on the role of the HREC

The above material paints a picture of the HREC as a body with both an advisory and a regulatory function. As part of its advisory function, the committee reviews research applications, checks the formal correctness of consents to participate in research, verifies the correctness of data anonymisation and, where justified, points out methodological and logical errors in the proposed research design. As part of its regulatory function, it refuses to issue an opinion on an application or refers it to the competent authority. An example of the first situation is the submission of an application for research during or after its completion. The second situation may concern the submission of an application for which another body is competent, e.g. a bioethics committee.

The literature emphasises that the typical roles of a research ethics committee involving human subjects include (Mehta et al., 2023):

- protecting the rights, safety and well-being of research participants,
- ensuring that research projects comply with ethical principles such as autonomy, justice, beneficence and non-maleficence,
- assessing the relationship between risks and potential benefits for participants and society,
- exercising independent oversight of the research process,
- building public trust in research,
- preventing conflicts of interest and promoting transparency and accountability in scientific research.

Research conducted in three committees confirms this intuition and adds even more to it. In addition to the typical functions performed by HRECs at technical universities, a whole range of other functions can be identified, less frequent but equally important. The authors identified these on the basis of interviews with committee members and an analysis of advisory proceedings and the structure of applications:

- supporting researchers as authors, i.e., ensuring that they meet the requirements set by journals that apply ethical publishing standards (preventive function),
- standardisation of research methods, especially surveys (normalising function),
- resolving semantic differences and measurement scales between fields at a technical university (normalising function),
- formal and legal protection of the research entity by ensuring compliance with legal regulations (GDPR) (preventive function),
- improvement of research methodology, in particular among younger researchers who are encountering the rigour of the research process for the first time (educational function),
- monitoring projects involving people in various fields of engineering, with particular emphasis on computer science, artificial intelligence and system design (predictive function),
- raising ethical awareness among technical researchers, as well as supporting the development of an ethical culture among researchers and students of technical disciplines (educational function),
- adapting ethical assessment procedures and methods to the specific nature of interdisciplinary research, e.g. by simplifying assessment processes in low-risk or multi-centre research (normalising function).

Of the functions listed above, the normalising function in particular seems to be a complex problem. For example, resolving semantic differences and measurement scales between fields operating at a technical university. This requires scientific reflection on the compatibility of

measurement levels and the adequacy of the measures adopted to the nature of the phenomena studied in different disciplines. Engineering disciplines often operate with numerical data, using ratio and interval scales that allow precise measurements and statistical analysis. In management sciences and ergonomics, on the other hand, ordinal and nominal scales are commonly used, often in the form of subjective assessments or declarations, making direct comparisons between research results difficult. Therefore, it is necessary to develop a common methodological framework that allows both data transformation between scales and the conscious design of measurement tools, taking into account their properties (such as reliability, validity, and level of measurement). Only in this way is it possible to reliably integrate the results of interdisciplinary research and create reliable models describing complex phenomena operating at the intersection of different fields of science.

The above list outlines a fairly wide range of functions that the HREC committee would have to perform at a technical university. Given that the status, scope of competence, and range of tasks of the HREC committee are not regulated in any way, this creates a situation full of substantive and organisational challenges. This is undoubtedly a difficult situation for committees operating in a non-standardised manner and without administrative support. This problem was already noticed by other authors (Guillemin et al., 2012).

However, the lack of statutory regulation can also be seen as an opportunity for technical universities. By comparison, bioethics committees operating under legal regulations have their responsibilities and methods of operation clearly defined by the legislator. They have no freedom of action as to what research they review and to what extent. They cannot also take action outside of the statutory regulations.

From this point of view, the situation of HRECs is much better. Due to the lack of statutory regulation, it can be assumed that they operate on the basis of organisationally designated prerogatives (i.e. at the university level) within the scope of what is not expressly prohibited by law. This gives the university the opportunity to make the HREC an important tool for shaping research policy, managing research and implementing selected social responsibility objectives of the university.

The university may decide that the HREC also performs managerial and social-community functions. Through appropriately assigned managerial functions, the HREC may become an important body of the university in the field of research governance. It is also worth considering the extent to which the HREC could participate in the process of informing the public about research involving human subjects conducted at the university, as well as the extent to which it could support the fulfilment of equality and accessibility requirements in the area of research.

However, equipping the committee with functions that go beyond advisory and regulatory ones requires not only careful consideration, but above all further research in this area and the formulation of forecasts and guidelines based on this research. Our proposal is based on the belief that HRECs established to review applications for research involving human subjects should assess not only the formal correctness of these applications, but also their reliability,

particularly with regard to the identification of risks by researchers and the proposed means of minimising them. Both the literature on the subject and normative acts (e.g. the Helsinki Declaration) emphasise that research conducted in a manner inconsistent with accepted principles cannot be considered reliable (Małek-Orłowska, Jach, 2022; Emanuel et al., 2000). In addition, one of the most important reasons why researchers conducting research involving human subjects are required to submit their research projects to prospective ethical review is to ensure the safety of research participants. Therefore, it can be assumed that HRECs play an important role in the process of managing scientific research at universities.

From this broad range of functions, three modes of operation can be identified: 1. strictly formal, limited to issuing opinions on applications, 2. extended to include substantive advice, and 3. implementing elements of research governance. Mode 1 seems insufficient in light of existing HREC committees. The committees whose work was observed by the authors of this article already perform functions corresponding to mode 2, often advising researchers on how to improve their research designs or educating them in the field of research ethics. The implementation of mode 3, on the other hand, seems to be a much greater challenge at present, due to the fact that the committees operate in an unstandardised manner, effectively without administrative support and without the backing of an appropriate organisational model. However, it is worth considering the possibility of such a solution, as its implementation could bring significant benefits to researchers, universities and external stakeholders, including the wider public.

4. Summary

One of the most important reasons for reviewing research projects involving human subjects is to assess the adequacy of ethical risk identification and the effectiveness of measures to minimise each risk. When reviewing projects, HRECs decide which of the submitted projects meets the ethical standards for conducting research involving human subjects, thus helping to manage research risk. Obtaining a positive opinion from an HREC provides a kind of guarantee that the proposed research design not only meets scientific standards but is also ethically sound. From this point of view, ethical excellence, understood as compliance with the principles of scientific integrity, loyalty to research participants and the usefulness of results, is an element of scientific excellence.

The participation of HREC in the research process can contribute to improving the quality of research, more effective research management and fuller implementation of the principles of social responsibility of universities. For this reason, it is worthwhile for technical universities to consider not only the need to standardise the work of HREC committees but also to optimally define the scope of their functions and competences. The role of HREC at a technical university

may go far beyond the narrow framework of confirming the formal correctness of applications submitted by researchers conducting research involving human subjects.

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STUDENTS' PERCEPTION OF THE VALIDITY OF PRO-ENVIRONMENTAL DEMANDS MADE BY ENVIRONMENTALISTS AND SCIENTISTS

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Purpose: The aim of the article is to present a study on the assessment of the validity of demands, and arguments related to environmental protection, depending on who is presenting them.

Design/methodology/approach: The study was conducted in 2022 and 2023 on a group of 760 students of various faculties and universities in Poland. Students assessed the validity of the same demands depending on whether the agent presenting them was an environmentalist, a scientist, an environmental organization, or a conservation organization.

Findings: The students' assessment of the validity of the demands and their willingness to comply with them, or sign the petition, did not change irrespective of who the representative was. The demands to limit meat production and consumption were assessed as less valid, regardless of who presented them.

Research limitations/implications: The perception of the credibility of various communicators varies over time and is sensitive to current events and issues, as well as the discussions surrounding them. The results of the survey largely reflect the state of affairs at a given moment in history. The problem, however, is universal: who can society trust when various representatives sound the alarm and call for action and sacrifice.

Practical implications: The study confirmed differences in the perception of various environmental issues and actions. It's worth raising awareness of the effects of meat consumption.

Social implications: The study's results are worth further reflection. They may inspire work to rebuild trust in the scientific community, and their authority among young people.

Originality/value: No similar studies were conducted in Poland. The results of this study may inspire other researchers to conduct further research on how to reach target audiences regarding environmental protection issues effectively.

Keywords: trust in science, trust in environmentalists, environmental denial, students' attitudes towards the natural environment.

Category of the paper: Research paper.

1. Introduction

One of the most critical issues of our time is the degradation of the natural environment and the looming prospect of a climate catastrophe. The cause-and-effect relationships surrounding these problems are often unclear, especially from the perspective of non-experts, who constitute the majority of society. Some of the consequences of current activities will take place long in the future. These consequences, some of them catastrophic, will only become apparent in several years or even decades. Alarming reports are accompanied by calls for change, for the introduction of new solutions, and often for restrictions and sacrifices, both at the systemic level and in the lives of individuals. It's worth considering who is perceived as a credible communicator when discussing threats and advocating for change.

Environmental activists raise alarms about threats and call for change. These are often individuals without a professional or specialized education. Therefore, they are sometimes accused of incompetence and at other times of over-publicizing threats (Tomiałoć, 2011). Furthermore, for many years, their negative image as troublemakers has persisted. More radical activists contribute to this image of troublemakers, contributing to the negative perception of environmentalists. They sincerely believe in what they do but sometimes operate in the edge of the law and can be overly alarmist about the threats. Greenpeace and Earth First! (and recently also Last Generation) are some examples of such organizations. Eco-terrorists, operating outside the law, using brutal methods, and taking bribes, harm the image of environmentalists the most (Tomiałoć, 2011). The actions of such activists are readily publicized by journalists (Pietrzak, 2015). The negative perception of environmentalists is not unique to Poland, as exemplified by "The Toxicity of Environmentalism" (Reisman, 2015), in which the author accuses environmentalists of being unscientific and over-hyping threats.

A separate group consists of individuals who masquerade as environmentalists for their own gain, for example, protesting against an environmentally unfriendly investment project solely because it is planned near their place of residence (Tomiałoć, 2011). In Poland, one of the very few examples of the environmentalist motif in fiction is the crime novel *With One Exception* (Puzyńska 2015). An environmental activist protesting against a company's use of environmentally unfriendly substances turns out to be a close relative of the boss of a rival company. Only in recent years did a more positive portrayal of environmental activists begin to emerge in Polish films, for example in *Apokawix* (Żuławski, 2022).

Does this mean that, scientists are the authority to whose appeals society will be more willing to heed? Objectified, verified, and confirmed knowledge is the result of the research work of scientists. Therefore, scientists should be perceived as trustworthy. Unfortunately, however, there is also talk of a decline in trust in science (Gryz, 2024).

The Covid-19 pandemic, among other factors, contributed to the decline in trust in scientists and the rise of conspiracy theories. Conspiracy theories are nothing new. They have been developing since the outbreak of the French Revolution as an explanation for profound changes in Western civilization. They operated on the margins of official intellectual life (Butter, 2022; Robison, 2023). Their rise in importance could be observed in the first half of the 20th century, but they were discredited along with their proponents – the propagators of Nazism and Stalinism (Butter, 2022). Unfortunately, at the turn of the 21st century, they experienced a rapid revival due to two overlapping phenomena: the social crisis associated with the collapse of the affluent society (Frank, 2008) and the rapid development of electronic media, primarily the Internet (Ancona, 2017). Meanwhile, the Internet, as a field of discussion devoid of any moderation, becomes a realm in which radical, uninhibited demagoguery triumphs (Grzesiak-Feldman, 2016).

Conspiracy theories about science have long been prevalent. These include the theory that the HIV virus was created in a laboratory (King, 2022). In the case of the Covid-19 pandemic, two popular conspiracy theories were that the virus was allegedly created in a laboratory to reduce the world's population (King, 2022) and that vaccines were supposedly dangerous. There is also the recurring theory that doctors diagnose diseases and drug addiction to keep the pharmaceutical industry operating. For the same reason, they conceal the fact that cures have already been discovered for diseases such as cancer and AIDS (King, 2022).

It's also worth noting the image of scientists in popular culture. The figure of the mad scientist has long appeared in films, as exemplified by *Metropolis* (Wiene, 1927), in which an evil scientist imprisons the positive protagonist – a gentle pacifist – and creates a chaos- and conflict-inducing robot in her place. Fantasizing about the possibilities of science is nothing new, as evidenced by classics such as *Frankenstein; or, The Modern Prometheus* (Shelley, 1818) and *The Island of Doctor Moreau* (Wells, 1896). The mad scientist has appeared in numerous science fiction and horror films from the 20th and 21st centuries, both in well-known and crowd-pleasing films, as well as in multiple lesser-known (and often not highly rated) productions. Deadly weapons, viruses, robots, and monsters were created in fictional laboratories. The environmentally friendly cartoon *Captain Planet and the Planeteers* (Turner, Pyle, 1990-1996) also follows this trend. One of the villains is a scientist, Dr. Blight, who destroys the environment, alongside, among others, a greedy businessman. Contemporary examples of negative scientist characters include the popular series *Stranger Things* (Duffer, Duffer, 2016-2025) and the movies from *X-Men* franchise (2000-2024).

However, theories concern not only unethical actions involving the creation of deadly viruses, but also other unethical actions. There are also those based on the assumption that scientists (either for their own interests or at the behest of some higher body) use their authority to impose theories that serve to compel specific behaviors resulting from voluntary acceptance of scientific authority or obedience to scientific authority enforced by state power (Butter, 2022; King, 2022; Pipes, 1998; Zdybel, 2002).

The worldview underlying conspiracy theories is particularly dangerous because it invalidates the traditional premise of understanding science as an endeavor to distinguish truth from falsehood. In its place, it introduces the motive of self-interest, which negates the search for truth as the fundamental motive for science and scientific debate. This mode of thinking underlies the offensive of denialism towards the threat of ecological catastrophe. It poses a significant problem for the development of contemporary environmental awareness because its assumptions exclude the possibility of treating environmental arguments as assessed according to the criteria of truth and falsehood, treating them instead as calculated deception.

It is becoming more and more commonplace to question the results of science in relation to the study of the natural environment, and diagnosing the conditions that threaten the well-being of societies or the future of human civilization on Earth. Issues such as the greenhouse effect, greenhouse gas emissions, etc., often arouse criticism, which has even been given a separate term, so-called climate change denial (Adamczyk, 2019; Cukiernik, 2019; Klaus, 2008; Klinsky, 2023; Lomborg, 2024; Mastalerz, 2000; Morano, 2023; Przekora, Zamorski, 2023; Reisman, 2015; Scruton, 2017; Schellenberger, 2021; Teluk, 2009; Warzecha, 2021; Whyte, 2015; Ziemkiewicz, 2019).

The article presents the results of a study examining the impact of the communicator on the reception of a message's content among students. Its aim is to answer the question of whether, and if so to what extent, the nature of the communicator's profession has an impact on the reception of the message's content. This question arises in the context of the current crisis of scientific authority in public debate and popular culture (Gryz, 2024). Because, in the context of environmental issues, science is sometimes pitted against the ideology of environmental activists (Tomiałojć, 2011, Reisman, 2015), conducted research will be interpreted in reference to the level of trust placed in scientists and environmentalists. Environmental awareness is a changing and dynamic phenomenon, highly susceptible to social and political impulses. Interpreting the study will therefore require placing it in a historical context (Ziemianie atakują Raport, 2024). The presented study was conducted and completed before the recent wave of radical criticism of the Green Deal and the controversial actions of the environmental organization Last Generation.

2. Literature review

The identity of the communicator and the characteristics that make a communicator to be considered as credible are the subject of social psychology research. Attributes of a communicator perceived as credible include competence and honest intentions. A classic psychology study has shown that the same exact text was evaluated differently depending on who the supposed author was, or which newspaper it came from. The same text was presented

to different audiences, with only the supposed author or source varying. An article on atomic submarines was presented to one group as authored by Robert J. Oppenheimer, while to another group as an article from the Soviet magazine *Pravda*. An article on Antihistamine drugs was presented as an article from the *New England Journal of Biology and Medicine* or as an article from a mass circulation monthly pictorial magazine (Hovland, Weiss, 1951). The texts were judged significantly more credible if they came from a source perceived as credible (Hovland, Weiss, 1951). As the study shows, scientists were perceived as credible communicators.

In a 2012 study, students assessed the advisability of supporting various initiatives and were asked whether they would support each initiative with a monetary donation (Ciążela, 2014). Participants declared both the lowest level of support and the lowest level of financial support for an environmental organization. The environmental organization was ranked last, being placed below initiatives such as an addiction treatment center and support for motorcyclists after accidents, a group associated with fast and reckless driving. Initiatives such as the protection of endangered animal species and the construction of an environmentally friendly facility also received relatively low support (Ciążela, 2014).

Ten years later, in a study conducted in 2022, students were asked about the characteristics of environmentalists and individuals involved in environmental protection (Ciążela, 2023a). The most frequently attributed characteristic was empathy, mentioned by 20% of the participants. Frequently attributed characteristics also included sensitivity, responsibility, and courage. Only a few participants mentioned attributes such as intelligence, knowledge, or forward-thinking (Ciążela, 2023a). This may indicate that environmentalists are not credited with expertise and competence, and that their actions and proposals are seen to stem primarily from sensitivity and idealism, not from an awareness of threats. They are not considered to be based on scientific knowledge.

It is also worth recalling the analysis of civil society in Poland (Dzwończyk, 2016). According to a study conducted on a sample of 1,000 Poles, respondents who were asked about the most important and most recommended areas of NGO activity, ranked environmental protection highest (Dzwończyk, 2016). The same study shows that environmental protection accounts for a small percentage of NGO activity (Dzwończyk, 2016). According to the author, the discrepancy between the association of environmental organizations with third sector activities and the actual state of affairs may, to some extent, result from media reports about spectacular actions by environmental organizations, such as the defense of the Rospuda Valley (Dzwończyk, 2016). The Young Values Report (2022) presents interesting research results: despite being the Climate strike generation, there is only little environmental activism among young people (Chmura-Rutkowska, Kozłowska, 2022).

A report on the environmental awareness of adolescents from Bełchatów and the surrounding area shows that 33% of respondents identified environmental organizations as responsible for protecting the natural environment (Bełchatów 2050, 2020). However, in response to the question "Where do you get your knowledge about environmental

protection?" only 18% of participants responded, "from an environmental organization". 74% indicated the internet, and 58% social media (Bełchatów 2050, 2020). An interesting question, however, is who the communicators of information on the internet and social media are – are they mostly influencers, or do they include others, for example scientists or environmentalists, politicians or perhaps even conspiracy theorists.

The attitudes towards demands related to environmental protection vary, and some are even considered controversial. This depends on many factors, including how long a given issue has been discussed, the emotions it evokes, and the lifestyle changes and sacrifices change requires.

In 2019, young people from Bełchatów were asked which environmental issues they consider to be priorities and which should be addressed first, and 53% of them indicated tree planting as the most important pro-environmental action (Bełchatów 2050 Report). Three years later, 47% considered reducing deforestation a priority (Debiutanci'23, 2023).

A study conducted in 2019 on behalf of the Ministry of Climate and Environment found that nearly 60% of respondents believed that a ban on the sale of everyday plastic items would serve to protect the natural environment. One-third of respondents said that everyday plastic products should be available for sale and that they could be recycled (Świadomość i zachowania ekologiczne Polaków, 2019). Plastic has become a popular topic in the media. Advertisements for plastic-free credit cards have appeared, for example, in 2021, advertised by Credit Agricole bank.

An issue that remains controversial, or perhaps not yet widely recognized, is limiting meat consumption and production. The causes of controversy around the issue include misconceptions about the negative health effects of vegetarian diet and the unpleasant consequences of not eating meat such as lack of energy or constant feeling of hunger, as well as the belief that meat has always been present in the human diet (Sowa, 2019). Only 11% of young people indicated reducing meat consumption as the most important environmental action (Bełchatów 2050, 2020). Three years later, only 15% of respondents prioritized promoting the reduction of animal products (Debiutanci'23, 2023).

The Young Values Report (Chmura-Rutkowska, Kozłowska, 2022) shows that giving up meat was undertaken less frequently than other environmental actions, such as preserving water and electricity, choosing to use public transport, or limiting general consumption, i.e., buying new things. Significantly more men (59.5%) than women (27.8%) declared that they would never give up eating meat (Chmura-Rutkowska, Kozłowska, 2022). Knowledge about the effects of meat consumption also isn't widespread yet. In a study involving 710 young Poles, only 56% of participants correctly answered the question that reducing meat consumption is a way to reduce greenhouse gas emissions (Ciążela, 2023b).

3. Method and sample

The study was conducted on a group of 760 students (615 women, 145 men, aged 19-26, with an average age of 21.78). Participants included students from various fields of study and universities in Warsaw, Toruń, Bydgoszcz, and Siedlce: the University of Warsaw, Cardinal Stefan Wyszyński University, Warsaw University of Life Sciences, Warsaw School of Economics, The Maria Grzegorzewska University, War Studies University, Nicolaus Copernicus University in Toruń, Kazimierz Wielki University in Bydgoszcz, and Siedlce University.

The study was conducted using Google Forms. It was distributed to student groups by lecturers or deans. Each participant was asked to evaluate one statement regarding environmental protection. The content and format of the statements were identical; the statements differed only in the subject. In the first variant, the message was attributed to environmentalists or scientists, whereas in the second variant, the message was attributed to an environmental organization or a conservation organization. Each participant rated one statement, unaware of the existence of other versions.

The study consisted of 8 statements. The statements concerned uncontroversial topics, such as stopping deforestation or reducing the use of plastic, or a potentially controversial topic – limiting meat consumption and production. The content of the statements is presented below.

1) uncontroversial topic – limiting the use of plastic

Version I: *Environmentalists warn that the continued mass use of plastic in the economy and trade will soon lead to irreversible environmental degradation, and therefore they advocate limiting the use of plastic, including single-use plastic packaging.*

Version II: *Scientists warn that the continued mass use of plastic in the economy and trade will soon lead to irreversible environmental degradation, and therefore they advocate limiting the use of plastic, including single-use plastic packaging.*

2) potentially controversial topic – limiting meat consumption

Version I: *Environmentalists warn that industrial farming of animals for meat produces enormous amounts of gases that contribute to climate change, and therefore advocate limiting meat consumption or completely switching to vegetarianism.*

Version II: *Scientists warn that industrial farming of animals for meat produces vast amounts of gases that contribute to climate change, and therefore advocate reducing meat consumption or completely switching to vegetarianism.*

Questions: *Rate the persuasiveness of the information on a scale of 1 to 10, where 1 means "definitely not persuasive" and 10 means "very persuasive".*

Would you comply with the proposal? Rate them on a scale of 1 to 10, where 1 means "I would definitely not comply" and 10 means "I would definitely comply".

4 sentences related to the content of a petition authored by an environmental organization or a conservation organization. The study assumed that the term 'conservation organization' would sound more neutral than 'environmental organization' and would not evoke associations with eco-terrorists and other radical activists perceived as troublemakers.

1) uncontroversial topic – stopping deforestation

Version I: *An environmental organization filed a petition against the clearing of forests for the planned construction of a recreation and leisure center. The justification for its opposition is that the forests are a habitat for numerous plant and animal species.*

Version II: *A conservation organization has filed a petition against the clearing of forests for the planned construction of a recreation and leisure center. The justification for its opposition is that the forests are a habitat for numerous plant and animal species.*

2) potentially controversial topic – limiting meat production

Version I: *An environmental organization has filed a petition to introduce a statutory limit of 50% on the current industrial farming of animals for meat. The petition is justified by the fact that animal farming results in the production of gases that contribute to climate change.*

Version II: *A conservation organization has filed a petition to introduce a statutory limit of 50% on the current industrial farming of animals for meat. The petition is justified by the fact that animal farming results in the production of gases that contribute to climate change.*

Questions: *Rate the validity of the organization's proposals on a scale of 1 to 10, where 1 means "definitely wrong" and 10 "very right".*

Would you sign such a petition? Rate it on a scale of 1 to 10, where 1 means "I would definitely not sign" and 10 "I would definitely sign".

After responding to the statement, each participant answered two more questions:

Do you consider environmental protection an important issue? Rate on a scale of 1 to 10, where 1 means "definitely unimportant" and 10 "very important."

How would you rate your daily environmental protection activities, such as sorting waste, saving water, and buying eco-friendly products? Rate on a scale of 1 to 10, where 1 means "I do very little" and 10 means "I do a lot".

Participants were randomly assigned to groups evaluating individual statements. The requirement was that a similar number of participants responded to each pair of statements. For six of the eight statements, the response was between 65 and 69. For one pair of statements, 175 and 186 responses were received, because of the size of the groups to which the email requesting participation in the study was sent by the lecturers.

Table 1.*Number of participants who responded to individual statements*

	Number
Environmentalists - plastic	186
Scientists - plastic	175
Environmentalists - meat consumption	66
Scientists - meat consumption	66
Environmental organization - deforestation	65
Conservation organization - deforestation	66
Environmental organization - meat production	69
Conservation organization - meat production	67
Total	760

The aim of the study was to determine whether the communicator's identity would cause respondents to assess the validity of the same demands and the arguments supporting them differently, as well as influence their readiness to comply with the demands or, respectively, sign the petition. The aim was also to determine whether study participants considered environmental protection important and whether this perception was related to the assessment of the validity of the demands and their declared willingness to act or sign the petition.

4. Results

The results compared the evaluations of the two groups, which differed in terms of the person making the proposal. Very similar results were obtained in groups assessing the validity of proposals concerning reducing plastic use, made by environmentalists ($M = 7.47$) and scientists ($M = 7.50$). Similarly, in assessing the willingness to comply with the proposal to reduce plastic use, the results obtained from both groups were similar: the group assessing the proposal from environmentalists ($M = 7.46$) and the group assessing the proposal from scientists ($M = 7.69$). Whether the proposals came from scientists or environmentalists did not affect the assessment of the proposals' validity or the willingness to comply with them.

The participants assessed the validity of the proposal to limit meat consumption as lower than the validity of the proposal to reduce the use of plastic, both when the information came from environmentalists ($M = 6.15$) and scientists ($M = 6.17$). The identity of the source of information did not differentiate the inclination to comply with the demand ($M = 5.55$ and $M = 5.88$, respectively). Comparison of the results revealed no significant differences between the groups. The results are presented in Tables 2 and 3.

Table 2.

Assessment of the validity of the demand of limiting the use of plastic and declared inclination to limit the use of plastic

	M	Me	SD	Min	Max
Environmentalists - validity	7.47	8	2.295	1	10
Environmentalists - compliance	7.46	8	2.288	1	10
Scientists - validity	7.50	8	2.168	1	10
Scientists - compliance	7.69	8	1.947	2	10

Table 3.

Assessment of the validity of the demand of limiting meat consumption and declared inclination to reduce meat consumption

	M	Me	SD	Min	Max
Environmentalists - validity	6.15	6.5	2.808	1	10
Environmentalists - compliance	5.55	5	2.889	1	10
Scientists - validity	6.17	6.5	2.721	1	10
Scientists - compliance	5.88	6	2.964	1	10

The demand for stopping deforestation was rated as the most valid by participants, regardless of who made the statement. The validity rating was high for both the environmental organization ($M = 8.65$) and the conservation organization ($M = 8.59$). Participants also declared a high willingness to sign the petition ($M = 8$ and $M = 8.03$, respectively).

As with the statements about environmentalists and scientists, the demand to reduce meat production was rated as less valid, both coming from the environmental organization ($M = 6.78$) and the conservation organization ($M = 6.04$). The inclination to sign the petition was also lower than for the no-deforestation petition. The identity of the communicator did not change the willingness to comply – $M = 6.16$ for the environmental organization and $M = 5.61$ for the conservation organization. Comparison of results revealed no significant differences between groups. The results are presented in Tables 4 and 5. The results were similar to the results of statements concerning reducing meat consumption. The willingness to sign the petition also turned out to be similar to the willingness to comply with the demands concerning meat consumption.

Table 4.

Assessment of the validity of the demand of stopping deforestation and declared willingness to sign a petition against deforestation

	M	Me	SD	Min	Max
Environmental organization - validity	8.65	10	2.110	1	10
Environmental organization- petition	8	9	2.646	1	10
Conservation organization- validity	8.59	9	1.780	2	10
Conservation organization- petition	8.03	9	2.300	1	10

Table 5.

Assessment of the validity of the demand of limiting meat production and declared willingness to sign a petition

	M	Me	SD	Min	Max
Environmental organization- validity	6.78	7	2.623	1	10
Environmental organization- petition	6.16	6	2.969	1	10
Conservation organization- validity	6.04	5	3.027	1	10
Conservation organization- petition	5.61	5	3.380	1	10

According to the results, the identity of the communicator did not differentiate the assessment of the validity of the demands – both in case of environmentalists or scientists and environmental organization or conservation organization. The validity of the demands regarding uncontroversial topics (stopping deforestation and limiting the use of plastic) was rated higher than the validity of the demands regarding controversial topics (limiting meat consumption and production).

The participants rated environmental protection as a very important issue ($M = 9.09$). 55.5% of participants rated the importance of environmental protection as 10. They rated their own environmental protection activities lower ($M = 6.66$). The results are presented in Table 6. The correlation between considering environmental protection an important issue and declared environmental action is significant, but not high ($\rho = 0.252$; $p < 0.01$).

Table 6.

Perceived importance of environmental protection and individual pro-environmental activity

	M	Me	SD	Min	Max
Importance	9.09	10	1.315	2	10
Own activity	6.66	7	1.639	1	10

Significant correlations were found between the assessment of the validity of the demands and the signing of the petition for all statements. The correlations are presented in Table 7.

Table 7.

Correlations between the assessment of the validity of the demands and the signing of the petition

	Importance	Own activity
Environmentalists - plastic - validity	0.383**	0.194**
- compliance	0.435**	0.314**
Scientists - plastic - validity	0.397**	0.237**
- compliance	0.394**	0.280**
Environmentalists - meat consumption - validity	0.352**	0.267*
- compliance	0.385**	0.323**
Scientists - meat consumption – validity	0.419**	0.363**
- compliance	0.459**	0.280*
Environmental organization - deforestation - validity	0.454**	0.334**
- petition	0.562**	0.406**
Conservation organization - deforestation - validity	0.447**	-0.060
- petition	0.456**	-0.039

Cont. table 7.

Environmental organization - meat production - validity	0.533**	0.156
- petition	0.421**	0.168
Conservation organization - meat production - validity	0.533**	0.099
- petition	0.513**	0.024

* - $p < 0,05$; ** - $p < 0,01$

5. Discussion

In light of the ongoing transformations in the social context, the study results prove difficult to interpret in many respects. The study's most important finding is that the results regarding the credibility of scientists closely align with the credibility of environmentalists. One explanation for these results could be an increase in trust in environmentalists or a decrease in the credibility of science.

One of the possible reasons why the communicator's identity did not influence the assessments of the respondents may be that environmental protection is perceived as being important and the need for action is considered obvious and essential. It may also be the result of increased trust in environmentalists, associated with a shift in perception of this issue. A study of the attitudes toward environmental protection and environmental knowledge of students conducted over five years, 2016-2021, which was a period marked by changes in Poland's approach to environmental protection, shows an increased belief in the reality of a severe ecological crisis and an increase in knowledge on current topics such as smog (Ciążela, 2024). The perception of the crisis as real is also evidenced by a study conducted on a group of students in 2022 (Kozłowska et al., 2023). This may indicate a shift in the perception of environmental protection issues and an increased belief in the need to take action to protect the environment. This possibility is supported by the participants' assessment of environmental protection as important. This may lead to increased trust in environmentalists as acting for a good cause (If the study had been conducted after the actions of the Last Generation, the results might have been different).

The results of the study indicate that environmental protection is perceived as an important issue. This is another change that has become visible over the years. Approximately 10 years earlier, environmental protection and related issues, such as the depletion of natural resources, were not considered significant issues (Stanaszek, Tędziągolska, 2011; Kachaniak et al., 2014). However, in July 2019, Polish respondents to a Eurobarometer survey ranked climate change third (out of 12) among the issues causing the most concern (Special Eurobarometer 2019, published August 3, 2019). The assessment of the validity of the demands turned out to correlate with the recognition of environmental protection as an important issue. Perhaps it would be

worthwhile to consider the factors that influence young people's perception of the importance of this issue.

The study results confirm that stopping deforestation is an uncontroversial topic among young people. Limiting meat consumption, however, remains a relatively controversial issue. While the results are not entirely low, they are still lower compared to attitudes towards stopping deforestation and limiting the use of plastic. This may also indicate that awareness of this issue is slowly increasing. In 2019, students' attitudes toward meat consumption and their intentions to reduce it for environmental reasons were surveyed (Borusiak, Kucharska, 2020). 42% of students stated that they had reduced their meat consumption in the three years preceding the study. Approximately 40% of respondents declared their intention to reduce meat consumption for environmental reasons (Borusiak, Kucharska, 2020). Nevertheless, it is worth remembering, that the majority of participants of the study were women. Women typically exhibit more pro-environmental attitudes and engage in more pro-environmental behaviors (Zelezny, Chua, Aldrich, 2000; Xiao, McCright, 2015). This trend is also evident in Poland (Chmura -Rutkowska, Kozłowska, 2022). The numerical predominance of women could have influenced the higher assessment and declared willingness to act, as well as the higher assessment of the importance of environmental protection.

It is also worth addressing the sources of information on environmental protection in general. The primary source is social media (Ciążela, 2021, Ciążela, 2023b, Ciążela, Gogacz, 2024), including among students in Kazakhstan (Ciążela et al., 2024). The question remains: who expresses their opinions on social media, and who are young people inclined to believe? Who shapes their attitudes?

6. Summary and conclusions

The results of the study indicate no differences in students' assessment of the validity of pro-environmental demands depending on the identity of the communicator: environmentalists or scientists, an environmental organization or conservation organization. As expected, the demands regarding limiting meat consumption and production were rated as less valid than the demands regarding limiting the use of plastic and stopping deforestation. Participants consider environmental protection to be an important issue, but they do not (in their own opinion) take sufficient daily action to protect the environment.

The study's results raise the question of whether students perceive a difference between scientists and environmentalists in terms of competence and knowledge related to environmental protection. Perhaps students are accustomed to the presence of environmental issues in the public sphere and do not pay particular attention to who speaks on the subject. However, given that they are increasingly convinced of the reality of the climate catastrophe

threat, their trust in environmental activists has also grown, and they share their opinions and appeals, which are similar to those coming from the scientific community. This may have negative consequences, as failing to consider the credibility of the speaker on this topic may amplify the influence of unreliable communicators on recipients and their attitudes. Such communicators may be incompetent, lack honest intentions, or act for ideological reasons (pro- or anti-environmental) or to serve their own interests.

Environmental protection and climate change prevention are highly relevant topics, so it is worth researching which sources and communicators influence societal ecological awareness. Another critical issue is the perception of scientists and, consequently, the trust in them: are scientists considered authorities, or is their credibility questioned, and if so, why?

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SOME METHODOLOGICAL REMARKS ON KNOWLEDGE MANAGEMENT/GOVERNANCE

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Purpose: Analysis of logical/methodological relations between various scientific disciplines studying knowledge (its structure, development, impact on society etc.). Author's conviction that that further integration of these disciplines is of greater and greater practical importance in knowledge society/information civilization – it was the main motive for preparation of this text.

Design/methodology/approach: Combination of logical analysis with some elements of the history of science/knowledge and general history of the 20th century.

Findings: Two challenges for the theory of knowledge management/governance were identified and some suggestions how to cope with were presented.

Research limitations/implications: Due to complexity of problems analyzed in this paper, it can only be regarded as an attempt at a description (a “map”) of the *problematique*.

Practical implications: Possible practical implications of analyzes presented this can be of indirect character: they might inspire some efforts oriented at restructuration of various mechanisms (institutional, legal, financial...) influencing development of knowledge/science and its role in the comprehensive development of society.

Social implications: In the (very) long run, the results of these studies might contribute to making various collective decisions (political including) more and more rational

Originality/value: The formulation of problems (paradoxes) indicating some possible ways on which their solutions could be sought. The paper is addressed to management theoreticians, sociologist, philosophers and all other persons interested in actual and possible roles knowledge/science plays/could play in (the global) society.

Keywords: globalization, production of knowledge, distribution of knowledge, consumption of knowledge, knowledge governance.

Category of the paper: View point.

1. Introduction

“Our times” – the last decades (symbolically: from 1989 – “Round Table” in Warsaw and the fall of Berlin Wall, or from 1972 – the Stockholm UN Conference and publication of the “Limits to Growth”, or even from 1945) can be characterized in quite a few ways (rather

complementary then alternative). Commencing the presentation of this paper, I would like to say – following (Handy, 1995) – that “our times” are times of paradoxes. One could add: of great many paradoxes. Obviously, I do not intend to provide even just a list of them; I am going to speak only about two of them: about paradoxes that inspired me – among other things – to write this text. To formulate them three/four notions will be essential: globalization, democracy and knowledge society/information civilization.

Quite a few interesting definitions of globalization were formulated (e.g. Bauman, 1999; Morin, Kern, 1993). Very useful and comprehensive overview was provided by (Scholte, 2005). In my opinion, the variety of these definitions is neither incidental nor (necessarily) reflecting different theoretical stances: Globalization – intuitively comprehended – is a very complex process and this variety reflects (though not exclusively) this complexity. Thus, formulating my own definition (perhaps similar definition have already been formulated but I know nothing about it), I am not going to claim that it would be better than others – in any sense. I want but draw attention of the Reader to this aspect of globalization which is of central importance – in the context of problems to be discussed in the present text.

By globalization I mean the process of (mainly: spontaneous) creation of one eco-techno-socio-system encompassing the whole planet (and, perhaps we should add taking into account the revival of interest in the exploration of the Space: its surrounding). Without elaborate considerations, let's only stress that the concept of eco-techno-socio-system combines the notions of ecosphere, of techno-sphere, and of global society. And the word “system” should be regarded as a “link” to general system theory. Let's also underline that introducing this definition expresses the factual thesis stating that the process of creation of this system does take place.

Now, a few words on democracy. Any elaborated discussion of this notion is impossible here (and a short one is unnecessary); I am going to formulate only one comment: Speaking in this paper about democracy I mean mainly its particular (one might also say: “demanding”) kind – deliberative democracy (Gutmann, Thompson, 2024). Briefly put: democracy – in which political decisions are made on the basis of rational (!) discussions/debates.

Finally, some comments on the concepts of knowledge society and information civilization. Reaching into the extensive literature, we will surely note that these two notions are both close and different. Discussing in a more systematic way their relations is impossible. I would suggest referring to two distinctions: this between information and knowledge and that between civilization and society. The first one is so often discussed that no further comments are necessary. As regards the second distinction, I would suggest to regard “civilization” as denoting non-human (and mainly material) aspects of social life and “society” – its central, human aspects. To these conceptual remarks, I'd like to add some more substantial. First, various studies – both relatively early (e.g. Drucker, 1993) and the recent (e.g. Harari, 2024) – demonstrate the profound economic, social, political, cultural changes resulting from the development of knowledge and technology. And second remark: The idea of the

rise/development of knowledge society/information civilization should be by no means interpreted as suggesting decreasing the role of other domains of human activity. – For instance: It is obvious that production of food will remain in the coming decades and (let's hope) centuries and millennia as important as it has always been. But production of food was extremely different in the societies of gatherers/hunters, very different in agricultural societies, different in industrial ones, and will be (more and more) different in knowledge/information societies. This same can be said about clothing and housing, also – about health care and upbringing children, etc. etc.

To these remarks on globalization, (deliberative) democracy and knowledge society/information civilization, I'd like to add some notes on a very important – at least in my opinion – idea which was born in our time: idea of (global) collective responsibility. This idea was most likely born after Hiroshima/Nagasaki 1945 tragedy. A philosophical elaboration it received in the book “The Imperative of Responsibility” (Jonas, 1984) And in the last years it regained some popularity, even in the form of “longtermism” (MacAskill, 2022) – an ideology insisting on our responsibility for, very simply put, the well-being of the generations living in next centuries.

To pass from these remarks on (global) collective responsibility to discussion of two paradoxes mentioned at the beginning of this Introduction still one, rather short, step is to be made: Some words are to be said about relation(s) between responsibility and knowledge (Ingarden, 1970): the idea underlying (at least) modern morality and law is both simple and fundamental: responsibility for an action of an (individual or collective) subject presupposes his/her/its knowledge about possible consequences of this action. Let's supplement this thesis with two rather obvious still important observations: First, one can possess the relevant knowledge if this knowledge exists at all. And second, if this knowledge exist s/he/it should have had access to it. (I ignore here the rather complex problem of responsibility for the lack of accessible knowledge). Having made this step, we can pass to discussion of paradoxes.

The first paradox runs as follows. If you accept two following assumptions: (1) Performing various actions we all contribute (in various ways, of course, to very different degrees...) to the process of creation of one eco-techno-socio-system. And indirectly – to various (ecological, social, cultural...) consequences of this process. (2) We all are potentially responsible for creating this system and for (particularly: negative) consequences of its existence. Do we have the relevant knowledge – necessary for transforming potential responsibility into actual one? I am prone to give rather negative answers. Of course, some individual appeals were voiced (e.g. Wilson, 1998) Some organized efforts under slogans of “inter-, trans-, multi-disciplinarity” have been made. – I would not like to underestimate them. But I think that at best what we have now (as regards the knowledge about the global system) is far too little in relation what we need (incidentally, to construct some possibly precise instruments to measure this relation would be a contribution to improving our to-day situation). And what seems to be most paradoxical is the fact that this (very?) negative situation is a side effect of the progress

(the word should be read here without quotation marks – in the old positive sense of the Enlightenment philosophy/ideology) of science: better health care, more food, more safety in industrial plants... And there is, in my opinion at least, little doubt that numerous achievements of science would have not been possible without progressing specialization in (or, as some figuratively say, “balkanization” of) science. In which way to overcome this paradoxical situation? – That is the question to which a tentative answer will be sketched in the chapter 4 (on knowledge governance).

And the second paradox? Complexity (Gell-Mann, 2022) is partly the very essence of globalization (the eco-techno-socio-system is – from definition – more complex as a whole than the subsystems considered as independent), but partly it increases the complexity of elements. And complexity has a simple but important epistemological consequence: some relatively simple parts of the world can be known without special cognitive activities. But “sufficiently” complex objects can be known either by (also complex) cognitive actions or by learning already gained knowledge.

If so, the development of deliberate democracy demands “smart citizens”. But some observers have noted an opposite tendency. A few decades ago, wrote about it (Bocheński, 1993), some years later (Wheen, 2004) – How to overcome this paradoxical situation? – To this question also, a preliminary answer will be outlined in the chapter 4.

Let me end this Introduction with a glimpse on the present text. Except for (rather long: presenting my view of the present state of the world – of science and not only) the Introduction, and short final remark, it contains three main chapters. This structure reflects a perspective on science in general, and on the science(s) of science – in particular. Before I pass to the presentation, let me formulate my opinion on “borders” between sciences. My opinion is rather not radical: On one hand, I am skeptical as to the possibility of defining very precisely (uncontroversially, ...) these “borders”. On the other, I think that “flexible” borders – help to define the relations between various disciplines. (Discussing analogies/differences between taxonomy of knowledge/science and biological taxonomy might be instructive. But it cannot be undertaken here).

First, I do accept (remembering the reservations made in the previous passage) the distinction: fundamental versus applied sciences. The goal of fundamental sciences is to describe (a part of) the world, irrespective of possible practical usefulness of these descriptions. Contrarily, applied sciences are oriented at solving practical problems. In other words, applied sciences do not describe the world but create designs to modify the world by constructing some new elements of the world. The sciences of the first type are fundamental for the applied in a double sense: Firstly, they provide diagnoses of the state of the world in this or that fragment of space and time. And some diagnoses enable defining practical problems to be solved by applied sciences. Secondly, fundamental sciences indicate the conditions to be satisfied by the hypothetical solutions. – This characteristic is not complete: Some practical problems can be defined without scientific instruments (e.g. how to avoid consequences of some natural

disasters). Thus, practical problems can direct interest of fundamental sciences to those regions of the world in which arise the practical problems.

I would say that the just described situation is quite common in social sciences. The preset text starts from practical problems (defined in this Introduction) – to be “solved” in the 4th chapter by purely experimental – trial and error – method. Thus, the two previous chapters are devoted to some fundamental problems. But why two separate chapters?

I could simply answer that epistemology (a part of philosophy) and sociology of knowledge are – for various reasons separate disciplines, however close. This is acceptable answer but, I think, a bit more profound one can be proposed. It will be based on methodological ideas of idealization and concretization. I will assume that epistemology studies cognitive activities performed by “ideal subjects” (the meaning of this term will be characterized in the next chapter), and sociology of knowledge – studies cognitive activities performed by “real men”. Briefly put, epistemology is regarded as a foundation for sociology of knowledge, and the latter as the foundations for the theory of knowledge governance.

2. Epistemology

The domain of philosophy known today as “epistemology” is as old as philosophy itself though its most popular today name it received only in 19th century (Woleński, 2004).

It is very large domain: just look at the *Handbook of Epistemology* (in which Woleński’s paper is published) to see how diverse are problems discussed by epistemologists and how various are epistemological orientations. However, it is neither possible nor necessary to summarize the issues/orientations presented in this *Handbook*. My goal is different: Firstly, I am going to indicate these epistemological problems that are – in my opinion – of key importance for the theory and practice of knowledge governance. And secondly, I am also going to point out these orientations that seem applicable to this discipline. From the point of view declared above, it is theory of truth that seems to play central n epistemology. However, a few theories of truth have been formulated (David, 2024). To summarize David’s 80-pages paper in tens sentences does not seem meaningful. But it would not be useful/necessary: I am convinced (here, as seldom, very profoundly) that – remembering what goals this paper is to achieve, even if partly– we can/should limit our attention – to one theory (or, more precisely: one group of related theories) – classical theory of truth. This theory was developed by, among others, Aristotle, St. Thomas and A. Tarski. This theory is very intuitive: it articulates way in which (great) majority of people understands this notion in everyday life. But this interpretation of the notion of truth plays a fundamental role in our social life, in particular – in morality and law: The declaration of a court “John Smith murdered Mary Brown” should be just – in both

classical and intuitive sense – true. And if the sentence is false, the court should declare that “John Smith did not murdered Mary Brown”.

I think that a few words about broader philosophical context of this theory should be said now. This theory presupposes a metaphysical (ontological) stance known as realism (Haack, 2004). Realism articulates the widely accepted convictions that world does exist – regardless of existence or non-existence of mankind. Intellectual experimentation with rejecting realism is not meaningless. But we try to define here epistemological foundation for knowledge governance. From the point of view of politics (a type of governance), knowledge – if to be generously financed – should be regarded mainly as an instrument of civilizational development, and only to a limited degree as a part of culture (in its narrow sense: poetry, theater, philharmonic etc.).

However simple and intuitive as regards its basic idea, classical theory contains more complex and less intuitive questions. One of the oldest issues (considered already by Aristotle, and widely investigated in the previous and present centuries) is the question of logical value of predictions – are they true or false (as propositions concerning the past or present time) or another values (e.g. possibility) should be ascribed? – So-called multi-valued logics try to precise the second answer.

Common knowledge (but also some scientific disciplines) contain many unprecise sentences, such as “Very few people participated in Sunday demonstration in front of Parliament”. – So called fuzzy logic tries to deliver some formal instruments to cope with this issue.

Possibly, relatively little attention from logicians received the problem of truth/falsity of collections of propositions. Perhaps most easily this problem can be illustrated by considering the possibility of two very different (one “positive”, one “negative”) biographies of one and the same person – both containing only true propositions. – This issue seems to be of importance for theory of (sophisticated) manipulation, a part of sociology of knowledge.

And last but not least: A prominent philosopher of science (a sub-discipline of philosophy that might be regarded as a part of epistemology in the broad meaning of the last term) N. Cartwright published in 1983 a book titled provocatively “*How laws of physics lie*”. – This title expresses opinion that in a form (perhaps, most often, less radical) has been widely accepted: scientific theories describe models of (some parts of) the world. And if one accepts this opinion, then one has to consider whether at all, and if so then in which sense scientific theories can be evaluated as true or false. – This issue seems to be also of importance for sociology of knowledge as well as for knowledge governance.

And now, moving on to the next part of this chapter, let’s note that truth (or falsity) can be interpreted as a relation between a proposition (or more complex semiotic system) and the world (reality, ...). But epistemology is also interested in relations between subject of cognition and propositions.

As declared in the Introduction, epistemology (as conceived in this text) regards subject of cognition as “ideal”. This decision would also deserve a broader discussion, but here I limit myself to a simple characteristic of “ideal subject”. – His/her cognitive activity is oriented at achieving (true) knowledge, and not other goals (from money to personal satisfaction).

Propositions can be accepted as true or rejected as false (Weirich, 2004). A neutral attitude can/should be also assumed: the proposition is neither accepted nor rejected (opinion/belief is “suspended”).

Though the decision to accept, to reject or to “suspend” (so to say figuratively, “abstain from voting”) can be made in an “irrational” way (without availing of any rules or criteria of acceptance/rejection/suspension), one of the main goals of epistemology, perhaps even the most important one, is to precise, compare and systematize rules/criteria that – if applied – make epistemic decisions rational. In other words put, epistemic decisions – as perhaps many (all?) others – should be justified (Lammenranta, 2004).

Even if we think about individual “intellectual biographies”, we should have noticed that probably all people change from time to time some of their opinions. But opinions change also in “macro” scale: history of science is not only adding new truths to the immutable collection of earlier accepted proposition. Contrarily, some “old truths” are simply rejected or (more often) replaced by “new truths” (some epistemologists claim that the “new truths” should “correspond” with the “old” ones). These issues are briefly characterized as problems of revision of believes (Hanson, 2004).

As noted above, epistemology is a very rich, differentiated domain of philosophy, and is constantly developing. And as already stressed, no systematic overview of this domain not possible. My only aim is to indicate these epistemological conceptions that, in my perception, could be – in this or that way – applied in sociology of knowledge and/or in the theory of knowledge governance.

In the previous passages I mentioned some older sub-domains of epistemology. Now ending this chapter, I would like to say a few words about two relatively new epistemological schools/currents – interesting and, in my view, of special importance for the problems undertaken in this paper.

Firstly: virtue epistemology. Though some its basic ideas are, as almost everything in philosophy, very old (e.g. Aristotle’s concept of dianoetic virtues). as a “school” it is rather young: initiated by E. Sosa and L. Zagzebski in 1980’s (Zagzebski, DePaul, 2003). In this field focus is on the role played by traits of knower’s intellect (personality etc.) in achieving truth/knowledge. One of the interesting (and connected with issues that will be mentioned in the next passage) questions concerns the possible role of intellectual virtues of a proponent of a proposition (a set of propositions) for justification this proposition (this set). To this question we could also approach from another side: from the perspective of ethics (the general notion of virtue is evidently ethical one). And assuming this perspective we could formulate a question

concerning moral responsibility for his/her beliefs (for their justification etc.) It seems that this question is getting more and more important in knowledge society.

Secondly: social (or: collective) epistemology. Like virtue epistemology, it is some forty years old; Alvin Goldman and Steve Fuller are its initiators (Goldman, Whitcomb, 2011). Two issues seem to be at the center of this sub-disciplines: From historical perspective, it is rather evident that individuals building their personal knowledge less and less can rely on their direct contact with the world, and more and more – on the knowledge of other persons. In this situation (characteristic for “our” times), some rather sociological categories – such as “trust” or “authority” are gaining greater and greater epistemological importance (Bocheński, 1993; Goćkowski, 1979).

To indicate the complexities of these problem, a brief comment on trust. Schematically put (and drawing upon everyday experience), trust can be “irrational” or can be justified (based on justified beliefs). But what justifies beliefs justifying trust? – With this question I end this notes on the first central issue of social/collective epistemology. Now, a few words on the second one. This issue is very directly important for the key problems discussed in this text.

To make it clear, let’s return for a while to the concept of knowledge society. It is a society in which knowledge/science plays/should play fundamental role in decision making (political, economic, cultural...). And, it could be said, the more fundamental decisions to be made the greater role knowledge/science should play in making them. But beyond this rule might lurk the danger of *circulus vitiosus*: Belief that a decision is of fundamental character is itself never a “pure” opinion but is always based on some knowledge. And decision that a decision should be regarded as fundamental seems to be fundamental also. – *Circulus vitiosus* or hermeneutical circle? One of many issues to be discussed in a (much) more extensive text.

At the very end of this passage let me note (only note! – it is too complex issue to be disused in a few passages) the connection between just discussed problems and the problem formulated in a form of a mathematical thesis known as Arrow’s theorem. It says, intuitively speaking, that not all criteria of aggregating individual preferences can be met at the same time (Arrow, 2012). If we assume that except for moral or utilitarian preferences, we could speak about epistemic preferences, and about collective epistemic decisions, we will have to take into consideration the possible consequences of Arrow’s theorem.

3. Sociology of knowledge

Passing from previous chapter to this one, I would like to make a comment on the “sociology of knowledge” as a name of a sociological sub-discipline. I think that the phrase “sociology of beliefs” in a better way than “sociology of knowledge” describes a quite well delineated and

consistent part of social reality (I regard the word “knowledge” as an approximate equivalent to Plato’s *episteme*, and “belief” – to his *doxa*).

Perhaps, to make my stance more clear, an analogy might be useful: analogy between sociology of knowledge and sociology/theory of literature (art). I think that sociologists working in the second field should be (and “today” more and more are) interested in all types of works: not only in these of Shakespeare, Rembrandt, Chopin or Bergmann..., but also in *Harlequines*, *kitches*, disco-polo, C-class movies...

Having formulated this remark, I must say that I am not going to propose changing the name of the discipline: all other reasons aside, such a proposal would be extremely unrealistic. So, I will use the traditional name, paying no attention to epistemological definitions of knowledge. I would also add that the (broad) way in which I use the name “sociology of knowledge” is close to so-called “strong program” of this discipline (Bloor 2004).

Sociology is a relatively young science (if to distinguish it from social philosophy existing at least from Plato); somewhat paradoxically, it received (from A. Comte in 1835) its name before its coming into academic world in the last decades of 19th century. Interestingly, one of the first subdisciplines of sociology was just sociology of knowledge (ca. 1920-1930). For these hundred years, this discipline has accumulated quite interesting and impressive achievements. As in the case of epistemology, it is neither possible nor necessary to summarize this history. I will present a (possibly systematic) view on this discipline.

Let me make now three general remarks on sociology. First: I tend to use this term as a convenient short equivalent for “social sciences” rather than as a name for a discipline separating itself from economy or political science.

Second: I believe that historical sociology is not a special subdiscipline of sociology but rather a strategy of developing sociology. For this reason, I will use (for practical reasons: only once, just here) the term “historical sociology of knowledge”.

And third: The variety of cultures, personalities, social orders... – it has, in my opinion: without any serious doubts – biopsychical foundations. Thus psychology (and particularly, though not only, social psychology) should be regarded as one of foundations of sociology.

Having made this remark on psychology, I’d like to use this moment to indicate a large and very important class of bio-psychological phenomena most often grouped under the heading “emotions”. – Let me add to this sentence two short notes. First: there exists sociology of emotions. And second, a bit more elaborate and much more important: In spite of some cultural tendencies (e.g. Romanticism) to oppose/isolate reason and emotions, their interrelations are very complex. In particular many opinions are more or less heavily influenced by such emotions like fear, terror, sadness...

Let’s pass now to an overview of some problems of sociology of knowledge. I think it could be convenient to distinguish two rather different (though, by no means, separated) areas of sociology of knowledge. This distinction is based on distinguishing two kinds of knowledge.

I tend to think that this distinguishing is not formal/mechanical but has serious substantive justification.

The first kind of knowledge can be named “common/spontaneous” one: Humans, like many other animals accumulate knowledge obtained by direct contacts with the (natural and/or human) world. Knowledge of this type is, so to say, a “by-product” or “side effect” of non-cognitive activities. To suggest usefulness of a notion (and more: interesting sociological idea), one could be speaking about knowledge generated by/in everyday life. Let us note that societies differ (in time and space) as to (also: statistical) differentiations of the everyday lives of their members.

The second kind of knowledge can be named “produced” one. Perhaps, some primates can also “produce” simple knowledge, but this ability is generally specific for humans.

I have decided to introduce the notion of “produced” knowledge since – in spite of some of its rather negative linguistic-aesthetic values – it suggests interesting and important analogies facilitating systematic/ordered sociological analyzes of this kind of knowledge. Let’s demonstrate some of these analogies.

First: Any knowledge exists in a material form: In the case of “spontaneous” knowledge, it exists only in the form of recordings in the brain/body. In the case of “produced” knowledge it exists in multiple forms: momentary (spoken texts, gestures etc.) and relatively permanent (books, papers, films etc.) In majority of these forms crucial role plays language (Marody, 1987). So, a comment on spoken texts. As we know, there exists (a speculative question: how long?) so-called ‘internal speech’. Referring to this fact, I’d say that one of the simplest (simplest: in a sense only) methods of producing knowledge is self-reflection (transformation of spontaneous knowledge into “produced”).

Second: “produced” knowledge is, *ex definitione*, a result of an intentional cognitive action. As in the case of any intentional action, its subject (actor or agent, if you prefer) has to have a (perhaps: complex) motivation to perform this action, S/he has also to have some skills/abilities to perform it. As regards the issue of motivation it could be said what follows:

Primo – the number of possible motivators is enormously great (from satisfying basic physiological needs through gaining money and power to self-esteem, meaning of life and many others).

Secundo – the number of motivators is historically (and geographically) variable and seems to manifest upward tendency.

Tertio, probably, on one hand, all types of motivators can motivate all types of actions (thus: also cognitive ones), but – on the second – statistical distribution of motivators as related to types of actions seems to be strongly differentiated. As regards abilities: Some of them are side-effects of trials/ attempts to achieve some “non-educational” goals. Some others are “products” of learning activities of which main goal is to develop some specific abilities.

Third: As in the case of many (all?) other types of activity – from finances to criminal activities – also organizations collectively produce knowledge. Already in ancient times we can note this phenomenon (Plato's Academia, Aristotle's Lykeion...), some fifteen centuries later – European universities... We could say that acceleration of this process started somewhere mid-19th century (say, symbolically, from the first international congress of chemists in Karlsruhe in 1860), and accelerated once again after 1945. All organizations have their own specific interests (financial, political, symbolic...). There is no reason to suppose that organizations producing knowledge should not have similar interests, though certain specificity should be expected.

Fourth Elliott Jacques, having published in 1951 "The Changing Culture of a Factory", initiated the studies on organizational culture. It seems rather obvious that if two banks or two motor-car plants may differ as to some elements of their functioning – due to their different organizational cultures – then two institutes of mathematics or two prominent universities will differ when their organizational cultures differ.

The list of analogies between production of knowledge and production of bread, houses, tanks etc. etc. might be enlarged, but not much place remains (the size of paper is limited) and I'd like to say a few words about other groups of analogies.

Texts – like any other products – must be distributed, Therefore, some material media of distribution have to exist: libraries, lecture halls, salons, clubs...radio, TV, Internet... Also schools (from grammar ones to universities), research institutes, local, ..., international scientific societies, academies..., museums, "cities of science"... There exist also various mechanism of regulating/controlling distribution of texts. The best known is the institution of (state) censorship. But here are many others: compulsory school readings, acquisition policies of libraries, and – public opinion of various milieus. These are but some instances – the list should be longer.

And the last element in the process of (economic, social, cultural...) reproduction: consumption. Consequently: consumption of texts (This phrase, somewhat strange, at least: at the first sight, is getting some popularity; it can be instantly found in Internet). Consumption is determined by production (let's risk supposition that in the case of texts the determining role of production in relation to consumption is greater than in the case of, say, food or clothes), by distribution, and by abilities (as regards many texts, the system of abilities to consume them is very complex – as is its production) and motivations.

Let me end this chapter stressing the systemic character of the social reproduction of knowledge: the complex interactions between production, distribution and consumption of knowledge. And we should not forget about the role of everyday life: It generates the "spontaneous" knowledge and the latter co-determines production, distribution, and consumption of the "produced" knowledge.

4. 4. Theory of knowledge governance

Let's start from a few comments on the title of this chapter. The most important is the word "governance". I've chosen it since it is "located" (as regards its intuitive content) somewhere in-between the word "management" and the word "politics". So much about the word. But why did I seek such a word?

The answer is composed of two parts. First, activities of managers of business organizations and of politicians are in many ways analogous (I'd even say that mayor of a small town is more a manager – in the conventional sense of the word, and CEO of an oil corporation – a politician). We could also add here the leaders of religious organizations, presidents of international sport federations (FIFA, IOC...) etc.

Regarding the term self-governance as denoting special case of governance, we could say that governance denotes any form of organizing collective activity (List, Pettit, 2011): from radical democracy (no leader), through various hierarchies/oligarchies to despotic authoritarianism (one leader). And analogies suggest seeking for one general theory describing/explaining differentiated phenomena (This methodological principle formulated decades ago Polish lawyer, sociologist and philosopher Leon Petrażycki).

And second part of the answer: all types of human activities (economy, religion, art...) are governed (regulated) by various groups of people and in various ways. This general regularity also applies to knowledge/science.

The very general, and thus not very precise question (providing concepts and methods allowing more precise formulation should be regarded as one of main challenges for sociology of knowledge) could be formulated as follows: Are the mechanism governing knowledge/science "sufficiently close" to optimal?

I think that the answer should be negative. Why? There is no doubt that the question of global climate is one of the most fundamental problems humanity faces today. And there is also no doubt that our decisions (political, technological etc.) concerning this problem should be based on the relevant knowledge. But is that how things are? An instance:

There is a book devoted to climatic crisis (Lomborg, 2021). You do not have to be denialist, a "merchant of doubts" (Oreskes, Conway, 2010), to ask questions – formulated by Lomborg – about the levels of ecological risks connected with climate changes, about alternative strategies of coping with global warming, about financial and other costs of various strategies etc. etc. In my opinion Lomborg is not denialist though is also rather distant from Greta Thunberg and other activists (or "activists" if you prefer). His book deserves many comprehensive debates. I am not able to analyze the situation in other countries, but in Poland I have not heard about even a single debate. To stay for a while to the climate problem: Quite recently a paper on wildfires was published (Cunningham et al., 2024). Their authors claim that these fires are mainly caused by climatic changes. Perhaps. But this year in this same journal a paper (Schutze,

de Dios, 2025) was published in which serious doubts concerning conclusions of the previous one. It is interesting whether this difference of opinions will be analyzed.

And another example: Health is one of the most important problems, both individually and socially. The Covid-19 epidemic reminded us of this in very dramatic way. As surely, we remember the problem of vaccination turned out to be a great political question. And it remains so. And yet one should think that since, at least, Pasteur, there should be no doubts as to positive role of vaccinations.

Two years ago a book (Kennedy, Hooker, 2023) concerning vaccinations was published. If accept the image of R.F. Kennedy, Jr. disseminated by some media, one should expect domination (if not exclusive presence) of ideological arguments. But just open the book and you find a great number of statistical data. Perhaps not precise, perhaps in a sophisticated way manipulated, or incorrectly interpreted... Perhaps. But, in my opinion, critique using ideological labels can convince only those who are already convinced. We will see if a genuinely scientific criticism will be addressed to this book.

How we could summarize the above remarks? In democratic countries you can express various opinions (in print, in electronic form, spoken...) but various mechanism – (to be) studied by sociology of knowledge – eliminate (more or less effectively) many opinions, theories and even data. Therefore as one of the most important challenges for the theory of knowledge governance can be regarded designing institutional/organizational mechanism supporting public access to pluralistic spectrum of opinions.

The opinions I have presented in the previous passages I would defend, regarding them as rather objective. To them, I'd like to attach two more subjective (based on personal "impressions") opinions:

First, I think the role played by big publishing houses (such as Kluwer, Macmillan...) is much too big: Their publishing policies seem to contribute to overproduction of (scientific) books and journals. (And this overproduction might have further, rather negative consequences).

And second, referring to situation in Poland: the role in the science governance played by the Polish Academy of Science (scientific societies etc.) is much too little in comparison with that of Ministry of Science and Higher Education.

I've above given instances of issues that should be discussed under the heading "optimal knowledge governance" – just to illustrate my intuitions concerning the question of optimality.

At this moment, I am not able to offer any more systematic analysis.

And some more general comments on "optimality": In some domains, the meaning of "optimality" is relatively (!) easy to be defined (in medicine, in technology). But in social life the problem is much more difficult: the values with which we evaluate social relations are less precisely defined than those in technology (such as resilience, durability...), sometime even contradictorily: think only about various definitions of justice. And even if we accept definitions then it turns out that, for instance, individual freedom and social solidarity, economic growth

and care for natural environment... – Ideological controversies were not created by ideologist; they only articulated and systematized real axiological differences and conflicts.

If you understand the words “goal” and “instrument” in a sufficiently broad sense, then the thesis that science is an instrument to achieve some goals is trivially true. The issue (also: historical) is what is/are the goal(s) of science: “contemplation of the beauty of the world”, “power over nature”, “intellectual satisfaction”, “sustainable development”, ...? Only having answered this question, one can start to discuss the problem of optimal knowledge/science governance. – An axiology of knowledge should be regarded as one of fundamentals of knowledge governance.

Note that the simple (in formulation) question arises here: who, and – in which way, should define the goal(s) of science. At this moment we are coming in the area of political philosophy, and to be precise, and since we are formulating this question in the 21st century – in this part of it in which are considered, the problems of democracy – of its forms, its limitations etc.

I would like now to make a comment on the role of applied sciences (and let me remind: I regard theory of knowledge governance as an applied science): To formulate it both briefly and generally, one could say that they are instruments of rational/free decisions. Freedom is closely connected with the notion of choice (no choice no freedom). And the latter – with that of alternatives. And designing new tools, new medical technologies, new organizational forms of social life... – theses and many other activities enlarge the spectra of alternatives in various domains, thus – they expand the sphere of our freedom.

I would like to end this chapter with a few words on knowledge/science and politics. Some aspects of their relations are widely known and discussed; in particular: the problem of public expenditure on science. But, viewing from the perspective of (national or global) society, the most important problem might be expressed in the (political) demand for “knowledge/science-based politics”. Two comments should be added to it:

First, scientists are citizens and this group is more or less politically diverse in all countries. But differentiation does not exclude the possibility of some common actions. The strengthening of political role of science seems to be a good realistic aim for such actions.

Second: taking into consideration the “pluralist” thesis, the demand for greater role of knowledge/science in politics does not imply any diminishing role of politicians. Quite contrarily: knowledge/science-based politics would be more interesting, creative and efficient. But, on the other hand, would be more difficult...

Is this vision even minimally realistic? – I am prone to give a cautiously optimistic answer. World Economic Forum, the various bodies of experts... – there are some phenomena indicating that some politicians are interested in intellectual debates with various experts. But these phenomena are first steps only and this process should be accelerated.

5. Final remark

At the very end of this text, let me return for a while to its beginning. I presented there two paradoxes. (I formulate them in somewhat different way as in the Introduction; it should help the Reader to grasp – “beyond” the words – the thoughts/ideas).

The first one: “Our” world is getting one complex natural, social and technological system. For various reasons we (humanity) need knowledge about this system. But some consequences of the development (progress) of knowledge (science) result in difficulties/obstacles in producing this knowledge.

And second: Due to the complexity of the system (genuine) democracy demands “smart” citizens. But many observations suggest that an opposite trend – toward various forms of irrationalism – has for the last decades dominated.

Personally, I am rather far from apocalyptic visions: Even if we do not overcome these paradoxes humanity will exist, people will live. But I am convinced that overcoming these paradoxes could contribute to making our world better than it today is. – That is the reason I started to work on this *problematique*.

Obviously, it is very large and cannot be presented in sufficiently systematic and detailed way. – A book is necessary. I am preparing one and hope to end it in one year or two. And the present paper is intended as draft of this book.

In a sense, it is more than a draft: it is also a plan of further studies necessary to complete this book. The role of this plan is determined by my two convictions (of very general character but applied also to the domain of sciences of sciences).

First: for the last century or so great amount of knowledge (also in the meta-knowledge domain) has been amassed that integrating (systematizing etc.) it seems to be more and more important task – both for cognitive and practical reasons.

Second: two general strategies – “down – top” and “top – down” might be possible. But if the previous conviction is valid the “down – top” strategy would be either impossible (at least to be adopted by one person) in a systematic way or results of its application would likely be chaotic and incidental. Thus the “top – down” strategy should be adopted: at the outset – construction of a comprehensive (both large and possibly detailed) image of the field (based on the general but determined by previous, specific interests of the author knowledge), then – searching for texts most relevant for all issues identified in this draft/plan, then studying them, and finally – writing the book. – This is rather schematic picture; I suppose that the plan will be modified during its realization.

At the very end of this paper let me say that I will appreciate all sorts of comments: on the general ideas and on the specific formulations, on the logic presentation and argumentation and on the language. I will also be thankful for any suggestions concerning books, papers and other materials I should be familiar with.

I would also like to express my thanks to one of the anonymous reviewers for some suggestions how to make this text more readable.

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“LITTLE BIG CULTURAL CENTERS” – HOW SMALL TOWNS DELIVER BIG ON CULTURE

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Purpose: The purpose of this article is to evaluate cultural disparities among Poland's subregional cities and explore how selected small towns manage to thrive culturally despite structural limitations.

Design/methodology/approach: The study is based on a comparative analysis of 40 subregional cities using a Cultural Potential Index developed by the author. The index integrates both core and extended cultural infrastructure components, drawing on quantitative data from official statistics and supplementary internet-based research. The approach combines quantitative mapping with interpretive case studies of two high-performing towns to illustrate distinct models of cultural success.

Findings: The study identifies wide variation in cultural potential among subregional cities, unrelated to size or spending levels. It highlights two successful models—Zakopane's institutional-heritage model and Cieszyn's networked-festival model.

Research limitations/implications: The study is based primarily on quantitative indicators, which do not fully capture the qualitative dimensions of cultural life, such as community impact or artistic value. Future research should incorporate in-depth qualitative analysis to better understand cultural practices, local narratives, and the role of informal actors.

Practical implications: The study provides guidance for local authorities seeking to enhance cultural development through strategic specialization and community-driven initiatives.

Social implications: Strengthening cultural infrastructure in smaller cities can foster social cohesion, reinforce local identity, and promote inclusive participation in public life. The study underscores the role of culture as a catalyst for community engagement, cross-generational dialogue, and regional integration.

Originality/value: This article offers one of the first comparative assessments of cultural potential across Poland's subregional cities using a standardized index. By combining quantitative analysis with illustrative case studies, it provides a nuanced perspective on how smaller towns can successfully position themselves as cultural leaders beyond the metropolitan mainstream.

Keywords: Cultural potential, subregional cities, cultural infrastructure, small-town development.

Category of the paper: Research paper, viewpoint.

1. Introduction

There is no single, universally accepted definition of culture. Still, most scholarly perspectives converge on the idea that culture is a complex and evolving system of values, norms, symbols, and practices transmitted across generations. It encompasses both tangible expressions—such as tools and architecture—and intangible ones, including language, customs, and law (Szacka, 2003, pp. 75-81; Sztompka, 2004, pp. 251-253). What makes culture particularly vital is its ability to adapt to shifting social, economic, and environmental conditions, which in turn shapes identity, fosters social cohesion, and drives innovation.

In recent years, the debate around urban development has increasingly turned its attention to the issue of cultural peripherality. This concept goes beyond simple geography—it's not just about being located outside major metropolitan areas. It also encompasses symbolic, institutional, and infrastructural marginalization (Lewicki, 2018, pp. 27-32). Subregional towns, despite playing important administrative and service roles, often remain on the fringes of the cultural landscape. The idea of *cultural marginalization* (Harvey, 2016; Bianchini, Parkinson, 1995) highlights how such places are frequently excluded from dominant cultural policies and narratives.

Paradoxically, it is often in smaller towns that the most innovative models of cultural participation and production are emerging today. Scholars have described these places as “laboratories of social innovation” (Manzini, 2015, p. 45), where local identity, grassroots initiatives, and hybrid cultural forms help compensate for institutional shortcomings. Studies of cultural practices (Szlendak, Goszczyński, Krajewska, 2019; Kiszkiel, 2020) and the impact of infrastructure investments (Wojnar, Grochowski, 2011) show that well-designed cultural initiatives in small towns can drive social revitalization, strengthen social capital, and boost economic appeal.

This article follows the trail of 40 subregional towns highlighted in a recent study by the Institute of Urban and Regional Development's Urban and Regional Policy Observatory (Sobala-Gwosdz, Janas, Jarczewski, Czakon, 2024), offering a preliminary assessment of their cultural potential. At its core, the aim is to move beyond a metropolitan lens and shed light on the complex and diverse cultural landscape that exists across the country.

The decision to examine the cultural potential of subregional towns stems from three closely related premises. First, there is a noticeable gap in both urban and cultural studies literature: while metropolitan areas dominate academic discourse, the complex cultural dynamics unfolding in medium-sized and smaller towns are often overlooked. Addressing this gap offers a chance to better understand how culture develops beyond the urban core and to expand the theoretical framework of urban studies.

Second, this issue carries practical significance. Identifying the strengths and weaknesses of the cultural sector in subregional towns can serve as a valuable resource for local governments seeking effective public policy models that bridge social goals—such as integration and social capital—with economic ones, like tourism and the creation of creative jobs. A deeper understanding of local contexts also enables better alignment of cultural initiatives with community needs, helping to strengthen residents’ sense of belonging and place-based identity.

Third, numerous examples—from the Zakopane art school to the cross-border film festival in Cieszyn—demonstrate the multiplier effect of culture: investment in a single, strategically chosen area (whether an institution, a festival, or an artistic network) can trigger a cascade of positive change. Such initiatives attract audiences from beyond the region, energize the creative sector, and enhance the city’s image. Understanding the mechanisms behind this phenomenon makes it possible to identify repeatable success factors that other towns can intentionally adopt and adapt.

This article is guided by two central research questions:

1. What are the key differences in cultural potential among Poland’s subregional towns?
2. What factors enable some smaller towns to overcome demographic and financial constraints and build a strong cultural presence?

2. Measuring Cultural Potential in Subregional Cities: Challenges and Methodological Approaches

The academic literature emphasizes the importance of using indicators that capture both the tangible and intangible dimensions of cultural activity. Quantitative measures typically include the number of cultural institutions (such as museums, theatres, and libraries), the frequency of artistic events, and overall participation levels. However, such indicators offer only a partial view of cultural potential, as they fail to account for the qualitative value of events or their impact on local identity and social cohesion.

Particular value lies in the use of methodological triangulation, which enables a more comprehensive assessment of cultural potential. Combining quantitative and qualitative data allows researchers to capture the interplay between cultural participation, accessibility, and the broader impact of culture on local communities. As noted by K. Wojnar and M. Grochowski (2011, p. 83), investments in cultural infrastructure not only enhance access to cultural goods but also contribute to urban revitalization and improved quality of life. Similarly, T. Szlendak et al. (2019, pp. 64-67) argue that any robust methodological framework must take into account the evolving needs of diverse social groups and their changing patterns of cultural engagement.

Equally important is the examination of how cultural initiatives influence social integration, the formation of local identity, and the stimulation of creativity and entrepreneurship. These dimensions represent a vital added value of cultural potential, particularly in the context of subregional urban development. Effectively leveraging such data can provide a foundation for local cultural development strategies that foster greater social cohesion and enhance the attractiveness of cities as places to live and work.

In assessing the cultural potential of subregional cities, this study adopts an approach that begins with a predominantly quantitative analysis. This is conceived as a preliminary step—an entry point into a more complex research process that will be expanded and deepened in subsequent stages. The author acknowledges the limitations of this initial focus, treating it as a foundation for future, more nuanced investigation.

Another major challenge in assessing the cultural potential of cities is the limited availability and timeliness of data. Statistics provided by Poland's Central Statistical Office (GUS) are often delayed by two to three years and tend to omit certain institutions—particularly private museums, galleries, and grassroots initiatives—which also contribute significantly to the cultural fabric of cities. These less formal entities are playing an increasingly prominent role in shaping the cultural landscape, especially in subregional areas. To address these data gaps, an additional internet-based query was conducted in October 2024. In reconstructing the current number of cultural institutions, the author relied on official city websites. When data on commercial venues (such as private art galleries) were missing—or for verification purposes—information was cross-checked using the OpenStreetMap database.

Table 1.

Component Criteria of the Cultural Potential Index and Their Scoring

Category	Included Types	Scoring
Cinemas	Multiplexes, arthouse cinemas, single-screen commercial cinemas	1 point for each venue of each type present in the city
Libraries	Main municipal library, branches, media libraries, newly constructed main building	1 point for every five library branches in the city + 1 point for a new main building + 1 for a media library
Museums	Public and private (distinct locations)	1 point for every five museum venues in the city
Cultural Centers	Public, cooperative, youth centers, including those with branches	1 point for every two centers in the city
Art Galleries	Independent public, private, and academic galleries	1 point for each gallery in the city
Theatres	Permanent theatre institutions with an acting ensemble	1 point for each venue in the city
Philharmonics	Philharmonic institutions with their own orchestra	1 point for each venue in the city
Zoos	Permanent full-scale zoological gardens	1 point for each separate facility in the city
Festivals and Awards	Recurring events with at least 10 editions or with a supra-local reach	1 point for each festival or cultural event held in the city

Source: Own study.

The outcome of the research process is a matrix (Table 1) encompassing both the core infrastructure—cinemas, libraries, museums, and cultural centers—and a range of less common but highly differentiating elements, such as art galleries, theatres, philharmonic halls, zoos, festivals, and cultural awards. Most categories are weighted to reflect both the availability and significance of a given institution. For instance, cinemas are divided into multiplexes, arthouse cinemas, and small single-screen venues to better capture the diversity of the local film market. Cinemas, libraries, museums, and cultural centers are present in every subregional city, forming the foundational layer of cultural infrastructure. All other institutions and forms of cultural participation are more selectively distributed and thus constitute the extended cultural offering.

In collecting data on cultural offerings, suburban areas were deliberately excluded from the analysis. The core network of cultural institutions is consistently located within the central city itself, and extending the scope to surrounding municipalities would primarily result in the inclusion of additional libraries, cultural centers, and occasionally museums or open-air heritage parks. Since these facilities are situated outside the urban core and require travel, they are generally less relevant to local residents in terms of everyday cultural participation. Moreover, museums located in peripheral areas tend to cater more to tourists than to the local population.

3. Ranking of Subregional Cities by Cultural Potential Index

All of the thematic components described above have been combined into a single index measuring the cultural offering of subregional cities (Table 2). The index ranges from five to twenty-one points, depending on the diversity and accessibility of cultural institutions within a given locality. To facilitate comparison, all cities were grouped into four categories based on their scores (Figure 1). The lowest category—the so-called *low tier*—includes cities scoring up to five points, indicating a limited cultural offering. The next group, the *lower-middle tier*, consists of cities with scores ranging from six to ten points. The *upper-middle tier* includes cities scoring between eleven and fifteen points, reflecting a more developed cultural landscape, typically marked by a greater number of institutions and events. At the top of the classification is the *high tier*, encompassing cities that received more than sixteen points. These localities stand out for their particularly rich cultural offerings and often function as regional cultural hubs.

In the low tier—comprising cities with the least developed cultural offerings—only two urban centers are represented: Świdnica and Skierniewice. Świdnica is characterized by the presence of a single multiplex cinema, a municipal library network consisting of a main branch and four satellites, as well as two museums and two cultural centers. The city also hosts one recurring cultural festival. Skierniewice, while offering a similar range of institutions, differs

in several respects. Instead of a multiplex, it features a single arthouse cinema. The city lacks notable festivals or cultural awards but does include one art gallery in its cultural portfolio. Despite these distinctions, both cities fall within the lowest category of the index, reflecting limitations in the accessibility and diversity of their cultural infrastructure.

The lower-middle tier includes twenty-three subregional cities—over half of all cities of this type—reflecting their varied levels of cultural provision. First among them are cities that only slightly exceed the threshold of five points. These include Siedlce, Inowrocław, Grudziądz, Elk, Ciechanów, Ostrołęka, and Włocławek. What distinguishes them from the low-tier cities is the presence of a more developed component in at least one area—cinemas, libraries, or art galleries. This single strength allows them to accumulate a total score of six points, placing them within the lower-middle category.

Secondly, this category also includes cities with a higher number of cultural institutions—up to ten public libraries with branches, two cinemas, or two art galleries. In some cases, these cities also host local festivals or grant cultural awards, further enriching their cultural landscape. Although they do not reach the level of the top-performing subregional cities, they demonstrate meaningful development in terms of access to a diverse range of cultural institutions.

Twelve cities fall into the middle range of this tier, with scores between seven and nine points. Cities such as Gniezno, Nowy Targ, Sieradz, Suwałki, Lubin, Puławy, Ostrów Wielkopolski, Piotrków Trybunalski, Leszno, Piła, and Biała Podlaska exhibit more developed cultural infrastructure compared to those barely surpassing the six-point threshold. These cities typically feature extensive networks of cultural centers, two or three art galleries, and unique assets such as dedicated theatre stages in Gniezno and Nowy Targ, or a zoological garden in Lubin. These elements contribute to a more robust and diversified cultural offering.

It is worth noting that within this group, some cities achieve relatively high scores due to exceptional development in a single category of cultural provision. For instance, Puławy earns as many as four points in the library category—thanks to its modern main library building and the presence of a media library. Similarly, Piła stands out among subregional cities by hosting three art galleries, a feature that significantly elevates its overall cultural score.

Chełm, Elbląg, Krosno, and Mielec each score ten points, placing them at the top of the lower-middle tier. Each of these cities has achieved this standing through distinct cultural strengths. Chełm owes its strong position to a highly developed art gallery scene, comprising five separate venues—making it one of the leading cities in this category. Elbląg, on the other hand, distinguishes itself with a particularly diverse cinema offering, including two multiplexes, an arthouse cinema, and a small commercial venue, providing residents with a broad range of film options. Additionally, the presence of a theatre further enhances Elbląg's standing in the sphere of cultural entertainment.

Mielec ranks highly in the library category due to its modern main library building and the inclusion of a media library, which significantly boosts its overall score. In contrast to other cities in this tier, Krosno stands out for its evenly developed cultural infrastructure across all categories, resulting in a stable and balanced score. However, the absence of a theatre and a zoo limits its potential to rise even higher in the ranking. Despite this, the well-rounded nature of its cultural offering places Krosno among the strongest cities within the lower-middle tier.

Upon surpassing the eleven-point threshold, subregional cities enter the upper-middle tier, represented by eleven centers with diverse cultural offerings. At the entry level of this group are Oświęcim, Legnica, and Kołobrzeg, each scoring exactly eleven points. Their position in this category is largely the result of a well-developed foundational infrastructure, complemented by the presence of recurring festivals.

The next subgroup includes five cities—Nowy Sącz, Jelenia Góra, Konin, Przemyśl, and Wałbrzych—that exceed the twelve-point mark and are firmly positioned within this tier. From this level onward, the presence of permanent theatres, extensive networks of libraries, cinemas, and cultural centers becomes the norm. Philharmonic halls also begin to appear as part of the cultural landscape in some of these cities.

Płock scored fifteen points in the study, placing it at the upper limit of the upper-middle tier. Notably, it is the first city to surpass the eleven-point threshold solely on the basis of core cultural infrastructure—cinemas, libraries, museums, and cultural centers—without relying on less common or highly specialized offerings.

At the top of the cultural offering index for subregional cities are four centers: Cieszyn, Kalisz, Tarnów, and Zakopane. This group includes two smaller cities (with populations under 40,000) and two larger ones (around 100,000 inhabitants). The specific cases of the smaller cities will be discussed in more detail later; for now, attention is focused on the two larger urban centers that achieved the highest cultural potential scores.

Tarnów stands out as one of the few cities with a well-balanced cultural infrastructure, exhibiting no major deficits in any of the core categories. Although it lacks a philharmonic hall and a zoological garden, this is offset by a broad and coherent cultural offering across all key areas—cinemas, libraries, museums, cultural centers, art galleries, a theatre, and special events.

Kalisz presents a similarly balanced cultural profile, with the added advantage of hosting its own philharmonic and offering a wider range of festivals and cultural awards. It not only performs consistently well across all evaluated categories but also does so without needing to compensate for gaps through the development of niche sectors.

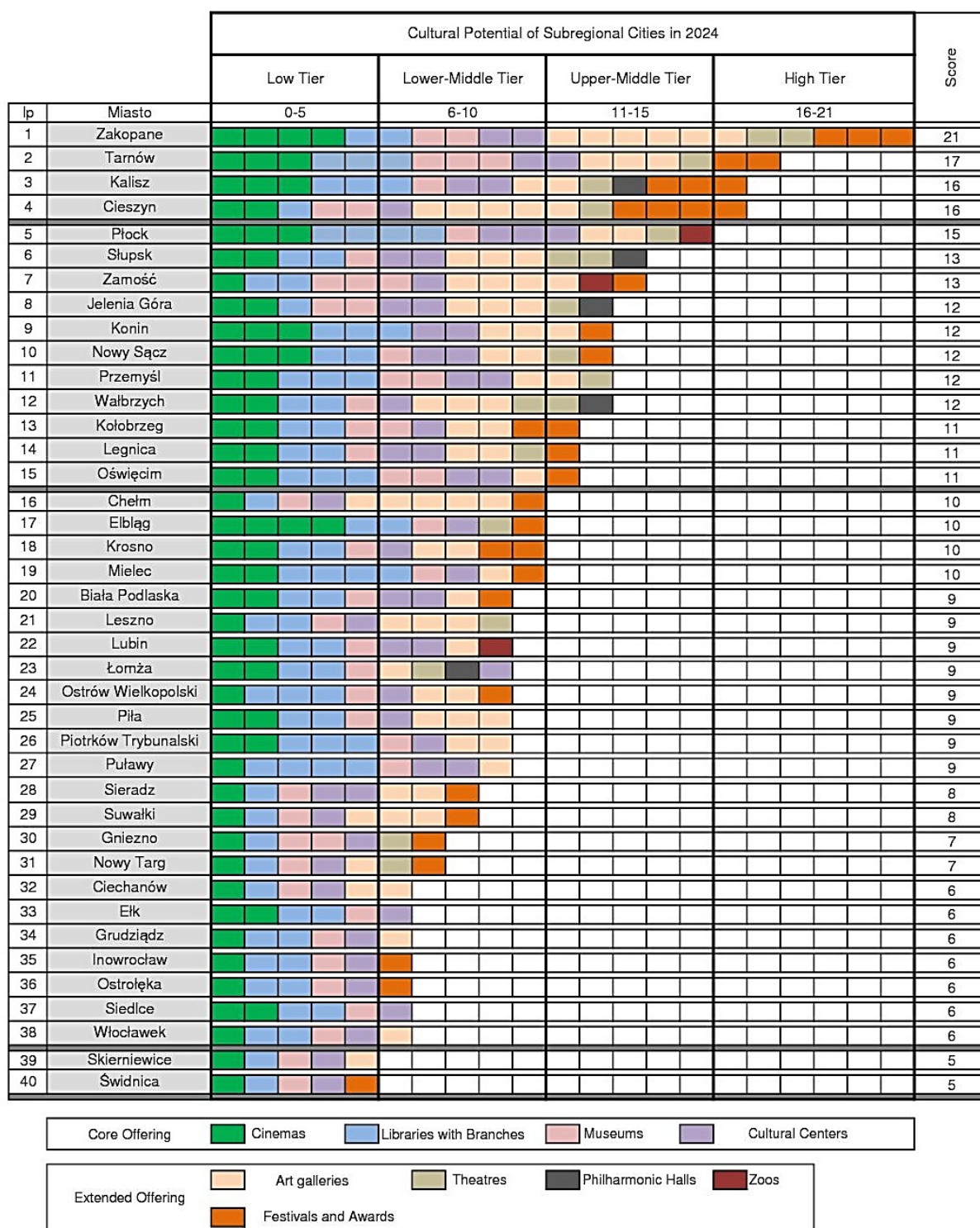


Figure 1. Cultural Potential of Subregional Cities in Poland in 2024.

Source: Own study.

4. “Little Big” Cultural Centers: Why Zakopane and Cieszyn Succeed in the Cultural Sphere

The chart reveals several noteworthy patterns concerning the relationship between the population size of subregional cities and the scope of their cultural offerings (Figure 2). While one might intuitively expect larger cities to possess more developed cultural infrastructure, the data suggest that this correlation is far from straightforward. Among cities with populations under 80,000, those with lower cultural index scores clearly predominate, indicating that smaller cities generally tend to have more limited cultural facilities.

However, the cases of Oświęcim, Cieszyn, and Zakopane challenge this trend. Despite their relatively small populations, these cities perform exceptionally well in the cultural index. Their success appears to stem from specific locational, touristic, or historical advantages, suggesting that factors other than population size can significantly shape a city’s cultural profile.

Conversely, larger urban centers such as Elbląg, Włocławek, and Grudziądz record relatively low scores. All three fall below the 10-point threshold, placing them within the lower-middle tier in terms of cultural provision—despite their substantial populations. This further confirms that city size alone is not a decisive factor in the development of cultural infrastructure.

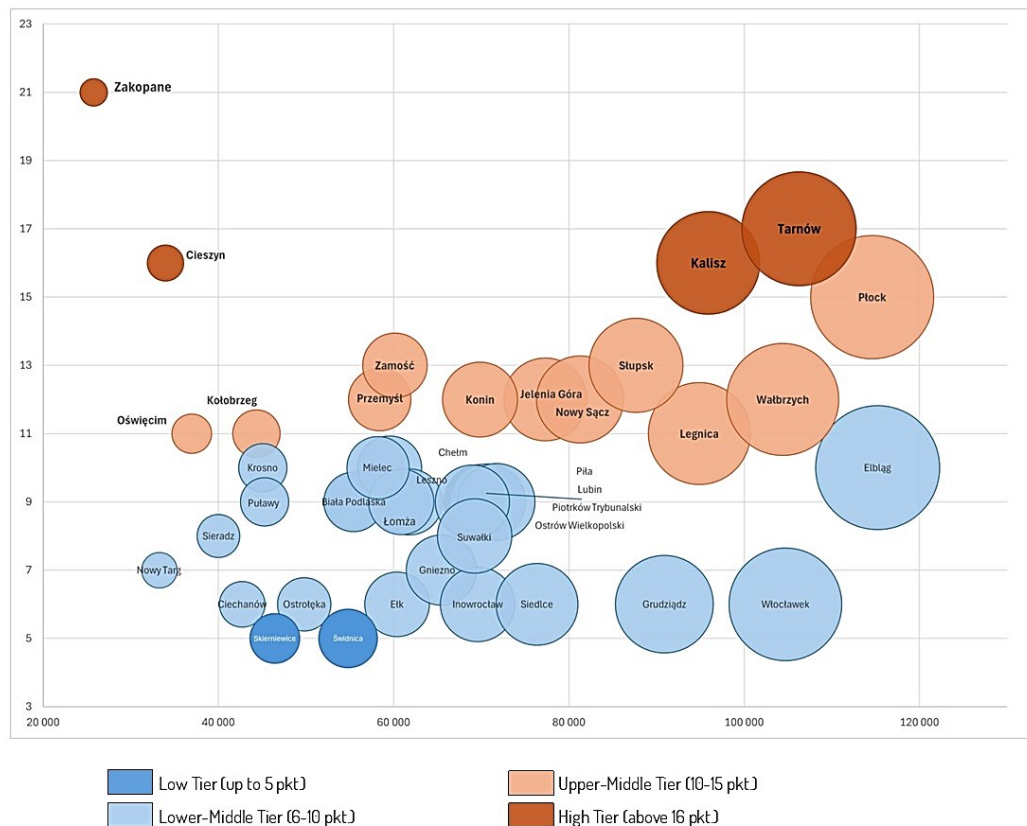


Figure 2. Relationship between city population size and the Cultural Potential Index (CPI) score. Larger populations are generally associated with higher CPI values, though several smaller cities achieve above-average scores.

Source: Own study.

An analysis of current per capita cultural expenditures in relation to the cultural offering index of subregional cities reveals no strong correlation between these variables (Figure 3). Most cities, regardless of their ranking in the index, spend up to 400 PLN per resident on cultural activities. Notable exceptions include Lubin, Puławy, and Zamość, which allocate significantly higher amounts—exceeding 500 PLN per capita. However, among them, only Zamość achieves a correspondingly high score in the cultural index, while Lubin and Puławy remain relatively low in the ranking.

This suggests that non-financial factors—such as historical heritage, tourism, or the engagement of local communities—may play a more decisive role in shaping a city's cultural potential. Moreover, current expenditure on culture may not fully capture a city's actual investment in cultural development. Some cultural spending may be embedded in other budgetary categories, such as city promotion, which complicates a straightforward interpretation of the data. These observations prompt a broader reflection on how to more accurately measure municipal commitment to culture, and how various non-financial factors contribute to the richness and diversity of the local cultural offering.

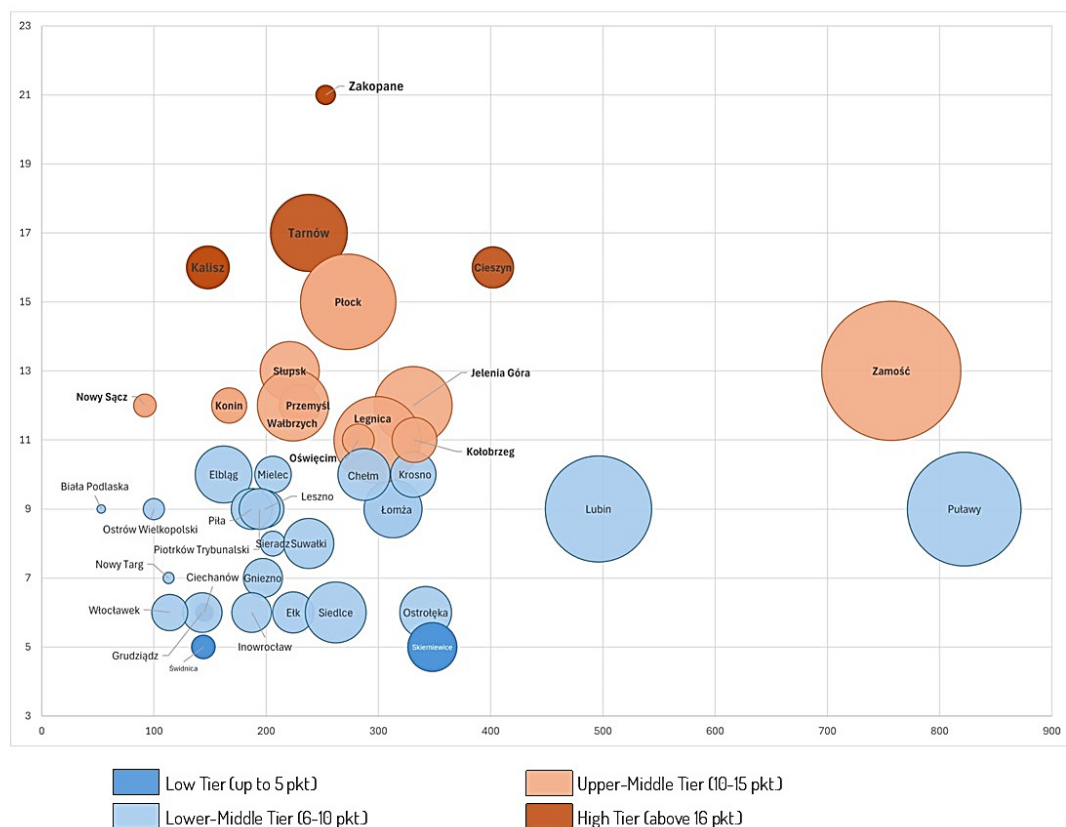


Figure 3. Relationship between per capita cultural expenditure (PLN/person) and Cultural Potential Index (CPI) score. Higher levels of cultural spending are not associated with higher CPI values.

Source: Own study.

Zakopane and Cieszyn represent two particularly compelling examples of subregional cities that, despite their relatively small populations, successfully function as significant cultural centers. Both cities ranked within the highest tier of the cultural offering index, placing them on par with Kalisz and Tarnów—cities that are considerably larger in demographic terms and hold a higher functional and administrative status (Sobala-Gwosdz, Janas, Jarczewski, Czakon 2024).

Cieszyn stands out primarily due to its borderland location, which not only shapes the city's unique atmosphere but also serves as a foundation for cross-border cooperation and joint cultural initiatives with Český Těšín. Although Cieszyn lacks a philharmonic hall and a major theatre stage, this is offset by a remarkably strong presence of art galleries—placing the city among the leaders in this category within the study. Moreover, Cieszyn hosts well-recognized festivals such as *Kino na Granicy* ("Cinema at the Border"), which draw supra-local audiences and contribute significantly to the city's cultural brand.

This illustrates the so-called niche concentration effect: in the absence of large institutions, the city invests in specialized segments of culture that generate strong social and media resonance. Cieszyn also benefits from the visible engagement of NGOs and creative communities, which enrich the cultural programme and enhance the city's cultural capital.

Zakopane, by contrast, draws upon a different kind of potential—its artistic heritage and the synergy it maintains with a well-developed tourism sector. The city's cultural legacy, tied to figures such as Witkiewicz, Hasiór, and Przerwa-Tetmajer, continues to resonate strongly within the local narrative and attracts new generations of artists. Zakopane boasts a remarkably robust cultural infrastructure for a city of its size, including museums, libraries, and two permanent theatres—an almost unique feature among cities in this population category.

A strong presence of art galleries, along with recurring festivals celebrating both high and folk culture, further strengthens Zakopane's role as a cultural hub capable of engaging both tourists and local audiences. The city skilfully leverages visitor traffic to finance ambitious cultural initiatives, while its rich year-round offering helps extend the tourist season—effectively linking cultural vitality with economic sustainability.

Despite following different developmental paths, both cities share several key success factors. Most notably, each possesses a strong cultural brand: in Cieszyn's case, rooted in its borderland identity and intercultural dialogue; in Zakopane's, in the historical myth of a place marked by artistic ferment. Both cities have also, whether consciously or not, chosen a clear cultural specialization—Cieszyn focusing on galleries and festivals, Zakopane on theatre and the visual arts.

In both cases, it is not the scale of core or extended cultural infrastructure that determines success, but rather the interplay between that infrastructure and other elements: locational advantages, a strong sense of local identity, and the active involvement of creative communities and civil society organizations.

The experiences of Cieszyn and Zakopane demonstrate that even small cities can develop into recognizable cultural hubs—“*little big*” *cultural centers*. What appears to be crucial is the strategic concentration of resources around one or two cultural segments, the effective presentation of local heritage, and an openness to cooperation—both within the local community and beyond.

These cases also suggest that investment in cultural infrastructure must be accompanied by a coherent programme and long-term vision; only then can such infrastructure truly foster cultural development, rather than serving a merely symbolic or representative role. The lessons drawn from Cieszyn and Zakopane may serve as a valuable source of inspiration for other small cities aiming to elevate culture to a central pillar of their development strategies.

At the same time, the differences between the two models are substantial. Zakopane operates on the basis of a highly developed cultural infrastructure: in addition to numerous galleries and museums, it boasts two permanent theatre stages—an exceptional feature for a city of its size. Cieszyn, while more modest in terms of institutional resources, stands out for its dense network of art galleries and the quality of its festival programming.

Another key distinction lies in the relationship between culture and tourism. In Zakopane, culture complements an already rich tourism offering; in Cieszyn, by contrast, it often serves as a substitute—attracting visitors specifically through its cultural events.

Table 2.

Zakopane and Cieszyn: Two Variants of the “Little Big” Cultural Center Model

Dimension	Zakopane	Cieszyn
Infrastructure Resources	Extensive and nearly complete infrastructure: cinemas, museums, libraries, theatres, galleries	More minimalist: lacks a theatre, philharmonic, and zoo; compensates with a rich network of galleries
Type of Heritage	Artistic heritage—post-Romantic, modernist, strongly embedded in the national myth	Multicultural heritage—borderland, hybrid, open to diversity
Relationship with Tourism	Culture as a complement and extension of the tourism offer—strong synergy	Culture as a substitute for tourism—a primary driver of visitor traffic
Scale of Impact	National—Zakopane is a widely recognized cultural “brand” across Poland	Regional and cross-border—strong presence within the Cieszyn Silesia Euroregion
Type of Festivals/Events	Strong focus on tradition (folklore, highlander culture) and high culture (theatre, visual arts)	Predominantly auteur and contemporary festivals, often exploring borderland themes
Promotional Model	Largely automated through tourism branding and association with the Tatra Mountains	Based on active identity-building—“ <i>Cieszyn, the city of encounters</i> ”

Source: Own study.

The scale of influence also differs between the two cities. Zakopane operates on a national level—its cultural brand is widely recognized across Poland, which in itself enhances the visibility and promotion of its cultural activities. Cieszyn, by contrast, is building its position primarily within the context of the Cieszyn Silesia Euroregion and through cross-border cooperation. This too represents a valuable and contemporary approach to cultural policy, rooted in regional integration and transnational collaboration.

In summary, Zakopane represents an institutional-heritage model—grounded in extensive cultural infrastructure and a strong, historically rooted identity. Cieszyn, by contrast, has developed a networked-festival model—dynamic, flexible, and built on collaboration and local initiatives. Both models demonstrate that there is no single path to becoming a “*little big*” *cultural center*; what matters most is a coherent strategy based on local assets and a consciously chosen area of specialization.

The lessons drawn from these two cities offer valuable inspiration for other subregional centers seeking to define their own cultural development trajectories.

5. Conclusions

The diagnosis of the “non-metropolitan gap” in cultural research reveals that the forty subregional cities identified by the Observatory of Urban and Regional Policy at IRMiR can be viewed as laboratories of social innovation—challenging the dominant paradigm of metropolitan centrality.

Their potential is assessed using the cultural offering index proposed by the author, which includes nine types of institutions and events: cinemas, libraries, museums, cultural centers, art galleries, theatres, philharmonic halls, zoological gardens, and festivals or cultural awards. The 5-21 point scale enabled the classification of cities into four tiers of cultural development.

The range of results is substantial: Świdnica and Skierniewice score just 5 points, while Cieszyn, Kalisz, Tarnów, and Zakopane reach the maximum of 21. These outcomes challenge two common assumptions. First, population size does not guarantee a richer cultural infrastructure—larger cities such as Elbląg, Wrocław, and Grudziądz perform worse than significantly smaller cities like Zakopane or Cieszyn. Second, high financial expenditure does not always translate into a higher cultural index: most cities spend ≤ 400 PLN per capita, and Zamość remains the only clear example of combining substantial spending with a strong cultural performance.

Differences in cultural potential emerge across four key dimensions: the scale of infrastructure (ranging from basic offerings to a full spectrum of institutions), the development profile (including “broad”, “narrow”, and “narrow-compensatory” cities), geographical conditions (with a band of lower-middle scores stretching along the Lubin–Suwałki axis), and the asymmetry between financial expenditures and cultural outcomes.

Two distinct models of success emerge as effective responses to demographic and financial constraints. Zakopane exemplifies the institutional-heritage model: a nearly complete cultural infrastructure, including two permanent theatre stages, combined with strong synergy between culture and tourism, underpinning its nationally recognized brand. Cieszyn, by contrast, follows a networked-festival model, building its visibility on a dense network of art galleries, cross-

border festivals, and the active engagement of NGOs—effectively compensating for the absence of major institutions.

In both cases, the key drivers of success include a strong cultural brand, strategic specialization in selected cultural segments, active involvement of local communities, and multi-level cooperation beyond the local scale.

An analysis of these experiences yields four key recommendations:

1. Diversity over monoculture – Even a single theatre or gallery can elevate a city into a higher tier of the cultural index.
2. Modern media libraries and landmark libraries – These facilities help engage younger generations and fill critical gaps in cultural infrastructure.
3. Strategic specialization – Focusing on a distinct cultural niche (e.g. a film festival or contemporary art) can trigger a multiplier effect in participation and visibility.
4. Consistent support for NGOs and cross-border partnerships – Such support sustains a “compensatory culture” that offsets the absence of large institutional anchors.

With a clear focus in these areas, smaller cities have a real opportunity to turn their local assets into lasting developmental advantages—and to emerge as true “*little big*” cultural centers.

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CHANGES IN THE PERCEPTION OF INNOVATION AMONG THE MANAGEMENT STAFF OF SILESIAN SMEs IN 2010-2012 AND 2020-2022

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Purpose: Comparative analysis of the results of the author's research on the perception of innovation among the management staff of Silesian SMEs from 2010-2012 and 2020-2022, diagnosis of changes in the above-mentioned area of research.

Design/methodology/approach: The conceptual framework of the research draws upon open innovation principles and the innovation strategy typologies presented in the Oslo Manual. Comparative research over time was conducted using the standardized interview method (questionnaire) and an online diagnostic survey.

Findings: There was a clear increase in awareness of the importance of innovation among the management of the surveyed Silesian SMEs, especially in the context of digitization, automation and green technologies. Respondents increasingly perceive innovations not only as technical improvements, but also as organizational, process and marketing changes.

Research limitations: Results of research of limited scope - regional, the need for comparative supra-regional studies.

Practical implications: Diagnosis of the direction of evolution of the ways of perceiving and implementing innovative strategies by SME management.

Social implications: Diagnosing the direction of changes in the perception of innovation among an important social group for the economy and society – SME managers.

Originality/value: Comparative analysis of the results of the author's research on the perception of innovation among the management staff of Silesian SMEs from 2010-2012 and 2020-2022.

Keywords: change, innovation change, perception of innovation, SMEs, questionnaire interview, online survey.

Category of the paper: research paper.

1. Introduction. Conceptualization of the Concept of Innovation

The development of regional enterprises and employees is one of the fundamental conditions for the evolution of the regional economy and its adaptation to global changes (Leitão et al., 2024; Drucker, 1992, 1993; European Innovation..., 2005; PARP, 2024). In the process of restructuring the Silesian Voivodeship's economy, the development of the small and medium-sized enterprise (SME) sector is of strategic importance. These enterprises are expected to produce innovative products, utilize innovative technologies, and introduce innovative forms of services.

According to the "Report on the Condition of the Small and Medium-Sized Enterprises Sector in Poland," the innovation of Polish companies is growing. Between 2020 and 2022, 32.2% of enterprises (excluding microenterprises) implemented innovations, the highest rate since the survey was conducted. Most of these were large companies, employing 250 or more people (Report on the Condition..., 2024). The most frequently implemented type of innovation was new or improved business processes. Among industrial enterprises, innovations in production methods or service provision dominated, while among service companies, innovations related to the principles of operation within the enterprise or in relations with the environment dominated. The growing importance of the knowledge-based economy and competition, as well as the impact of globalization, have made innovation one of the greatest challenges for modern enterprises (Alyami et al., 2024; Apa et al., 2020; Ehigiamusoe et al., 2024; Erickson et al., 2024; Kasprzyk, 1980; Kłopotek et al., 2001). Innovation, as a fundamental process of an enterprise, should include (Ambler et al., 2004, p. 23; Aufan, 2004; Błażlak, Owczarek, 2014, 2016, pp. 33-38):

1. Creating new ideas, which includes: identifying customer needs, supporting the emergence of new ideas and creativity among employees, and creating mechanisms and criteria for selecting ideas that will be developed into new products and services.
2. Changing production processes resulting from the introduction of new technologies and management methods to increase the value of a product or service.
3. Product development, encompassing the cycle from concept to market launch of a new product or service, as well as coordinating the activities of internal staff with external teams involved in the design and development of the new product.
4. Changing marketing processes to increase the value of existing products and services or creating new ones.
5. Managing knowledge and technology within the company, but also externally by outsourcing research and development projects to technologically and scientifically specialized organizations, purchasing licenses or patents, establishing technological alliances with other companies, and monitoring technological developments that will impact future products and services.

It should be emphasized, however, that a well-designed innovation process does not necessarily guarantee successful implementation (Błażlak, Owczarek, 2016, pp. 33-34; Kuzior et al., 2023; Kim, Park, 2024; Hutton et al., 2024).

Changes must possess essential features to be considered innovations (Świtalski, 2005; Davila et al., 2005; Hamel, 2002; Oblój, 2002). In different perspectives on innovation, two most important features can be distinguished: novelty and change (Ohme, 2005; Dolińska, 2010; Jonasz, Kozioł, 2007; Kożusznik, 2010, pp. 21-51). In practice, when implementing innovative solutions, it is necessary to understand change in its two dimensions. The first is a change in value, which is expressed in the products offered by the enterprise, as well as in the processes (ways, methods) facilitating the creation of products and their delivery to customers. The second dimension is the degree of novelty (Brzóska, 2014, p. 41). Treating change as an innovation is conditioned by certain characteristics. These include: 1) a change considered by a given entity as an innovation should be introduced in a purposeful, conscious, and sustainable manner; 2) innovation is a change that leads to more effective operation of the enterprise; 3) innovation involves change and results in improved function; 4) an increase in the usefulness of the results of a material product or service – an improved function is manifested in better technical quality or usability; 5) innovation is the effect of change consisting in the modification or introduction of entirely new elements to the entity's method or effect; 6) more effective operation of the entity is manifested in a shorter response time of the entity to external stimuli; 7) the change should have the possibility of spreading to other entities (Brzóska, 2014, p. 41; Świtalski, 2005, pp. 68-69; Brzóska, Pyka, 2011).

Innovation is considered an economic success when new ideas are implemented (Weryński et al., 2014; Băban, Băban, 2024; Dost et al., 2020). It is rather treated as a continuation of technical and organizational changes, encompassing, on the one hand, simple modifications to existing products and services and, on the other, processes (Kuczmarski, 2000; Haffer, Karaszewski, 2004; Jasiński, 2006). According to the Dictionary of Innovation and Technology Transfer: "The phenomenon of innovation is inextricably linked to the concept of change, novelty, reform, or an idea considered new" (Matusiak, 2011). Innovation is also defined as various facts, processes, and phenomena of a technical, organizational, social, or psychological nature. In this context, "innovation" can be defined as all phenomena, processes, and products that arise as a result of introducing changes or taking into account factors that have caused changes, for example, in the way things are used. The main goal of innovation in this area should be to improve the quality of people's lives. This translates into the development of an economy based on science and knowledge (Weryński et al., 2013; Dolińska-Weryńska, Weryński, 2019; Weryński, Dolińska-Weryńska, 2021; Weryński, 2022).

The authors' operational definition of the concept of innovation is based on a pragmatic approach to truth. It accepts as true what works through its practical consequences. It is close to being identified with the effectiveness, efficiency, and adequacy of satisfying human needs in a specific situational context. Pragmatically understood innovation emphasises the

importance of the effects of social activities, the importance of activities focused on action research, i.e., research, action, and cooperation (Mulgan et al., 2007, pp. 22-23; Lubimow-Burzyńska, 2014, pp. 83-88). The above-mentioned approach to social innovation includes the diagnosis of reality, identification of the problem, initiation, testing, implementation, and possibly validation of the final product of the innovation (i.e., product, service, and model), which in effect leads to a permanent and significantly predicted change in a specific environment, social group, or organisation. It is achieved through the cooperation and mutual inspiration of innovators, users, and recipients and by applying the idea of open innovation (Alyami et al., 2024; Oliveira et al., 2025).

Referring to the terminology proposed by the Organisation for Economic Co-operation and Development (OECD) in the Oslo Manual, four types of innovation can be distinguished. These largely correspond to the most common classifications of innovation strategies based on the area they concern (the subject of innovation): product innovation, process innovation, marketing innovation, and organizational innovation (OECD, 2008, p. 48). Incorporating these innovation strategies into a company's strategy is intended to help focus efforts on building the foundations for the company's future position (Oliveira, Rua, 2005). From this perspective, the innovation strategy chosen by the surveyed companies is particularly interesting.

These types of innovation were incorporated into the process of conceptualization and operationalization of the presented research. In the above area, the authors posed two research questions: (1) How did the perception of the concepts of "change" and "innovative change" change among the management staff of Silesian SMEs in the years 2010-2012 and 2020-2022? (2) How did the structure of key innovative activities change according to the representatives of the management staff of Silesian SMEs in their enterprises in the above-mentioned period?

2. Research methods and procedures used

This article compares the results of studies conducted between 2010 and 2012 and 2020 and 2022 among management representatives of Silesian SMEs. The first study was conducted as part of the innovative research project (POKL) "With the Entrepreneurship Implementation Matrix" (Weryński, 2012, 2013). Among other things, 300 questionnaire-based interviews were conducted with SME representatives from all counties of the Silesian Voivodeship. A quota sample was selected for the above studies so that the distribution of the research sample among micro, small, and medium-sized enterprises in the individual counties where enterprises are registered proportionally corresponded to the actual distribution. The sample was constructed based on data from the end of 2010, published on the website of the Provincial Statistical Office in Katowice.

The second study, conducted via an online survey, was conducted in the second half of 2022. The study employed simple random sampling. The minimum sample size was calculated based on the general population of 6,781,600 people employed in 100,811 small and medium-sized enterprises in Poland (www.stat.gov.pl). The calculations assumed a 95% probability that the survey result would not deviate from the actual population value by more than 5%. The resulting minimum sample size was 384 people and 383 companies. Therefore, the 542 respondents obtained from 542 companies exceeded the minimum sample size, allowing for statistically reliable data.

In this study, the survey questionnaire was sent via email, and separate links were sent to each selected company. A total of 542 representatives of Polish small and medium-sized enterprises (including 71 from the Silesian Voivodeship) participated in the study, representing both management and specialists. The analysis in this article focused on the sections of the same questionnaire concerning the perception of innovation in both studies.

3. Research results

3.1. Perception of the concept of change and innovative change

From a research perspective, it is crucial to understand the difference between the concepts of change and innovative change. Change is any modification to some part of an organization, typically undertaken to minimize negative environmental impact, meet technical requirements, or improve efficiency (it can be planned long-term or adaptively). Its implementation involves reorganization, which can cause disruptions and difficulties, and therefore its implementation is often delayed (Piotrowski, Świątkowski, 2000, pp. 133-134). Innovative change, on the other hand, is a change with specific characteristics: it is an expression of creativity, i.e., the creation and implementation of a new idea or product. The originality and freshness of the idea are also important. Factors influencing the growth of innovation include hiring appropriate employees who possess the ability to act creatively in all positions within the enterprise, both managerial and executive, the existence of an atmosphere conducive to the search for new solutions, an efficient innovation implementation system, and a large number of successfully implemented innovations by the enterprise in the past.

Following this line of reasoning, it is therefore crucial to ask how SME decision-makers understand the concepts of innovation and change. This issue was operationalized in the form of two closed-ended questions: "What does the term 'change' bring to mind for you?" and "What does the term 'innovative change' bring to mind for you?" Below is a comparative graph of surveys conducted between 2010-2012 and 2020-2022, examining respondents' associations with the concept of change.

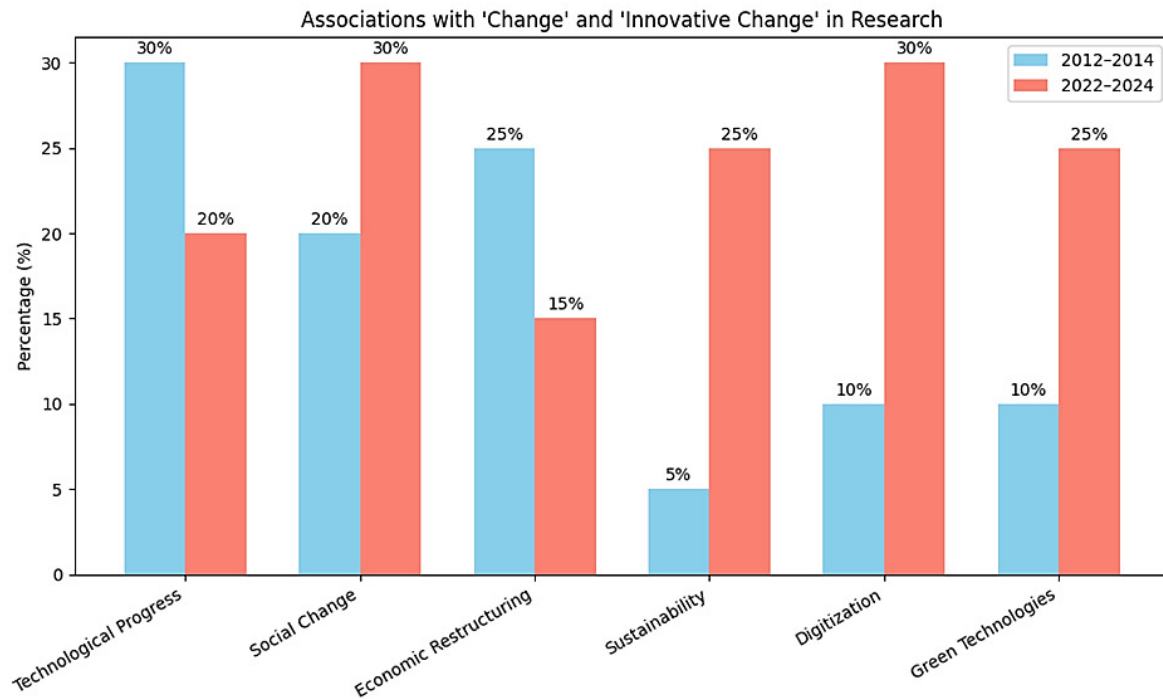


Figure 1. Associations related to the concept of "change".

Source: own research.

The table above clearly shows that technological progress and economic restructuring were more noticeable in previous years, while social change, sustainability, digitalization, and green technologies gained importance between 2020 and 2022 and continue to do so. This shift undoubtedly reflects a broader shift toward environmental awareness, digital transformation, and social innovation. Research conducted between 2010 and 2012 indicates that surveyed entrepreneurs were already mentally prepared to implement changes not only in technological processes but also in their relationships with their surroundings, but they needed several additional years to implement them. Surveyed entrepreneurs demonstrate a positive approach to change. The approach that perceives change solely as a source of uncertainty accounted for approximately 20% of all responses (only a few indicated change as a threat). Nearly one-third of respondents associated change with the possibility of success (although 63.9% of these responses also associated success with a threat). It is encouraging that almost 45% of surveyed entrepreneurs perceive change exclusively positively. This trend deepened in subsequent years. The distribution of responses suggests that the Silesian SME sector is not afraid of change and recognizes that it operates in an environment that requires significant fluidity and flexibility. Interestingly, the structure of responses does not differ by company size, and the approach to change is very similar, both in companies with nine or more employees and in those with 50 to 249 employees. It is worth noting that implementing change in larger companies typically involves a more complex implementation process, and consequently, consequences such as developing effective workflow reorganization and the ability to manage the resulting chaos. Therefore, a positive approach to change may also be an indicator of the high qualifications of those responsible for implementing it (change agents).

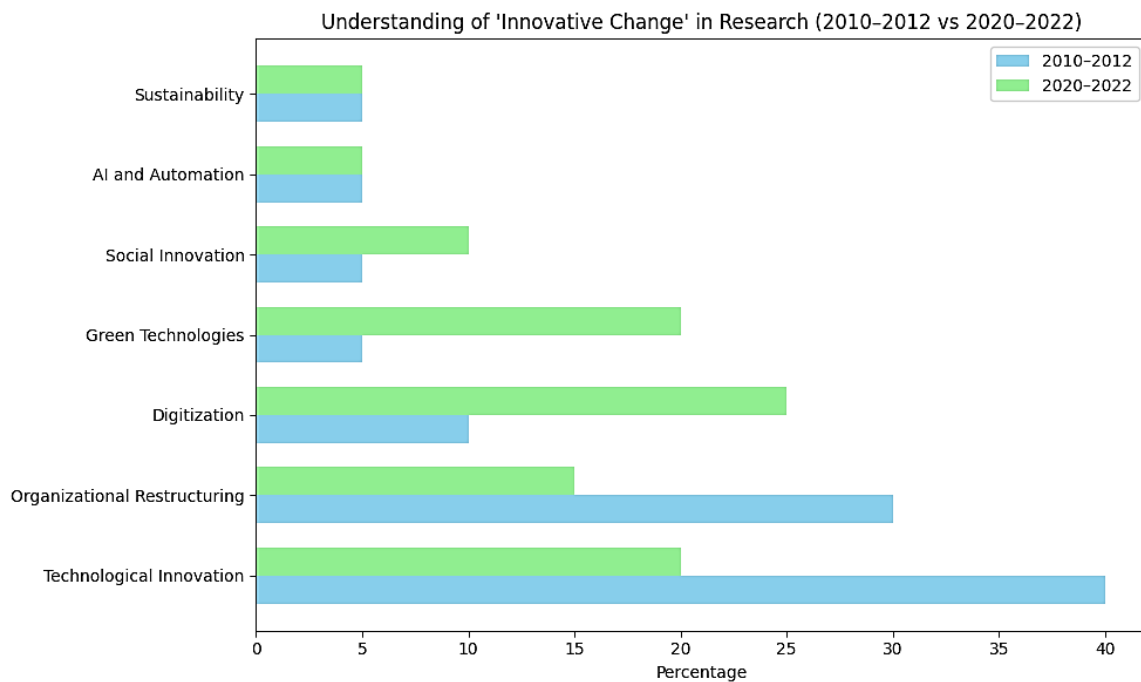


Figure 2. Perception of the concept of "innovative change".

Source: own research.

The above graph illustrates the evolution of the understanding of the concept and meaning of innovative change over the years. In 2012, we observe a traditional approach to innovation. Innovation was understood primarily as technological progress and organizational restructuring. The emphasis was on efficiency, modernization, and competitive advantage, especially in the industrial context, while the environmental and social aspects of innovation were marginal. In 2022, innovation is already systemic and inclusive. This concept has been expanded to include digitalization, green technologies, and social innovation. This reflects the shift toward sustainability, digital transformation, and inclusive growth. The development of green and digital agendas (e.g., the European Green Deal, Industry 4.0) likely influenced this evolution. Artificial intelligence and sustainability remained present but did not dominate the discourse.

The question about entrepreneurs' understanding of the concept of innovative change examined managers' awareness of the scope and importance of innovation. The most consistent response to the definition itself was a combination of the two previous elements. Sixty-two percent of respondents understood the importance and value of innovative change and perceived it as a factor contributing to both increased sales and production efficiency, as well as a change in people's mindsets and behaviours. This trend intensified in 2022. For 64% of respondents, innovative change is associated with both increased efficiency and a change in mindset.

Considering the size differences between enterprises, there is a significant difference in the distribution of responses to this question among representatives of microenterprises compared to medium-sized enterprises. This may be related to both less knowledge about innovative solutions and different business goals (e.g., a greater focus on profit and pressure for results).

There is a noticeable tendency towards a stronger syncretization of elements of people's mentality and behaviour, as well as increased sales and production efficiency as the organization develops. This problem may be related to the previously mentioned lack of preparation among medium-sized enterprises for implementing change.

Research conducted in 2012 and 2022 indicates that the surveyed entrepreneurs are ready for innovative actions, understood as change, including in their relationships with their environment. They do not perceive it as a threat to their companies, either currently or in the future. This attitude is shared by representatives of both small and medium-sized companies (the relationship between company size and the perceived threat of change proved statistically insignificant, meaning it does not differentiate respondents). The vast majority of respondents also associate the concept of change, broadly defined, with success or something positive (nearly 60% of responses). For another 25% of respondents, change is associated with success but with potential threats. These results suggest that the surveyed entrepreneurs have developed a foundation of awareness and possess a capital of confidence in their capabilities and resources.

3.2. Changes in the structure of key innovative activities according to respondents

In line with the conceptualization section, we maintain the assumption that innovation is a characteristic of firms that have introduced at least one technical innovation during the period under review or have participated in the creation of new or significantly improved products introduced to the market in the past three years. In the survey, respondents were asked to indicate which of the following operational strategy factors they considered to be a priority in their firm over the past three years.

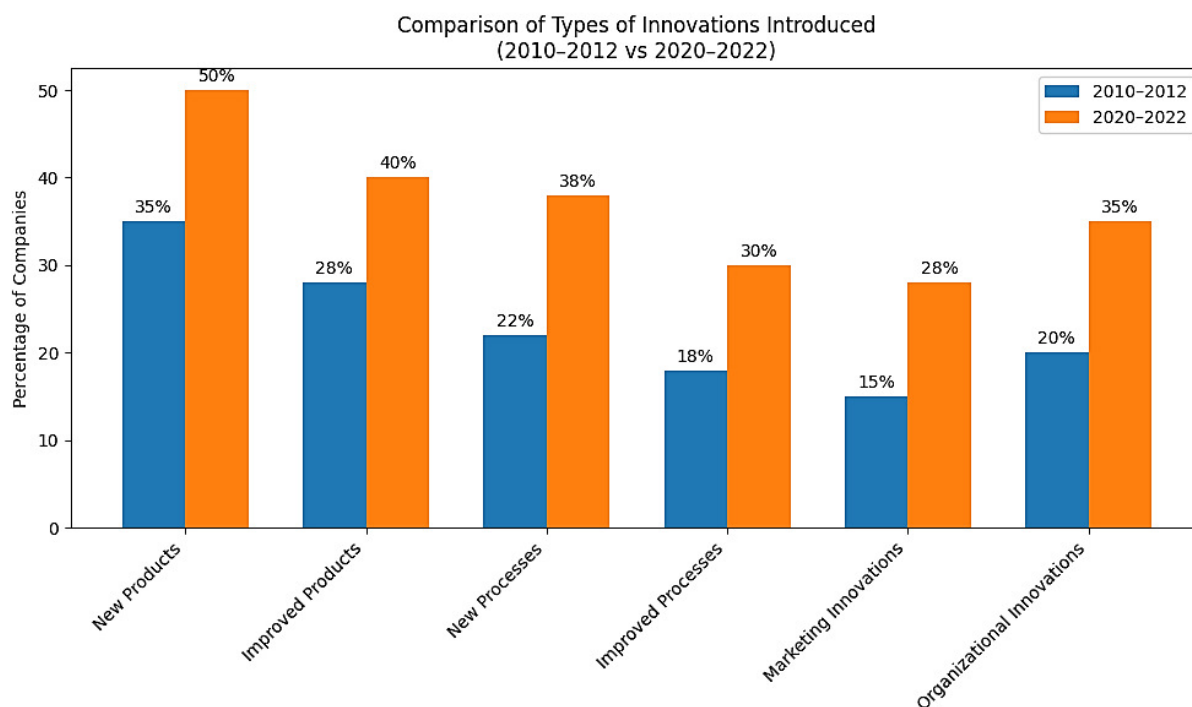


Figure 3. Key innovation activities of the company.

Source: own research.

The graph above clearly demonstrates the evolution of innovation activities over time along several dimensions: (1) Technological innovations (e.g., new technologies, production methods) increased significantly between 2020 and 2022, reflecting a significant shift toward digital transformation and automation. (2) Market expansion and distribution channels show a stronger emphasis in the later period, suggesting that the company more aggressively adapted to global markets or new platforms (e-commerce, digital marketing). (3) Organizational and structural changes became much more visible, likely driven by external factors such as remote work trends or internal restructuring to ensure scalability. (4) Design and communication innovations (such as branding and UX) were strengthened, indicating a deeper focus on customer experience.

While new products/services were already a strength in 2010–2012, their development accelerated even further between 2020 and 2022—a testament to consistent strategic prioritization. Overall, the chart illustrates how the company's innovation profile has broadened and intensified, moving from fundamental improvements to more dynamic, technology-driven, and customer-centric innovations. This comparison clearly demonstrates how the company's innovation profile has matured—from fundamental shifts in previous years to bold, strategic advances in recent years.

Respondents indicated the following as the most important (in descending order): implementing new and/or significantly improved products and services, using new or significantly improved production methods, changing pricing strategy, finding new markets, improving technology, obtaining new sources of raw material supplies, changing distribution channels and changing work organization methods.

SMEs too often focus on product features and quality, disregarding the customer's willingness to pay for their own benefits. The results presented confirm these observations. By choosing a product/service, customers buy both new technological advancements and (perhaps above all) satisfaction, a sense of security, self-confidence, and self-esteem. Therefore, the survival of any company depends on prioritizing customer needs over product features.

Thinking about innovation is not limited to research and development of new products but is increasingly becoming a way of looking at the entire organization. There are several paths that can be followed to reap the benefits of innovation (Kožusznik, 2010, pp. 14-15). The surveyed entrepreneurs indicated actions within all four strategies described in the Oslo Manual, but placed the greatest emphasis on product and process strategies. Implementing new and/or significantly improved products/services is reported by approximately 60% of respondents (product innovation). Nearly half of the surveyed entrepreneurs (48%) declare introducing process innovations through the use of new and/or improved production/service methods and the use of new technologies (45%). Process innovation also occurs when introducing innovations in the way a product reaches customers; therefore, finding a new sales market, indicated by 44% of respondents, can also be classified as process innovation and, to some extent, marketing innovation. It is worth emphasizing that respondents also indicated

marketing innovation activities undertaken, among others, by changing the pricing strategy (44%).

When asked how much importance respondents attach to individual factors in a company's operational strategy, 96% of respondents considered product/service features and quality to be a rather important or very important element of the company's operational strategy. These responses correspond to the question about actions implemented in the last three years, where the majority of respondents admitted to implementing new and/or significantly improved products/services in the last three years. Respondents also emphasized the importance of product/service pricing as a component of the company's operational strategy. Ninety-five percent of respondents considered product/service pricing to be a rather important or very important element of the company's operational strategy. As the results show, respondents consider pricing strategies an important element of the company's operational strategy, but are less likely to take action in this area.

4. Conclusions

This article examines changes in the perception of innovation among the management of small and medium-sized enterprises (SMEs) in Silesia between 2010-2012 and 2020-2022. It highlights the growing importance of innovation as a key element in the development of the regional economy. It presents the evolving perception of the importance of various aspects of innovation, such as the creation of new ideas, changes in production processes, product development, changes in marketing processes, and knowledge and technology management. A comparative analysis demonstrates the evolution of perceptions of innovative activities over time, with particular emphasis on digital transformation, automation, market expansion, and organizational and structural changes.

Between 2012 and 2022, there was a significant increase in awareness of the importance of innovation among the management of the surveyed Silesian SMEs, particularly in the context of digitization, automation, and green technologies. In 2012, innovation was often perceived as costly and risky. In recent years, a decidedly proactive attitude has prevailed. Innovation is treated as a necessity and an opportunity for development, rather than as a costly and risky endeavor. Respondents increasingly perceive innovation not only as technical improvements but also as organizational, process, and marketing changes.

Regional differences in innovation implementation are also evident. The Silesian Voivodeship, as a highly industrialized region, is characterized by a higher level of implementation of process and technological innovations than the national average. Employees of Silesian SMEs are more willing to participate in training and research and development projects, which influences their positive perception of innovation. This shift in motivation and

attitudes also stems from the growing role of EU and national innovation support programs, which has led to greater employee engagement in innovation processes. The COVID-19 pandemic has also significantly impacted the development of innovation processes, accelerating digitization and forcing many companies to implement innovative remote solutions, changing the perception of innovation as a tool for survival and adaptation.

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THE APPLICATION OF FRACTALISATION IN MARKETING: A FRAMEWORK FOR PERSONALISED THERAPEUTIC STRATEGIES

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Purpose: The objective of this article is to introduce the concept of @fractalisation as an innovative approach to the personalisation of medical services within therapeutic organisations. The authors aim to demonstrate how contemporary information technologies – such as the Internet of Things, artificial intelligence, and data analytics systems – can transform medical data into personalised insights that support accurate therapeutic decision-making and enhance treatment quality.

Design/methodology/approach: This is a conceptual and model-based article, grounded in a review of the literature and the development of a three-stage @fractalisation process for patients. This process integrates both quantitative data (e.g. laboratory test results) and qualitative data (e.g. social opinions, levels of patient trust). The approach is based on the abstraction and aggregation of patients' "hidden" characteristics, supported by IT tools for data analysis and visualisation.

Findings: The article presents a @fractalisation model that enables the classification of patients into fractal sets based on similarities in test results and behavioural traits. The model facilitates the evaluation of therapeutic effectiveness, identification of best medical practices, and dynamic monitoring of health status changes. The concept of @prediction is introduced as a tool for forecasting health behaviours, alongside "defractalisation" as a method for identifying patients with stable health conditions.

Research limitations/implications: The proposed model requires further empirical validation under real clinical conditions. Limitations may include the availability and quality of medical data, as well as the need for data standardisation. The authors advocate for the development of dynamic fractalisation algorithms and the inclusion of psychological and social factors in future research. It is also essential to examine the impact of prediction on therapeutic decisions and patient behaviours.

Practical implications: The application of @fractalisation has the potential to significantly improve diagnostic and therapeutic processes by enabling faster decision-making and leveraging the experiences of other clinicians. The model may be implemented in e-health systems (e.g. e-Patient, mojeIKP), automating patient communication and supporting therapy personalisation. Additionally, it may contribute to reducing treatment costs through early disease detection and the use of proven therapeutic methods.

Social implications: The implementation of @fractalisation may enhance the accessibility and quality of healthcare, improve treatment outcomes, and foster public trust in medical institutions. Prediction can support the development of positive health behaviours, increase patient awareness, and promote responsible use of medical services. The model may also inform health policy and support the advancement of digital transformation in healthcare.

Originality/value: This article offers a novel contribution by proposing the concept of @fractalisation as an innovative tool for supporting therapeutic decision-making. The integration of quantitative and qualitative research, the use of visualisation and prediction, and the dynamic assignment of patients to fractal sets represent a pioneering approach to the personalisation of medical services. The publication is intended for healthcare managers, medical practitioners, and researchers engaged in the digitalisation of healthcare.

Keywords: @fractalisation, therapy personalisation, artificial intelligence, Internet of Things, digital health.

Category of the paper: methodological paper.

1. Introduction

Contemporary information technologies compel nearly all manufacturing and service enterprises to adapt traditional forms of stakeholder communication to the requirements of the Internet. Information conveyed through computer programmes now constitutes the foundation of knowledge creation, enabling managers to reduce uncertainty in making accurate decisions (Nowicki, 2005).

The growing expectations of stakeholders, coupled with increasing societal awareness, mean that possessing information derived from information technologies has become a prerequisite for achieving competitive advantage within a given industry (Mruk, 2002). A new business environment is emerging, in which actions based on modern IT solutions – enhancing productivity and operational efficiency – serve as a fundamental criterion determining the success or failure of undertaken initiatives (Sztucki, 1998).

Newly emerging trends represent objective and long-term directions in broadly understood consumer preferences, choices, and behaviours. These trends are a consequence of changes in the market environment occurring across socio-political, cultural, demographic, legal, and technological dimensions (Zalega, 2016).

It is important to emphasise that the Internet also facilitates easy access to a unified target group of customers (Małachowski, 2000). This leads to a shift in marketing efforts – from addressing customer needs to focusing on expectations, understood as additional utility values delivered at the point of purchase. The application of various data processing techniques aims to design customer relationships by taking into account psychological, cultural, social, and economic characteristics (Rosa, 2005).

Companies can collect extensive user data already at the stage of transforming it into information, using appropriately designed data analysis programmes within the enterprise (Szwarc, 2010). From an IT perspective, the quality of a product or service remains unchanged; however, expectations – namely, the manner in which information about the product or service is presented to customers – should be adapted.

By utilising electronic platforms that store historical customer data, it is possible to personalise relationships between stakeholders and the company. Such actions may result in processed data becoming a highly attractive form of personalised promotion, potentially engaging additional individuals (Meyer-Waarden, 2013). Special offers, as part of a company's pricing strategy, may serve as a key marketing tool for retaining existing customers or acquiring new ones (Hansen, 2006).

2. Tailoring Customer Value Propositions via Digital Marketing Channels (@Marketing) (Krettek, Dworak, 2020)¹

From the perspective of relationship management, the personalisation of offers leads to higher customer satisfaction with products or services. This is due to the increasing demand for individualised service during various stages of customer acquisition and retention (Bleier, De Keyser, Verleye, 2018). While personalisation was previously a direct means of meeting customer expectations, it is no longer considered an innovation; rather, it has become a near-standard practice among medium and large enterprises. It is perceived as a compromise between mass-market offerings and the vision of establishing direct contact between the company and its end users (Brown, 2018).

Effective personalisation may be implemented through @marketing, which is closely linked to the organisation's ability to initiate dialogue with consumers by transforming data into various forms of information delivered in a comprehensible manner and within the shortest possible time. The implementation of these changes should be overseen by a manager who, through the use of the Internet of Things (IoT), connect marketing, and artificial intelligence (AI), can persuade customers to purchase the company's products or services. Reliable information provided by @marketing should serve as a guarantee that the organisation will be perceived as a trustworthy economic entity, one that uses modern @programmes to safeguard the interests of its stakeholders.

The benefits resulting from the implementation of @marketing strategies will be reflected in the organisation's image, likely increasing the number of clients engaging with the innovative method of diagnosing patient health conditions. A practical example underpinning the discussion on personalised actions involves organisations within the healthcare sector, particularly therapeutic institutions (hospitals, clinics, health resorts, outpatient centres)

operating in the private sector and serving individuals with various medical conditions. In this context, the product is medical information, which – through the application of @fractalisation – can be delivered to patients more rapidly and with greater precision.

The article discusses the concept of **fractals** – here understood as patients with identical or highly similar test results – allowing them to be grouped into fractal sets based on shared characteristics. This enables comparative analysis of the effectiveness of recommended treatments or therapies provided by different physicians or therapists. Such an approach may facilitate the automatic selection of the most suitable treatment, which could then be interpreted as a suggestion from a “computational specialist” acting as a consultant in complex clinical scenarios.

The content presented in this article should be regarded as conceptual models intended to inspire managers to implement them within therapeutic organisations under their leadership, with the aim of improving treatment outcomes. The primary objective of this article is to present the principles of @fractalisation in therapeutic organisations, specifically as a series of comparisons enabling the selection of the most effective treatment methods for conditions identified through structured medical examinations.

The problem addressed by the authors is expressed as follows: How can modern information technologies be used to transform data into personalised information capable of enhancing the quality of services provided?

The authors operate under the assumption that the observations made in this article do not, in any way, undermine the work of professionals employed in therapeutic organisations. Rather—and this must be emphasised unequivocally – they are merely a proposal for the utilisation, processing, and dissemination of data aimed at optimising knowledge about clients/patients through the use of modern information technologies. It should also be noted that @fractalisation may be regarded solely as a rapid form of computer-assisted consultation between physicians/therapists and specialists who have demonstrated success in improving patient health.

3. An Introduction to Typological Frameworks and Core Terminology

In economics, **typology** refers to the categorisation of individuals, objects, processes, and phenomena according to defined criteria and a set of principles (Typologia, 2025). Its primary aim is the operationalisation of conceptual meanings within a given domain through the use of metrics and indicators, the ranking of the examined set of objects, and the assignment of items or phenomena to specific categories in which similarities and differences can be identified (Biały, Długosz, 2015).

Classification, by contrast, is understood as a system for organising entities that share at least one common feature, which can be hierarchically structured (Surma, 2025). It focuses on the analysis of a limited number of observations that can be grouped or ordered into homogeneous sets (Kisielnicki, 2009).

An additional concept related to the grouping of studied objects is **typification**, which involves limiting the number of designed product types (in terms of their construction or production methods) to a manageable quantity, thereby enabling their **segregation** based on characteristics essential for determining functionality, production costs, and operational efficiency (Typizacja, 2025).

In traditional marketing, a similar concept is **segmentation**, which refers to the division of customers into homogeneous groups characterised by similar traits. Segmentation enables a more precise understanding of customer needs, allowing enterprises to refine their offerings in a manner that best meets those expectations (Segmentacja, 2018). Segmentation may be based on various criteria, including gender, age, marital status, education level, income, source of livelihood, nationality, place of residence, social group affiliation, or occupation (Konopka, 2021).

4. Fractalisation as a Method for Data Aggregation and Analysis

Given that the concepts of typology, classification, typification, and segmentation meet managerial expectations primarily in terms of dividing objects into homogeneous groups based on observable characteristics, a new category for grouping individuals under study has been articulated – namely, **fractalisation**. Unlike marketing segmentation, which focuses on dividing individuals according to easily observable physical traits, fractalisation is understood as the grouping of identical or nearly identical objects, processes, and events into sets based on “hidden” characteristics identified during the research process.

From a theoretical standpoint, data aggregation is based on fractals – geometric figures whose smaller parts, when magnified, resemble or replicate the original structure (Kudrewicz, 2015). “Fractals are interconnected through an efficient information and communication system. They autonomously determine the type and scope of their data access” (Warnecke, 1999). Furthermore, “fractals reorganise (restructure), regenerate, and decompose” (Warnecke, 1999). This allows researchers – after accepting primary features and excluding secondary ones (defining the fractal dimension) – to assign studied objects to a predefined set. Here, the term fractal dimension refers to the number of features that determine the complexity of an object, necessary for its assignment to a fractal set based on analogous traits (Falconer, 1997).

From this perspective, a point, line segment, circle, or sphere has one dimension; a rectangle has two dimensions; a cuboid has three dimensions, and so forth. These serve as criteria for aggregating the multidimensionality of objects (Pomiar wymiaru fraktalnego, 2008).

Thus, the fractal dimension does not depend on the size, colour, or material composition of the objects, which, from a practical standpoint, makes them appear highly similar. The fractal dimension is therefore a convenient attribute for formulating various types of assertions about objects (Kudrewicz, 1993).

In simplified terms, when selecting clients, the key information is not whether the individual is middle-aged or elderly, male or female, or holds higher or primary education. Rather, the crucial factor is how the individual can be fractalized – that is, assigned to an existing set of objects with a similar internal structure.

A defining feature of the fractalisation process is the continuous observation of factors that alter the structure of an object's "hidden" characteristics. This enables initial assignment to a given fractal set, followed by potential reclassification into another set with different attributes. In a world dominated by information technologies, traditional methods of grouping objects into homogeneous sets are implemented by IT specialists through algorithms. This dynamic form of fractalisation may be referred to as @fractalisation.

It is worth noting that with the advancement of computer technologies, algorithms are increasingly used to perform repetitive tasks across various production domains. In such contexts, each new product – despite differing in colour, shape, or size—may be considered a fractal due to selected features that render it similar to a homogeneous group (Peitgen, Jürgens, Saupe, 2002).

5. Operational Procedures and the Implementation of Fractalisation within Healthcare Systems

The process of @fractalisation within the domain of medical services is primarily based on the method of abstraction – defined as the omission of secondary patient characteristics and the identification of those deemed essential (Abstrahowanie, 2025). In this context, the term "fractal dimension" is replaced by the notion of "marketing fractalisation dimension", understood as the number of "hidden" traits considered by a physician or therapist during comparative analysis, enabling the assignment of a patient to a specific fractal set.

Within this framework, the following categories of individuals may be distinguished:

- Those affected by similar physical ailments – individuals who do not stand out in a crowd, yet through the analysis of medical tests, therapeutic approaches, and dietary regimes, may be grouped according to predefined criteria. Here, diagnostic results are of primary importance; gender and age are of minor relevance, while education and place of residence are considered negligible.
- Individuals with psychological conditions – who function within society until their “hidden” traits, such as behaviour in public spaces, work performance, or parental functioning, deviate from accepted norms. The therapist’s focus on identifying individuals within a population who share identical determinants of depression, neurosis, burnout, or apathy becomes a priority. This enables the assignment of such individuals to a fractal set of patients with similar conditions. Careful observation of their behaviour allows for the identification of endogenous or exogenous factors that may trigger a transition out of the assigned fractal set.

@Fractalisation thus enables not only the inclusion of a new object (patient) into fractal set “Q”, characterised by specific parameters at time t_0 , but also the automatic response to a change in one of those parameters at time t_1 , resulting in reassignment to set “V”. The most critical aspect of this process is the analysis of prescribed therapeutic methods by various medical professionals, the outcomes of which determine the patient’s transition from set “Q” to set “V”. From a practical standpoint, this mechanism facilitates the assessment of medical effectiveness. Positive outcomes serve as the basis for medical benchmarking (Bonelli, 1992), indicating which recommendations led to increased recovery rates, while negative outcomes help eliminate errors arising from incidental circumstances.

The dimension of @fractalisation is defined by the number of hidden traits (indicators) that characterise a patient’s health status. The therapist or physician may freely determine which of these traits to consider during @consultations, selecting those deemed most relevant to the specific clinical context.

6. The Role of Quantitative Analysis in Patient Fractalisation Processes

Currently, standard laboratory reports present individual test results in tabular columns, allowing only for the identification of values that fall within or outside the normative range. In contrast, the process of @fractalisation of patients comprises three distinct stages.

Table 1.*Fractalisation Matrix of Selected Medical Indicators [@fraktalisation patients]*

	Indicator 1 (Leuk.) Leukocytes	Indicator 2 (Hemo.) Haemoglobin	Indicator 3 (Lymph.) Lymphocytes	Indicator 4 (Plat.) Platelets	Indicator 5 (Hct.) Haematocrit
150-159%					
140-149%					
130-139%					
120-129%					
100-119%					
Upper Norm = 100%	Leuk_{max} = 11.0 = 100% = 100 pts	(Hemo_{max}) = 18.0 = 100% = 100 pts	(Lymph_{max}) = 4.5 = 100% = 100 pts	(Plat_{max}) = 400 = 100% = 100 pts	(Hct_{max}) = 52.0 = 100% = 100 pts
90-99%					
80-89%					
70-79%		(Hemo_{min}) = 13.0 = 72,2%			
60-69%					
50-59%					
40-49%					(Hct. min) = 40.0 = 76,9%
30-39%	(Leuk min.) = 4.0 = 36.6%		(Lymph. min.) = 1,5 = 33.3%	(Plat. min.) = 150 = 37,5%	
20-29%					
10-19%					

Source: own study.

In the first stage, a @fractalisation matrix is constructed, as illustrated in Table 1. For the purpose of presenting the @fractalisation model in medicine, it is assumed that the values of individual indicators change linearly and that all are stimulants. Accordingly:

- The upper normative threshold for all indicators is defined as (W_{max}). Values exceeding this threshold signal the emergence of pathological symptoms. For the purposes of @fractalisation, the upper norm for all indicators – regardless of their numerical values – is standardised to 100%.

In Table 1, the indicators are as follows: (Le_{max}) = 11.0 = 100%; (He_{max}) = 18.0 = 100%; ($Lymph_{max}$) = 4.5 = 100%; ($Platelets_{max}$) = 400 = 100%; ($Haemoglobin_{max}$) = 52 = 100%. Each of these values is assigned a score of 100 points.

- The lower normative threshold for all indicators is defined as (W_{min}). Values below this threshold also indicate the presence of pathological symptoms.

For the purposes of @fractalisation, the lower norm is expressed by the formula:

$$W_{min} = W_p \times 100\% \div W_{max}$$

In Table 1, the indicators are:

1. Leukocytes $Leuk_{min} = 11.0 \times 100\% \div 4,0 = 36.6\%$.
2. Haemoglobin $Hemo_{min} = 13.0 \times 100\% \div 18.0 = 72\%$.
3. Lymphocytes $Lymph_{min} = 4,5 \times 100\% \div 1.5 = 33.3\%$.
4. Platelets $Plat_{min} = 1,5 \times 100 \div 4,5\% = 37.5\%$.
5. Haematocrit $Hema_{min} = 40.0 \times 100\% \div 52.0 = 76.9\%$.

- The grey-shaded area in Table 1 indicates that if all of a patient's test results fall within this range, the patient may be presumed to be healthy. This assumption is made solely for the purpose of presenting the @fractalisation model.
- Indicators that fall above the upper norm or below the lower norm signal a pathological condition. Again, this assumption is made for illustrative purposes within the @fractalisation model.

In the second stage, the matrix presented in Table 1 will be populated with the test results of patient "A" – (113.6; 112.2; 72.2; 86.6; 58.0; 61.5) – which will serve as the criteria (dimensions) for their @fractalisation. These values will enable the identification of identical or similar cases among other examined patients, as illustrated in Table 2.

Table 2.

Fractal Set 'Q' – @fractalising patients based on laboratory test results at time point t_0

	Indicator 1 (Leuk.) Leukocytes	Indicator 2 (Hemo.) Haemoglobin	Indicator 3 (Lymph.) Lymphocytes	Indicator 4 (Plat.) Platelets	Indicator 5 (Hct.) Haematocrit
150-159 %					
140-149%					
130-139%	Patient A = 12,5 = 113,6				
120-129%		Patient A = 20,2 = 112,2%			
100-119%					
Upper Norm = 100%	(Leuk_{max}) = 11.0 = 100% = 100 pts	(Hemo_{max}) = 18.0 = 100% = 100 pts	(Lymph_{max}) = 4.5 = 100% = 100 pts	(Plat_{max}) = 400 = 100% = 100 pts	(Hct_{max}) = 52.0 = 100% = 100 pts
90-99%					
80-89%			Patient A = 3,9 = 86,6%		
70-79%		(Hemo _{min}) = 13.0 = 72,2%			
60-69%					
50-59%				Patient A = 232 = 58.0	
40-49%					(Hct _{min}) = 40.0 = 76,9%
30-39%	(Leuk _{min}) = 4.0 = 36.6%		(Lymph _{min}) = 1,5 = 33.3%	(Plat _{min}) = 150 = 37,5%	
20-29%					Patient A = 32 = 61.5
10-19%					

Source: own study.

Individuals who, based on blood test results at time t_0 , exhibited the following values: Leukocytes – 113.6%; Haemoglobin – 112.2%; Lymphocytes – 86.6%; Platelets – 58.0%; Haematocrit – 61.5%, will be assigned to fractal set "Q" (allowing for minor deviations).

In the third stage, at time t_1 , all patients within fractal set "Q" underwent the same diagnostic tests again, enabling an analysis of the effectiveness of therapies recommended by various physicians and therapists. This approach allows the clinician treating patient "A" to

benefit from the insights of a “specialist” who has achieved the most favourable outcomes in similar cases.

The stages of @fractalisation presented here should be regarded as a model developed through quantitative research. In this instance, the dimension of @fractalisation is five – referring to the number of indicators included in Tables 1 and 2, which were considered in the analysis. In future applications, this number may be expanded by incorporating additional patient-specific factors such as age, gender, and others.

@Fractalisation will involve the reassignment of a patient/fractal to a different group when changes in test results occur as a consequence of treatment.

The data presented in Table 3 may be visualised using a radar chart, as illustrated in Figure 1.

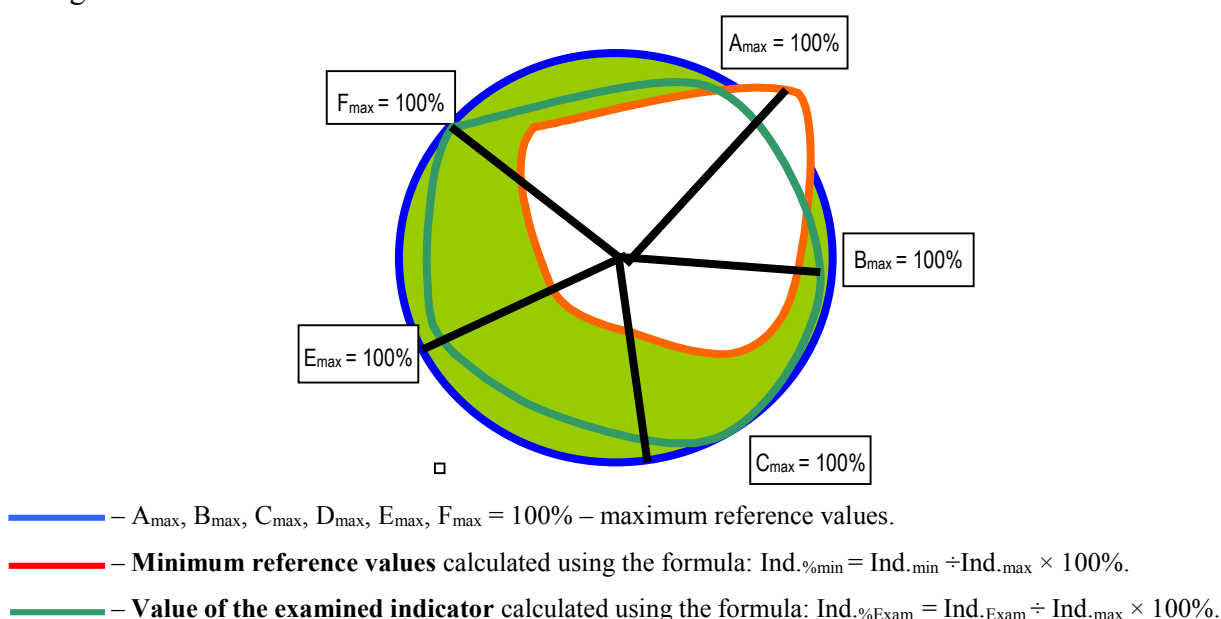


Figure 1. Indicator model relative to the upper reference limit.

Source: Author’s own elaboration.

The set of maximum values for selected indicators ($A_{\max}, B_{\max}, C_{\max}, \dots, F_{\max}$) serves as a visible reference point for visualising relationships among the remaining data. Rapid generation of such a presentation, based on the values collected and entered into Table 2, is no longer a technical challenge. Its advantage lies in the use of symbolic markers to represent the width of normative ranges, thereby clearly illustrating the patient’s health status – both in a static view and dynamically (with the possibility of incorporating historical test results).

Moreover, the chart enables the identification of changes resulting from therapy, thereby demonstrating the effectiveness of interventions that have restored a given indicator to its normative range. This occurs when the examined indicators $W\%_n$ fall within the interval between the maximum value $W\%_{\max}$ and the minimum value $W\%_{\min}$, i.e.: $W\%_{\min} \leq W\%_n \leq W\%_{\max}$.

Such a chart allows the patient to analyse multiple pieces of information simultaneously. Depending on the context, the evaluation framework may be adjusted. For instance, if the minimum normative values are set as the 100% reference point, the result will be a circular plot with two curves representing the maximum normative values positioned externally. In a third possible variant, the reference points (100%) are defined by the patient's own values, forming a circle surrounded by a curve representing maximum normative values and enclosed by a curve representing minimum normative values.

@Fractalisation provides the physician with visual access to information regarding:

- which patients with similar test parameters recovered most rapidly,
- which physician made the most accurate diagnosis,
- which medications and methods of administration yielded the best outcomes.

The presented model of patient @fractalisation, based on quantitative research, should facilitate efficient communication regarding health status. When applied in practice, the Internet of Things (IoT) can automatically notify the patient of subsequent test results, suggest appointments with specialists, and, in justified cases, even transmit prescriptions – e.g. via the e-Patient system. This approach allows the form of patient service to be tailored to expectations regarding the quality of care provided by modern therapeutic organisations.

It is also worth noting an additional practical application of @fractalisation: the transmission of supplementary knowledge to patients that may influence their health-related behaviours. This is achieved through prediction (in statistical analysis, the forecasting of future outcomes or statistical characteristics of random phenomena) (Predykcja, 2025), which in this context functions as a conduit for additional information about individuals who, having identical or similar medical test results:

- received a diagnosis of illness,
- recovered following treatment,
- incorporated dietary changes into their therapy,
- reduced stress in their lives.

@Prediction – here understood as a novel form of forecasting applied in therapeutic contexts – acts as a knowledge repository concerning individuals with comparable test results. It enables patients to access personalised insights into behavioural strategies appropriate to their condition.

7. @Fractalisation – Application of Qualitative Research Methods

@Fractalisation may also be applied to the grouping of individuals with advanced psychological conditions, based on the manner in which they express opinions regarding: the competence of medical professionals, laboratory diagnostics, the behaviour of superiors, family acceptance, and transcendental experiences.

For example, @fractalisation in this domain is illustrated in Table 4, where:

- Indicators Wfs_1 , Wfs_2 , Wfs_3 , Wfs_4 , and Wfs_5 represent the percentage acceptance of various forms of opinion expressed by individuals from the patient's immediate social environment concerning their condition.
- A scale for evaluating the indicators is presented, ranging from 10% to 90%;

The indicator "Patient Trust Level" (W Trust Level) is defined for each @fractalisation dimension. These are expressed as numerical ratios: $80/20 = 4.0$; $70/30 = 2.3$; $50/50 = 1.0$; $20/80 = 0.16$; $20/80 = 0.16$.

Table 3.

@Fractalisation with the Application of Qualitative Research Methods

Percentage of Patients Accepting:					
Indicator / Evaluation Scale	Wfs_1 Acceptance of physicians' actions regarding their condition	Wfs_2 Acceptance of acquaintances' opinions on laboratory results	Wfs_3 Acceptance of superiors' behaviour regarding similar conditions	Wfs_4 Acceptance of family opinions on limitations caused by illness	Wfs_5 Perceived influence of transcendental experiences on recovery
100%					
90% ²					
80%					
70%					
60%					
50%					
40%					
30%					
20%					
10%					
Trust Index (W Trust Level)	80/20 = 4,0	70/30 = 2,3	50/50 = 1,0	20/80 = 0,16	20/80 = 0,16
The fractal label "(4; 2.3; 1.0; 0.16; 0.16)" defines the content of the fractal set, allowing for a deviation of up to 0.05 from the calculated indicator values presented in Tables 1 and 2.					

Source: own study.

In this example, individuals who, by completing questionnaires, characterised their level of trust in therapeutic interventions according to the credibility of: physicians' opinions, laboratory results, assessments by superiors, family perspectives, and spiritual requirements, were represented by the numerical values: "(4; 2.3; 1.0; 0.16; 0.16)". These individuals are assigned to the fractal set bearing this designation.

This enables the therapist or clinician to gain a visual and analytical understanding of the patient's personality and mental disposition, thereby facilitating the assignment of the individual to an appropriate therapeutic approach.

Table 4.

Extended Analysis of the Fractal „(4; 2,3; 1,0; 0,16; 0,16)”

Elements of the Fractalisation Set Type “A”	Numerical Characteristics of the Fractal Set	Commentary
Column 1	Column 2	Column 3
@Fractalisation Dimensions	Wfs1; Wfs2; Wfs3; Wfs4; Wfs5	Number of indicators considered.
Maximum Degree of @Fractalisation	Calculation: $5 \times 90\% = 450$ percentage points, where $450 = 100\%$, representing full acceptance of all forms of therapeutic persuasion.	This is a hypothetical reference value used for comparative purposes. A respondent/patient scoring 450 points is considered fully receptive to all forms of therapeutic persuasion.
Evaluation Ranges for Therapeutic Influence on Patients	Personality types of therapeutic patients: A. 10-30% – “Non-receptive” B. 31-50% – “Resistant” C. 51-70% – “Compliant” D. 71-90% – “Communicative” E. 91-100% – “Cooperative”	Placement of a patient within any fractal range provides guidance to the therapist regarding the personality type they are engaging with.
Actual Degree of @Fractalisation	Calculation: $80 + 70 + 50 + 20 + 20 = 240$ percentage points, which in secondary standardisation equals $240/450 \times 100 = 53.33\%$	The therapeutic personality of the patient is characterized at 53.33%, indicating moderate susceptibility to persuasive methods.
Most Effective Form of Persuasion for Fractal Set “(4; 2,3; 1,0; 0,16; 0,16)”	Therapeutic actions based on indicator “Wfs ₁ ”, i.e. $(80/20 = 4.0)$	Persuasion models developed for individuals exhibiting these parameters.
Patient's Trust Level in Opinions Expressed by Their Social Environment	Calculation: sum of values $(80/20 = 4.0) + (70/30 = 2.3) + (50/50 = 1.0) + (20/80 = 0.16) + (20/80 = 0.16) = 7.62$	Additional Information: - The maximum level of patient trust in expressed opinions is calculated as: $5 \times (90 \div 10) = 45$. - The arithmetic mean of the patient's trust level in the therapy is: $45 \div 5 = 9$. - The trust level regarding the examined fractal was established at 7.62, which allows for an estimation of the challenges faced by the therapist in the execution of their professional duties.

Source: own study.

In summary, the information contained in Table 4 regarding the effectiveness of therapeutic interventions within the fractal set serves as a guide for selecting persuasive strategies that are most likely to influence patient behaviour positively.

8. Concluding Remarks from a Managerial Perspective

The patient @fractalisation system developed using the Internet of Things enables the personalisation of medical services through artificial intelligence. By replacing segmentation based on explicit client characteristics with @fractalisation focused on latent traits, therapists and physicians can benefit from expert recommendations in the diagnostic process.

From a @marketing perspective, @fractalisation allows therapeutic organisations to: build a positive reputation within their environment, enhance brand recognition, and attract new clients—ultimately aiming to maximise profitability (Noga, 2009). The key drivers of success in this context include:

- Automated patient notifications – not only regarding test results and appointment scheduling, but also offering diagnostic support from specialists whose patients have demonstrated rapid recovery.
- Enhanced promotional strategies through the integration of advanced information technologies in patient care.
- Facilitating patient interaction with others belonging to the same fractal set.
- Reducing the cost of medical services by enabling early-stage diagnosis based on validated clinical patterns.
- Replacing traditional methods of health status communication with digital channels, such as the e-Patient system, mObywatel, or mojeIKP.

@Fractalisation enables: comparative analysis of outcomes achieved by different physicians and therapists; immediate transmission of reliable health information; and minimisation of the time required to reach an accurate diagnosis.

Additionally, the introduction of the concept of “defractalisation” – understood as the suspension of all categorisations based on object characteristics – allows for the identification of patients whose test results, despite varying endogenous and exogenous factors, have consistently remained within the normative range over time. This process facilitates the selection of individuals whose living conditions, dietary habits, and stress management strategies have not significantly impacted their health status.

9. Summary and Closing Reflections

The system of patient @fractalisation developed through the Internet of Things enables the personalisation of medical services via artificial intelligence. By replacing segmentation based on explicit client characteristics with @fractalisation focused on latent traits, therapists and physicians can benefit from expert recommendations in the diagnostic process.

From a managerial perspective, the proposed model of @therapeutic services allows healthcare managers to build a positive institutional image, which may translate into an increased number of patients seeking treatment. Successful outcomes – particularly faster recovery trajectories – serve as the most compelling endorsement for choosing these facilities.

@Fractalisation, as an innovative method of transforming quantitative and qualitative research data into actionable insights for improving therapeutic effectiveness, is expected to influence the decision-making of individuals affected by various conditions in selecting their place of treatment.

Below is an example of informational content intended for potential patients, describing the therapeutic method based on @fractalisation:

The personalised therapy offered in our facilities is based on @fractalisation, which involves grouping patients according to characteristics that allow individuals undergoing standard preventive examinations to be assigned to a set referred to as fractals. These are patients with identical test results, similar perceptions of their environment, and shared inherited value systems.

The diagnostic and therapeutic @fractalisation system enables the identification of effective recovery methods based on numerous analogies supported by artificial intelligence. AI, drawing upon data from thousands of patients, uses algorithms to assist physicians and therapists in: Determining the most effective therapeutic approach for individuals with observable physical conditions, including recommending medication types and dosages that have contributed to rapid recovery in similar cases; Identifying determinants that improve mental health by selecting persuasive arguments that encourage sceptical individuals to engage in health-promoting behaviours.

AI-driven comparisons – based on thousands of patients treated successfully across various global locations – provide ready-made recommendations for physicians and therapists regarding the most appropriate therapeutic strategies to restore health in the shortest possible time.

Footnotes

1. Terms preceded by the symbol “@” refer to internet-based activities, as previously introduced and explained in: Kretek, H., Dworak, J. (2020). Post-Pandemic Marketing. @Marketing. In: *Multidisciplinary Aspects of Production Engineering, Part 2* (pp. 585-594). Monograph. K. Midor (ed.). Warsaw: Sciendo Publishing, ISBN e-Book: 978-83-66675-03-2, ISBN Print: 978-83-66675-02-5,.
2. This study does not take into account legal constraints related to data confidentiality.
3. The concept of “@fractalisation” has been introduced to draw managerial attention to its practical relevance in shaping a positive organisational image through internet-based tools.
4. A distant yet illustrative analogy is the water molecule, which in its fundamental structure is a fractal. Depending on environmental conditions, it may take various forms—ice, snow, rain, hail, or frost. In this case, the hidden features (atomic structure) of H₂O remain identical across all physical states, despite differing observable properties. Fractalisation, therefore, involves both the identification of endogenous characteristics that render objects similar, and the recognition of exogenous phenomena that influence those characteristics.
5. The term “marketing fractalisation dimension” has been introduced to distinguish it from the already established concept of “fractal dimension”, which is used in other scientific disciplines.

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DIVERSITY, EQUITY AND INCLUSION MANAGEMENT AS A KEY ELEMENT OF SUSTAINABLE DEVELOPMENT OF ORGANIZATIONS IN POLAND

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Purpose: The aim of the article is to analyze how diversity, equity and inclusion (DEI) policies are integrated into the sustainable development strategies of Polish organizations. The author also examines specific actions undertaken by companies within their DEI policies and identifies challenges related to their implementation.

Design/methodology/approach: The study is based on document analysis: reports from four editions of the Diversity IN Check initiative (2021-2024) and the list of employers most advanced in diversity and inclusion management (2021-2025), as part of the Responsible Business Forum initiative. Content analysis was applied, along with diachronic and synchronic comparisons, considering the methodological variability of the studies over the years.

Findings: The results indicate a progressive formalization of DEI strategies in Polish organizations and their integration with business goals and sustainable development. At the same time, practical actions, especially in relation to supporting groups at risk of exclusion, remain fragmented and uneven. The greatest difficulties concern the implementation of programs targeted at people with disabilities, the LGBT+ community, and caregivers of dependent adults.

Research limitations/implications: The study is limited to secondary data analysis from Diversity IN Check reports and does not include direct research on organizations. Future studies could expand the methodological scope to include interviews or case studies, especially in the SME sector or among universities.

Practical implications: The results provide organizations with knowledge about gaps and areas that require development in the context of DEI. They allow for better alignment of actions with the goals of sustainable development strategies and support the professionalization of diversity management strategies within organizations.

Social implications: The implementation of DEI policies supports equal opportunities and inclusivity, which directly impacts employee quality of life and the building of a more just society. The results may also inspire the development of social responsibility strategies.

Originality/value: The article provides a unique analysis of the evolution of DEI approaches in Poland, based on a long-term and comparative perspective of data from the Diversity IN Check initiative. It contributes to the development of literature on diversity management in the context of sustainable development in the Polish environment.

Keywords: diversity, DEI, sustainability, social responsibility. Diversity IN Check.

Category of the paper: Research paper.

1. Introduction

The issue of organizational management can be approached from various specific perspectives, such as human resource management, diversity and inclusion management, sustainable development management, and many others. Although each of these perspectives is important, it is particularly essential to perceive the organization as a whole. Moreover, a classification of these approaches in terms of their mutual interdependence and influence is highly valuable. Only such a holistic approach can lead to effective management within individual specialized perspectives. In the case of diversity and inclusion management, it should be noted that this particular perspective is most strongly linked to sustainable development management and, consequently, to the Corporate Social Responsibility (CSR) policies implemented by the organization.

Diversity, Equity & Inclusion (DEI) management is treated as a key element of sustainable development in organizations, having an impact on the social, economic, and environmental dimensions (Karbowska, 2023). DEI is not only associated with the promotion of equal opportunities and social justice but, above all, contributes to increasing organizational innovation and competitiveness (Kupczyk, Kubicka, 2014; Gross-Gołacka, 2016; Anand, 2021). In Poland, a major initiative aimed at monitoring and evaluating organizational activities in the field of DEI is the Diversity IN Check (DINC), implemented by the Responsible Business Forum (FOB). The purpose of this initiative is to assess the maturity of employers in diversity management and in building inclusive working environments (FOB, 2024a).

The aim of this article is to analyze how diversity, equity, and inclusion (DEI) policies are integrated into the sustainable development strategies of Polish organizations. The author also examines specific actions taken by organizations within their DEI policies and identifies challenges related to their implementation. The study is based on reports from four editions of the Diversity IN Check initiative (2021-2024) and on the list of employers most advanced in diversity and inclusion management (2021-2025). The following research questions were formulated in the article:

- P1:** How and to what extent are DEI policies formally integrated into the sustainable development strategies and business objectives of Polish organizations?
- P2:** How do Polish organizations implement specific programs and actions in the field of diversity and inclusion management, particularly in relation to supporting groups at risk of exclusion, and what challenges do they encounter in this process?

2. Literature review

2.1. DEI in the Context of Sustainable Development

The concept of Diversity, Equity & Inclusion encompasses a multidimensional approach to management, based on three pillars: diversity, equity, and inclusion. In management sciences, diversity management refers to workforce resources and is viewed as a source of new opportunities in a competitive market (Lisowska, 2021; Roberson, 2006). Diversity refers to the presence of individuals with different demographic characteristics, backgrounds, cultures, and even experiences and research confirms that such diverse teams tend to be more innovative and creative (Tucker, 2023). In a workplace where diversity is accepted and appreciated, employees are more willing to share their talents, are more creative, less conformist, and more committed to the organization's goals, which translates into higher productivity, lower turnover, and greater job satisfaction (Lisowska, 2021; Cox, Blake, 1991). Equity assumes the elimination of barriers and biases so that all individuals within an organization have fair access to opportunities and resources. This, in turn, positively affects employee engagement and motivation, which directly influence organizational performance (Proniewski, Kielczewski, 2023). Inclusion focuses on creating an environment in which each individual is respected and can actively participate in the life of the organization, thereby increasing engagement and employee loyalty and building organizational resilience to change (Baran, 2024; El-Amin, 2022; Weaver et al., 2024; Shore et al., 2011; Schmidt, 2021; Ciuk et al., 2022).

Today, DEI is not only a major challenge and management trend for organizations, but also a strategic necessity in the context of implementing sustainable development strategies. Research shows that DEI strategies contribute to transforming workplace culture, increasing minority representation within organizations, and enabling the implementation of effective business strategies (Tucker, 2023; Baran, 2024). Organizations, regardless of their size, play a key role in promoting the ideas of equality, diversity, and social inclusion, and their internal policies may indirectly influence societal development (Schmidt, 2021). In the near future, the market value of organizations will increasingly be determined by non-financial factors such as reputation, talent acquisition capabilities, and crisis management capacity (Lisowska, 2021), which is why a focus on human capital is becoming even more important.

It is also worth highlighting the key role of DEI in the implementation of the Sustainable Development Goals (SDGs), particularly in areas such as gender equality, the reduction of inequalities, and the promotion of decent work and economic growth (Nishii, 2013; World Economic Forum, 2020). DEI practices support the building of responsible, open, and resilient organizations that provide full participation opportunities for all stakeholders and thus implement the principles of social justice and corporate social responsibility (CSR). Organizations increasingly recognize that operating in line with the principles of sustainable

development and CSR is not only a means to improve reputation (Gadomska-Lila, Wasilewicz, 2016), but also a strategy for positioning themselves as attractive employers. CSR, as a response to the challenges of sustainable development, entails acting in accordance with accepted social norms by integrating social, ethical, and environmental initiatives (Jaźwińska, 2016). This can lead to increased competitiveness, stakeholder acceptance, and interest from partners and potential employees (Gadomska-Lila, Wasilewicz, 2016; Jaźwińska, 2016).

The concept of sustainable development is a fundamental determinant of global progress, aimed at improving quality of life and societal well-being in three key areas: economic, environmental, and social. Thus, sustainable competitiveness integrates economic, social, and environmental aspects, and improving activities or products in the context of sustainable development involves adapting and aligning with the external environment through the integration of economic, ecological, and social goals (Gadomska-Lila, Wasilewicz, 2016; Proniewski, Kielczewski, 2023; Proniewski, Zielińska, 2023). The relationship between DEI strategies and these three dimensions is presented in Figure 1. The very concept of sustainable development is an intergenerational initiative that seeks to meet the needs of the present generation without compromising the ability of future generations to meet their own needs (Gadomska-Lila, Wasilewicz, 2016; United Nations, 1987). In this context, managing diversity, equity, and inclusion is becoming an increasingly important component of organizational strategies and a key tool for building a sustainable future (Strzelczak, 2021; Schmidt, 2021; Shore et al., 2011).

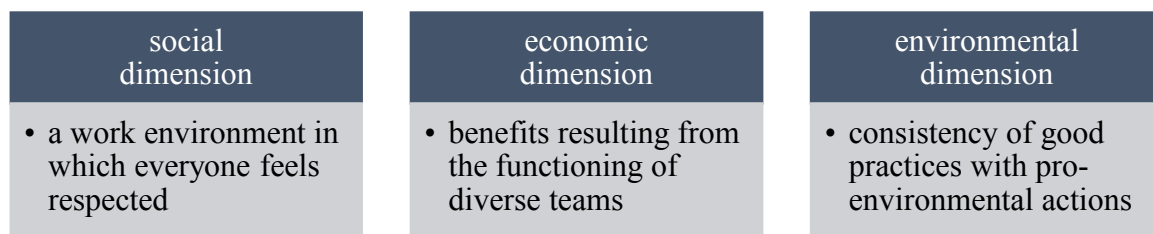


Figure 1. DEI Strategy in Three Dimensions.

Source: Own elaboration based on: Schwab, 2014, pp. 53-55.

At both the EU and national levels, there are numerous legal regulations supporting DEI, ranging from the Charter of Fundamental Rights of the European Union and the Universal Declaration of Human Rights to directives on equal treatment and strategies for gender equality or the inclusion of specific groups (Responsible Business Forum, 2021). Since 2017, EU Directive 2014/95/EU (amending Directive 2013/34/EU) has required large publicly listed companies to disclose information in their annual reports regarding diversity and related policies (Lisowska, 2021; Żaba-Nieroda, 2023). In the absence of such measures, companies must explain why steps have not been taken to create a more diverse work environment, teams, or boards (Lisowska, 2021).

Furthermore, under EU Directive 2023/970, starting in 2026, employers with more than 100 employees will be required to ensure pay transparency in relation to gender (Lisowska, 2024). However, in 2025, the European Commission announced the so-called Omnibus package, aimed at simplifying and reducing reporting obligations under the CSRD Directive and ESRS standards, especially for small and medium-sized enterprises. As part of these changes, deadlines for mandatory reporting were postponed and the number of required disclosures in the areas of environmental, social, and governance (ESG) issues was reduced (European Commission, 2025).

Although the core obligations related to diversity and inclusion remain in force, the new regulations give organizations greater flexibility in determining which aspects including those related to DEI they consider material from the perspective of so-called double materiality. In practice, this may affect both the scope of data disclosed in this area and the actual actions undertaken by organizations.

2.2. Diversity IN Check

Diversity IN Check is an initiative of the Responsible Business Forum, aimed at analyzing the maturity of employers in Poland in the area of diversity management and building inclusive organizations. This initiative also seeks to support employers in monitoring their own strategies, procedures, and practices in this field. It consists of two main components: an organizational monitoring tool (a questionnaire) and a list of the employers most advanced in diversity and inclusion management in Poland. The Diversity IN Check questionnaire is based on international standards and guidelines (SDGs, ISO 26000, ISO 30415, GRI Standards, OECD Guidelines for Multinational Enterprises, ISO 30415:2021 Human Resource Management Diversity and Inclusion), as well as the experience of the Responsible Business Forum gained through the implementation of the Diversity Charter in Poland. The study enables employers to assess the maturity level of their diversity management practices and the inclusiveness of their organizations, while also helping them identify strengths and areas for development. Each employer, regardless of the result obtained, receives an individual report presenting their position in relation to the average and best scores in the study. Diversity IN Check is conducted on an annual basis (FOB, 2025).

3. Methods

The analysis was based on Diversity IN Check (DINC) reports from the years 2021-2024 and the lists of employers most advanced in diversity and inclusion management in Poland (2021-2025). The report from the 2025 edition was not yet available at the time of writing.

The study conducted as part of this initiative is based on a structured questionnaire. The questionnaire includes five areas (Responsible Business Forum, 2024a):

1. Foundations of management – this area analyzes whether respect for diversity is reflected in the mission, vision, and values of the organization. It examines the existence of separate D&I strategies and policies, their thematic scope, and management methods. It also looks at risk management tools and systems related to anti-discrimination and respect for human rights, as well as the declarations made by organizations. This area includes, among others, verification of whether organizations have anti-discrimination, anti-mobbing, and anti-harassment procedures, whether diversity management is directly reported to the board, and whether there are written goals related to diversity management.
2. Employee engagement – this area focuses on activities aimed at engaging employees in the idea of diversity and inclusion. It checks whether organizations conduct internal surveys on equality and diversity, company values, and inclusive culture building. It also analyzes the involvement of top management and executives in promoting diversity policies, and examines the existence of support networks for various employee groups.
3. DEI programs and initiatives – this area examines specific initiatives and programs implemented by organizations to support diversity and inclusion. It reviews solutions that support work-life balance, including childcare and dependent care options, such as remote work opportunities, flexible working hours, and additional caregiver leave. It also assesses the delivery of training in equal treatment and inclusive culture building.
4. Outcome indicators – this area analyzes how the implemented activities translate into specific indicators related to employment, promotions, and salaries of women and men, employment of persons with disabilities, and foreign nationals. It checks data regarding access to training, job tenure, employee retention, and use of parental leave. It also monitors the representation of women in various positions and their salaries in comparison to men.
5. Products and services – introduced in 2024, this area assesses whether the services and products offered by businesses take diversity into account. It evaluates the accessibility of products and services for marginalized groups, particularly persons with disabilities, neurodivergent individuals, and non-heteronormative individuals. It also analyzes whether products are adapted to various needs, such as sensory preferences.

To answer the research questions P1 and P2, document content analysis and comparative analysis were applied both diachronic (2021-2024) and synchronic (within one year, across different types of organizations). Particular attention was paid to how organizations declare and implement DEI policies in the context of sustainable development strategies and whether such activities are treated as part of corporate social responsibility integrated with ESG goals.

The analytical procedure included the following steps:

1. Identifying organizations included in the analysis in each DINC edition.
2. Analyzing the structure of the questionnaires and the weightings assigned to individual areas (based on information from the reports).
3. Qualitative coding of the report content and organizational declarations regarding the integration of DEI with sustainable development goals.
4. Comparing results over time and across organizations to assess the presence of DEI as an integral component of sustainable development and CSR strategies.
5. Drawing analytical conclusions regarding trend changes and the level of institutionalization of the DEI approach in the organizational sector in Poland.

The variation in the areas and their weightings across different editions of the study was taken into account in the comparative analysis. Detailed information on the share of individual areas in the overall score is presented in Table 1.

Table 1.
Share of Individual Areas in DINC Study across Editions

Year	Management Fundamentals	Building engagement	Programs and Activities	Outcome Indicators	Accessibility of Products and Services (formerly: Products and Services)	COVID 19
2021	29%	28%	43%	Not scored		Not scored
2022	27%	28%	45%	Not scored		Not scored
2023	22%	23%	37%	18%		
2024	19%	20%	33%	17%	11%	
2025	Data not yet published	Data not yet published	Data not yet published	Data not yet published	Data not yet published	

Source: Own elaboration based on: Diversity IN Check: Raport 2021, 2022, 2023 and 2024.

Methodological variability creates certain challenges in comparing results. However, this trend is also justified by the dynamic development of the DEI concept and the need to respond to emerging issues, as was the case in 2021 and 2022, when a separate COVID-19 area appeared in the report.

4. Results

Between 2021 and 2025, a total of 129 unique organizations participated in the Diversity IN Check study. Nine organizations took part in all five editions (2021, 2022, 2023, 2024, 2025), demonstrating the longest and most consistent commitment to the initiative. Ten organizations participated in four out of five editions, which indicates strong and long-term engagement in diversity management, although they may have joined later or skipped one edition. Another ten organizations took part in three editions, and fifteen organizations

participated in two editions. The largest group, comprising as many as 85 organizations, participated in only one edition of the initiative 39 of which joined in the most recent edition (2025), while 46 participated in one of the earlier editions (2021-2024).

On one hand, this dynamic growth in new participants reflects the increasing interest in the Diversity IN Check initiative and growing awareness of the importance of diversity and inclusion management among Polish employers. On the other hand, the relatively high number of organizations 46 that participated only once suggests the need to implement measures aimed at maintaining long-term engagement.

Moreover, some organizations may have treated their participation in Diversity IN Check as a one-time assessment of their DEI maturity or as an opportunity to explore the topic without intending to engage annually. Nevertheless, given the significant increase in participating organizations in 2025, it will be particularly interesting to observe employer behavior in 2026. That will be the moment to determine whether organizations are continuing their commitment or whether their involvement was a one-time effort. The breakdown of organizational engagement is presented in Table 2.

Table 2.

Organizational Engagement in the Diversity IN Check Initiative

Number of Diversity IN Check editions an organization has participated in	Number of employers most advanced in diversity and inclusion management in Poland
5 editions	9
4 editions	10
3 editions	10
2 editions	15
1 edition	85

Source: Own elaboration based on: Diversity IN Check Responsible Business Forum, <https://odpowiedzialnybiznes.pl/diversity-in-check/>, 10.07.2025.

Certain insights into the level of engagement of Polish employers can be drawn from the results in specific areas, as presented in Table 3.

Table 3.

Overall Results of the Diversity IN Check Study

Research Area	2021 (Average %)	2022 (Average %)	2023 (Average %)	2024 (Average %)
Overall Score	60%	65%	68%	64%
Management Fundamentals	63%	71%	74%	71%
Programs and Activities	56%	57%	59%	59%
Building Engagement	62%	73%	69%	66%
Outcome Indicators	N/A	N/A	76%	75%
Products and Services	N/A	N/A	N/A	40%

Source: Own elaboration based on: Diversity IN Check: Raport 2021, 2022, 2023 and 2024.

The overall Diversity IN Check score increased from 60% in 2021 to 68% in 2023, indicating growing maturity in organizations' diversity and inclusion (D&I) management. However, a slight decrease to 64% occurred in 2024, which may be attributed to a larger number of participants and the introduction of a new area: "Products and Services". The "Management

Fundamentals” area steadily grew to 74% in 2023, reaching 71% in 2024, which reflects a high level of formalization of D&I strategies (95-98% of organizations have such documents). The weakest area continues to be “Programs and Activities” (56-59%), indicating an insufficient translation of strategies into concrete initiatives for various groups, including caregivers, migrants, people with disabilities, and LGBT+ individuals. In the “Building Engagement” area, an increase to 73% was observed in 2022, but the indicator dropped to 66% in subsequent years, despite high involvement from executive boards low engagement from middle management remains an issue. Meanwhile, the “Outcome Indicators” area is currently the highest rated (76% in 2023 and 75% in 2024), reflecting the growing importance of measuring and reporting diversity data. The new area “Products and Services” scored only 40% in 2024, highlighting that organizations still take limited account of DEI principles outside the workplace such as in their offerings, communications, or relationships with suppliers.

In attempting to answer the first research question (P1: How and to what extent are DEI policies formally integrated into sustainable development strategies and business goals of Polish organizations?), it should be noted that DEI policies are embedded within the sustainable development strategies of Polish organizations on several levels, indicating their increasing though still incomplete integration.

First, it is important to emphasize that the Diversity IN Check survey is based on international standards and guidelines. These include the UN Sustainable Development Goals (SDGs 5, 8, and 10), ISO 26000 (concerning social responsibility, including human rights and labor practices), GRI standards (on diversity and equal opportunity), the OECD Guidelines for Multinational Enterprises, and ISO 30415 (dedicated to diversity and inclusion). This systematic foundation shows that DEI is treated as part of a broader approach to responsible and sustainable management.

Furthermore, the formal documentation of DEI strategies by organizations in Poland is notable. The vast majority of surveyed organizations have a diversity management strategy and work toward creating an inclusive organizational culture. In the 2021 edition, 96% of organizations had such a strategy 46% in the form of standalone documents and 50% as part of other strategic documents (e.g., codes of ethics, HR policies, CSR or sustainability strategies). Similar results were recorded in subsequent years (96% in 2022, 98% in 2023, 95% in 2024), with a consistent tendency to incorporate DEI into broader strategic documentation.

Next, the connection between DEI objectives and business strategy is worth noting. In 2021, 82% of surveyed organizations included diversity management goals in strategic documents, and in most cases (92%), these goals were aligned with business strategy and subject to monitoring. These figures remained consistently high in following years, with evidence of continued alignment between diversity objectives and the organizations' business strategy (95% in 2022, 83% in 2023, 84% in 2024), underscoring the strategic approach to DEI.

Equally important is the influence on key operational areas. The study analyzed whether respect for diversity is reflected in organizations' mission statements, visions, and values. DEI policies influence key HR processes such as recruitment, remuneration and motivation systems, employee development, and performance evaluations. Organizations clearly declare that their diversity-related activities are aligned with their adopted sustainability strategy.

Creating dedicated positions and teams is also significant. In 2021, 96% of organizations had a separate position, team, or advisory body for diversity management, or these responsibilities were assigned to other departments (e.g., CSR, HR, ethics). Although the percentage of organizations with a separate DEI position/department is lower (30% in 2023, 36% in 2024), the overall assignment of competencies in this area remains high (72% in 2023). In large organizations, the need for a dedicated position or department is emphasized to effectively monitor and communicate the diversity policy.

Turning to the second research question (P2: How do Polish organizations implement specific programs and activities as part of diversity and inclusion management, particularly in supporting groups at risk of exclusion, and what challenges do they face in this process?), it must be noted that the greatest challenge remains the implementation of concrete programs and actions targeted at groups at risk of exclusion.

Although organizations declare the existence of strategies and procedures, the “Programs and Activities” area consistently scores the lowest from 56% in 2021 to 59% in 2023-2024 while other categories exceed 60-70%. The most frequently supported group includes caregivers 85-100% of organizations offer flexible working hours or remote work, and some provide additional paternity leave or subsidies for fathers using parental leave. Nevertheless, support for caregivers of dependent adults and nursery benefits remains marginal.

In the area of disability, as many as 90% of organizations declare workplace accessibility, but the employment rate of people with disabilities remains low (1.4-2%), and accessibility certifications are rare (e.g., 3 organizations out of 77 in 2024). Programs for the LGBT+ community are implemented by approximately 45% of organizations (2024), whereas in 2021, 72% declared no such activities. Age management is more common 85-89% of organizations declare activities in this area, primarily focused on managerial competencies and intergenerational integration. Programs for migrants are still underdeveloped (only 15% in 2021, 60% in 2024), as are initiatives for neurodiverse individuals, although their number is growing (43% of organizations in 2024). Women are covered by numerous developmental and communication initiatives, yet the gender pay gap remains at 85-92%. These data confirm that despite increasing awareness and declarative engagement, actual DEI actions remain selective and unevenly developed depending on the target group.

Polish organizations, despite advancing formalization of diversity and inclusion approaches, still face significant cultural, social, and institutional challenges. Persisting traditional gender roles lead to lower male involvement in caregiving responsibilities, despite the availability of appropriate organizational solutions highlighting deeply rooted perceptions

of women as default caregivers. Difficulties in breaking stereotypes and prejudices are particularly evident in relation to LGBT+ individuals and people with disabilities, limiting the effectiveness of inclusion efforts. A negative public narrative, deepening social divisions, and economic uncertainty present additional barriers to DEI development, especially for smaller entities operating in an unfavorable institutional environment. Moreover, the low level of DEI integration in supply chains and product and service design remains a key area for improvement only 43% of organizations in 2023 and 2024 required suppliers to adhere to diversity standards, and even fewer implemented programs to support diverse suppliers. The new “Products and Services” area, rated the lowest in 2024 among all categories, indicates insufficient inclusion of inclusive perspectives in offered solutions, further confirmed by the lack of internal regulations in 68% of organizations. Therefore, despite growing interest in DEI, the practical implementation of actions targeting the needs of marginalized groups and the integration of these values into operational activities of organizations require further development and systemic support.

5. Discussion

The analysis indicates a growing interest in DEI among Polish organizations, particularly in the formalization of strategies and anti-discrimination policies. In most organizations, diversity management is reflected in internal documents and reported at the executive level. There is also an increasing share of organizations that monitor data disaggregated by gender; at the same time, the analysis of pay disparities remains a key issue (Bierca, Strzelczak, 2023). The representation of women in senior management positions remains limited. The employment rates of people with disabilities and foreign nationals are still low (Responsible Business Forum, 2024a). Practices supporting inclusion and combating stereotypes are implemented unevenly and require further development. Despite clear declarations, organizations face difficulties in implementing actions that translate into real organizational change. Sustainable development and DEI are dynamic and complex concepts reflected in policy, the economy, and society, despite ongoing challenges and differing interpretations. A holistic approach is essential to reconcile often conflicting social, economic, and environmental objectives (Proniewski, Kielczewski, 2023; Horn, 2019).

At the same time, there is growing awareness that DEI is not only an ethical obligation but also a strategic element that supports innovation and competitive advantage. Demographically and socially diverse teams demonstrate greater creativity, which may contribute to market success (Ciuk et al., 2022). Further actions are needed, particularly in the areas of implementation, impact measurement, and inclusion of new dimensions of diversity. DEI should be permanently embedded in the organization's sustainable development strategy.

Despite the existing legal framework and growing awareness, diversity management in Poland remains a significant challenge (Lisowska, 2021). Research shows that progress in this area over the past decade has been unsatisfactory, both in terms of the number of entities declaring openness to diversity and the quality of actions undertaken (Lisowska, 2021).

Among the key barriers hindering the implementation of DEI actions are: lack of stakeholder interest, legal regulations, competitive pressure within the sector, and lack of demand for products or declining profits (Jaźwińska, 2016). In the Polish context, workplace diversity is often reduced in practice to gender and age, while aspects such as race, religion, or nationality are less frequently addressed (Lisowska, 2021). Another problem is the lack of understanding or insufficient integration of the essence of the sustainable development concept within organizational strategies, which can lead to decreased effectiveness and hinder growth (Jaźwińska, 2016).

6. Summary

In successive editions of the Diversity IN Check study, a growing interest in diversity and inclusion management among organizations has been observed, reflected in the systematic increase in the number of participating organizations—from 46 entities in 2021 to 104 in 2025. Despite this positive trend, the participant structure remains dominated by large organizations and signatories of the Diversity Charter, which may indicate limited representation of smaller organizations or those outside formal structures promoting DEI. The most frequently represented sectors are services, trade, transport, banking, the financial and insurance sector, as well as consumer goods and pharmaceuticals, which may suggest greater sensitivity of these sectors to social and reputational issues. An interesting development is the participation of the first two universities in the 2025 edition. While there is observable progress in implementing diversity policies, significant disparities in the level of advancement of DEI activities are also evident. Even among organizations declaring openness and engagement, there remain substantial gaps that require further development and deeper integration of diversity values into organizational strategies.

The findings of the study lead to several recommendations. Of key importance is the stronger linkage of DEI initiatives with measurable organizational outcomes, as well as the development of systems for monitoring their effects. Particular attention should be directed to areas that have so far remained marginalized, such as support for persons with disabilities, the LGBT+ community, migrants, and caregivers of dependent adults. It is also essential to integrate the DEI perspective into product and service design and into supply chains, as well as to strengthen the engagement of middle management.

At the same time, it should be emphasized that the research presented in this article has certain limitations. Relying exclusively on secondary data from DINC reports and the list of the most advanced employers restricts the ability to fully capture practices implemented in smaller and less formalized organizations. The variability of methodologies across successive editions further complicates longitudinal comparisons and calls for caution in interpreting trends. In this context, future research should be expanded to include case studies and qualitative interviews, as well as focus on SMEs and public institutions, in order to better capture the diversity of the Polish market and to identify the factors that foster the effective implementation of DEI strategies.

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PROSOCIAL BEHAVIOR AS A BOND OF INTERPERSONAL RELATIONS AMONG THE YOUNGEST PART MEMBERS OF SOCIETY

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Purpose: The aim of this article is to present the results of a study on the manifestations of prosocial behavior among children aged 1;6 to 3;3 attending a public nursery, in a Polish sample.

Design/methodology/approach: The study was conducted in a state nursery affiliated with the Nursery Complex of the Capital City of Warsaw, using a sample of 33 children (18 girls and 15 boys) and the original diagnostic task "Pain".

Findings: During the "Pain" diagnostic task, involving young children aged 1;6 to 3;3, prosocial behaviors in the form of empathy-driven helping were observed. These behaviors were manifested through giving, bringing, or moving—that is, through specific, observable actions—but also through providing information ("you need to take your medicine") and by attempting to distract. Gradation, or the order in which messages appear in a task, was helpful for the children, providing scaffolding for the learning process. Thanks to this, the children quickly recognized the social situation and knew what to do to help.

Practical implications: The proposed diagnostic task, "Pain", can be used in the process of teaching children prosocial behavior in preschool education, and can also be used in research on prosocial behavior at the youngest segment of society.

Originality/value: The study on the prosocial behavior of children up to 3 years of age conducted in a public nursery (with the participation of these children) is the only known study on a Polish sample.

Keywords: prosocial behavior, helping, empathy, young children, nursery.

Category of the paper: Research paper.

1. Introduction

Facing the endless challenges of today's world, situations that exceed individual capacities, and the search for answers to fundamental questions, attention should be drawn to interpersonal relationships, and particularly to the bond that binds them together—prosocial behavior. These behaviors are manifested through helping, sharing, and comforting others, and can be

observed even among the youngest members of society, children below the age of three (Paulus, 2014, 2018). Although research in this field is rare in Poland, it is becoming particularly important today, as we are receiving reports of acts of aggression by increasingly younger children and against younger children. Prosocial behavior provides a natural counterbalance to these aggressive behaviors (Schaffer, 2006).

While working as a psychologist in a public nursery for nearly 10 years, I frequently observed situations in which children displayed various prosocial behaviors toward peers who were, for example, experiencing strong emotional responses, such as separation from a parent or the loss of a toy snatched from another child's hand, or who were experiencing the low mood characteristic of the initial stages of a physical illness. I often witnessed situations where children, after noticing another child crying, would point the child out to the caregiver, clearly expecting their intervention, or would approach and wipe the tears of a crying friend, trying to comfort them by bringing them a toy, making a cheerful face, or tenderly saying, "Don't cry".

I observed this type of behavior in all age groups, among children from the age of eighteen months to three years old. I also observed the reactions of the caregivers to these early displays of kindness in children. Some noticed these moments and rewarded them with words and gestures, but I also saw adults who passed by indifferently or even stopped children who ran to help, explaining it was for safety reasons.

It appeared to me that the adults' knowledge was insufficient to understand the essence of prosocial behavior and to consciously develop it within natural and structured situations, both at home and in daycare. These observations prompted me to seek and consolidate my knowledge, and subsequently, to conduct scientific research.

2. Literature review

"Prosocial behavior" (Reykowski, 1986) constitutes "the center of human social functioning" (Gupta, Thapliyal, 2015, p. 38). In the literature, the term is often treated interchangeably or combined with concepts such as "altruistic behavior" (e.g., Eisenberg, 1987) or "empathic behavior" (e.g., Hoffman, 2006).

When defining the concept of prosocial behavior, many authors focus on the criterion of selflessness (voluntariness) as a necessary condition for a given behavior to be classified as prosocial (e.g., Comte, 2008; Bar-Tal, 1976). Some authors, however, argue that this is not a necessary condition (e.g., Kenrick et al., 2002). Some researchers also point out that prosocial behavior is susceptible to environmental conditions, which means that a given person may sometimes exhibit prosocial behavior and refrain from it at other times, in various social situations, claiming that "today's altruist may be tomorrow's passive observer" (Latane, Darley, 1969, 1970, as cited in Bierhoff, 2002).

In this article, I follow Hans W. Bierhoff's view of prosocial behaviors in relation to helping and altruistic behaviors as hierarchically nested. According to this author, **prosocial behaviors are actions that benefit another person, regardless of the motivation behind them.** In this approach, the result of prosocial behavior can be, for example, "receiving social approval or reducing one's own suffering when witnessing a crisis involving another person" (egoistically motivated behavior) (Bierhoff, 2002, p. 4).

As the literature review shows, early prosocial behaviors in children do not constitute a homogeneous category and are not interrelated (Paulus, 2018). Longitudinal studies have not confirmed a relationship between early helping and later sharing or comforting (Paulus et al., 2015). This has several consequences. The multidimensional nature of prosocial behavior is increasingly emphasized, drawing attention to its distinct developmental path, the different socio-cognitive abilities required for specific types of behavior, and the motivation that triggers specific behaviors. Situational context is also important (Paulus, 2018).

A study by Audun Dahl (2015) found that children between 11 and 25 months of age were already helping around the house before their first birthday, and by the second year of life, helping became commonplace. Children helped by handing items needed by an adult during meal preparation, turning on the washing machine, or watering plants. Most attempts at help involved encouragement, praise, or thanks from the caregiver (this type of caregiver behavior can encourage children to make further attempts). The author also investigated how children first engage in helping situations and what their parents were doing at that time, and sought to answer these questions in a subsequent study (Dahl, 2017). She found that around their first birthday, children are oriented towards the adult (focusing their attention on him or her), but without offering help yet. Then, the adult encourages them to join in (child attentiveness, adult encouragement). In the second year of life, children become more likely to help even before receiving instructions from the adult. This is illustrated by a situation in which they see an adult watering flowers, for example, and run up to him or her, calling out, "Help?" Interestingly, in Dahl's study, parents thanked younger children more often for their help than they thanked older children, which may indicate that older children already consider their actions to be regular, daily activities for the common good. The author also noted that encouragement and praise increased prosocial behavior in young children, which she believes is related to their age. Her research showed that in a group of 13-14-month-old children, encouragement increased prosocial behavior, while in the case of slightly older children (15-18 months), it had no effect.

Most researchers agree that prosocial behaviors in children flourish in their second year of life. During this time, children are able to infer a great deal about the emotions and needs of others and demonstrate motivation to help those in need (Bischof-Kohler, 1991; Brownell, Carriger, 1990, as cited in Svetlova, Nicholas, Brownell, 2010, p. 1823; Brownell, 2013).

Young children are not indifferent to the sight of others experiencing sadness and melancholy. They usually demonstrate a willingness to offer help or comfort (Zahn-Waxler et al., 1992, as cited in Hay, 2021), although their help is not always tailored to what is actually needed in a given situation. There are also instances when young children react with amusement or physical aggression at the sight of a person in pain (Demetriou, Hay, 2004; Zahn-Waxler et al., 1992 as cited in Hay, 2021). This largely applies to children who know each other or are related to each other (e.g., siblings).

Young children have been documented to exhibit prosocial behavior toward a wide range of suffering individuals, including family and non-family members. They offer help to parents (Zahn-Waxler et al., 1992, as cited by Hay, 2021), siblings (Dunn, Munn, 1986, as cited by Hay, 2021), and peers (Lamb, Zakhireh, 1997; Murphy, 1937, as cited by Hay, 2021). Children who respond positively to a peer's suffering are also able to share their resources with them if so requested (Hay et al., 1999, as cited by Hay, 2021).

An analysis of the literature on the development of prosocial behavior indicates a pattern in the emergence of specific types of prosocial behavior in young children, including instrumental, empathetic, and altruistic help. The first physical signs (cuddling, stroking) appear around the middle of the second year of life, followed by verbal comforting such as "It'll be okay", advice ("Be careful!"), instrumental help (giving a bottle to a crying infant), sharing food with siblings, or distraction. Concern for others, both in the form of an emotional reaction to sadness (empathy) and behavioral attempts to reduce it (altruism), is therefore noticeable at the beginning of the second year of life (Schaffer, 2006).

At the earliest stage, children cooperate in tasks requiring **instrumental** assistance (as early as the second year of life) (Svetlova, Nichols, Brownell, 2010). This is because "the ability to provide help to overcome instrumental needs is based on the ability to interpret goal-directed behavior, distinguish purposeful actions from accidental actions, and correct unintended outcomes of skills, which occurs in children as young as 15 months of age (e.g., Behne, Carpenter, Call, Tomasello, 2005; Csibra, Gergely, Biro, Koos, Brockbank, 1999; Meltzoff, 1995; Woodward, 1998; as cited in Malti et al., 2016). Instrumental help is conditioned by understanding the goal of the action and the willingness to help the adult achieve it (e.g., a child gives an object that the adult cannot reach). It has been documented in experimental situations in children at 12 and 14 months of age (e.g., Liszkowski et al., 2006, Warneken, Tomasello, 2008).

Empathic helping is associated with a response to the distress of others and the intention to alleviate their pain (Zahn-Waxler, Radke-Yarrow, 1992). This form of helping is much more complex than instrumental helping. Besides the intention to help, the child must also manage their own emotional state, a much more demanding skill. This type of helping is believed to emerge between 18 and 24 months of age, when a child's social understanding, self-awareness, and emotions become more developed.

Altruistic helping appears last in the development of prosocial behavior and involves the child consciously giving up their own resources for the benefit of someone in need. This kind of help requires children to bear some costs, as they may find it difficult to part with an item or give up a favorite game. Research suggests that even young children are sometimes capable of doing so (Svetlova, Nicholas, Brownell, 2010).

3. Method and sample

The aim of the study was to enrich the knowledge about the prosocial behavior of young children aged 1;6 to 3;3 based on the results of the diagnostic task "Pain" conducted in a way that took into account the degree of gradation of messages and the type of actor to whom help¹ was directed.

The research was conducted at Public Nursery No. 49, part of the Warsaw City Nursery Complex. A total of 33 children (18 girls and 15 boys) participated in the study. The research lasted six months and followed a six-month pilot study. The entire process was recorded using a camera.

Using the knowledge about children acquired from interviews with parents, document analysis, and own notes, the following children were selected to participate in the study: born at full-term; healthy; without any diagnosed disabilities; not in the process of making any specialist diagnosis, as well as those children who had successfully completed the adaptation process (they felt safe in the nursery, ate meals, fell asleep and slept peacefully, played individually and joined in with other children), and those children who usually came to the nursery willingly, and whose farewells to their parents were warm and not very long.

In order to collect empirical data, the method of **diagnostic tasks** was used - introduced into the methodology of psychological and pedagogical research by Jean Piaget, and used together with Jean Piaget by Alina Szemińska (Piaget, Szemińska, 1941), used in Polish scientific research (Tyszkowa, Czepajtis, 1968), and popularized by Edyta Gruszczyk-Kolczyńska and Ewa Zielińska (e.g. *Children with specific difficulties in learning mathematics. Causes, diagnosis, corrective and compensatory classes* (1997). Warsaw: WSiP; *Teachers' diagnosis of children's mathematical education. Methods, interpretations, conclusions* (2013). Nowa Era, etc.).

¹ The presented study results are part of the collected research material that formed the core of the doctoral dissertation entitled: "Exploring and shaping prosocial behaviors in young children", prepared under the supervision of dr hab., prof. APS Agnieszka Olechowska and defended at the Maria Grzegorzewska University in December 2024.

Diagnostic tasks, therefore, involve situations in which an adult presents a child with a problem and then observes how the child solves it. During diagnostic tasks, the researcher observes the children's functioning, analyzes it and then draws conclusions about the researcher's topic of interest.

The diagnostic task method "can be used in assessments organized for one child as well as in assessments involving a group of children" (see Gruszczyk-Kolczyńska, Zielińska, 2013, pp. 25-120). In the presented research, the diagnostic task method was used in groups of children differentiated by age: the youngest (from 1;6 to 2;1), older (from 2;1 to 2;9), and the oldest (from 2;7 to 3;3). During the research, children belonging to individual groups participated in diagnostic tasks carried out in subgroups (1-, 2-, 3-, and 5-person groups plus the researcher).

Each diagnostic task was structured according to a fixed plan:

1. Bringing the children to the room where the space and props for the assessment were prepared and initiating contact through shared play (e.g., stacking blocks).
2. Establishing contact with the children, describing the space and the situation, and providing the children participating in the diagnostic task with a first-level message – informing them of the need to provide assistance to a given actor.
3. If necessary (no response to the first-level message), providing the children with a second-level message.
4. If necessary (no response to the second-level message), providing the children with a third-level message.
5. Concluding the diagnostic task (playing with blocks, thanking the children, escorting the children to their homerooms and caregivers, and saying goodbye to the children).

The message addressed to children could be categorized into three levels:

M – "Message" (first level).

MH – "Message naming the Help needed" (second level).

MHM – "Message naming the Help needed and the Method of providing it" (third level).

Addressing a message of a given level to children determined the **phases** of the diagnostic task:

Phase I – M message.

Phase II – MH message.

Phase III – MHM message.

Depending on the variant (type of actor to be helped), the messages took the following forms:

M – Variant I (help should be provided to a toy) "The teddy bear has a headache".
Variant II (help should be provided to an adult) "I have a headache".

MH – Variant I (help should be provided to a toy) "The teddy bear has a headache. The teddy bear needs medicine." Variant II (help should be provided to an adult) "I have a headache. I need medicine".

MHM – Variant I (help should be provided to a toy) "The teddy bear has a headache. The teddy bear needs medicine. Here it is, please pass it." Variant II (help should be provided to an adult) "I have a headache. I need medicine. Here it is, please pass it".

The "Pain" diagnostic task required blocks, a teddy bear (toy), syrup, and a spoon. Each diagnostic task could therefore be shorter or longer, depending on which message was followed by the children's expected action. When none of the children demonstrated helpful action, the researcher modeled the problem solution and demonstrated to the children how it should be solved. After completing the diagnostic task, the researcher thanked the children, sometimes played with the blocks for a while, and then escorted the children to the room where the other children and their caregivers were.

4. Results

The presentation of research data will include tabular summaries:

- for a given type of diagnostic task ("Pain"),
- completed first in Variant I and then in Variant II,
- in subsequent research groups and subgroups.

A tabular summary was chosen due to the accumulation ("density") of data, one task, three age groups, and four research subgroups within each group, three levels of communication, and two actors. The tabular summary allows for more detailed analysis of:

1. After communication, at which level (in which phase) did the **first prosocial behavior** occur:
 - in a given type of diagnostic task ("Pain"),
 - in a given Variant (I – with a toy, II – with an adult),
 - in a given research group (N, S, SN),
 - in a given subgroup of a specific research group (I, II, III, IV).
2. **How many children** exhibited prosocial behavior in a given group/subgroup and throughout the entire task?
3. **From which subgroups** were the children recruited who exhibited prosocial behavior?
4. **What types of prosocial behavior** did the children demonstrate (giving, informing, pointing out, or attempting to comfort).

Table 1.*Prosocial behavior of children from the youngest group in the "Pain" research tasks*

DIAGNOSTIC TASK „PAIN”			
GROUP N – the youngest			
Phase	Subgroup	Variant I – with a toy	Variant II – with an adult
M	I	1 information	1 bringing and giving before the message
	II	0	0
	III	0	0
	IV	0	1 bringing and giving
MH	I		
	II	0	0
	III	1 information	0
	IV	0	
MHM	I		
	II	0	0
	III		1 bringing and giving
	IV	2 bringing and giving	
The total number of children		4	3

Legend:

0, 1, 2 ... – number of children who behaved in a prosocial way.

– the  diagnostic task was completed in the earlier phases.

Text in the table row – a manifestation of prosocial behavior.

Source: own work.

As illustrated by the data in Table 1, in the youngest research group (N), a comparable number of children responded in a prosocial way in both Variant I (with a toy) and Variant II (with an adult) during the "Pain" research task. However, in the second variant (with an adult), a child from the same first subgroup (subgroup I always consisted of the researcher and one child) responded in a prosocial way in the adult variant after completing the task in the toy variant, before the researcher had finished uttering the message.

In Variant II, subgroup IV, the children completed the task in the first phase (prosocial behavior occurred after hearing the first-level message), whereas in Variant I, this only happened after hearing the third-level message (the last level in the three-level gradation of messages).

Table 2.*Prosocial behavior of children from the older group in the "Pain" research tasks*

DIAGNOSTIC TASK „PAIN”			
GROUP S – older			
Phase	Subgroup	Variant I – with a toy	Variant II – with an adult
M	I	0	1 information before the message
	II	0	0
	III	0	1 bringing and giving
	IV	0	2 bringing and giving
MH	I	0	
	II	0	1 trying to distract from the pain
	III	0	
	IV	0	

Cont. table 2.

MHM	I	1 bringing and giving	
	II	0	
	III	1 bringing and giving	
	IV	2 bringing and giving	
The total number of children		4	5

Legend:

0, 1, 2 ... – number of children who behaved in a prosocial way.

– the  diagnostic task was completed in the earlier phases.

Text in the table row – a manifestation of prosocial behavior.

Source: own work.

Based on the analysis of the empirical data presented in Table 2, it is very clear how effectively children can learn during the diagnostic tasks. In Variant I (with a toy), the first prosocial behaviors appeared only in the final phase of the task (after hearing the third-level message) and occurred in three of the four subgroups. This means that despite the increasingly specific messages provided, none of the children in Subgroup II took action to provide help. Meanwhile, in Variant II, prosocial behavior appeared in Subgroup II, and at the second (not the last) level of the message gradation. However, the greatest difference can be observed among the children in Subgroups I, III, and IV, as in Variant I, they did not react in a prosocial way in either the first or second phase of the task. In Variant II, I observed as many as four prosocial behaviors in all the subgroups mentioned, including one before the researcher even delivered the first-level message.

Table 3.

Prosocial behavior of children from the oldest group in the "Pain" research tasks

DIAGNOSTIC TASK „PAIN”			
GROUP NS – the oldest			
Phase	Subgroup	Variant I – with a toy	Variant II – with an adult
M	I	0	0
	II	0	0
	III	0	0
	IV	0	0
MH	I	0	0
	II	1 pointing	0
	III	0	1 bringing and giving
	IV	1 bringing and giving	1 bringing and giving
MHM	I	1 bringing and giving	1 bringing and giving
	II		1 bringing and giving
	III	0	
	IV		
The total number of children		3	4

Legend:

0, 1, 2 ... – number of children who behaved in a prosocial way.

– the  diagnostic task was completed in the earlier phases.

Text in the table row – a manifestation of prosocial behavior.

Source: own work.

None of the children from the eldest group responded to the first-order message in either the first or second task variant. The first prosocial behaviors in this group occurred after the children heard the second-order message (the same number of children responded in task variants I and II). Prosocial behaviors also occurred after the researcher delivered the third-order message, including the observation of prosocial behavior by a child in subgroup I in both task variants I and II. In the first task variant, one subgroup (III) completed the task without any prosocial behavior from any of the children in that subgroup.

5. Discussion

During the "Pain" diagnostic task, involving young children aged 1;6 to 3;3, prosocial behaviors characterized by empathic helping were observed. These behaviors manifested in various ways. Not only in the most obvious ways, such as giving, bringing, or pushing—that is, through specific, observable actions—but also, as Tomasello (2016) pointed out in his research, through providing information ("you need to take your medicine"), and, as observed in my own research, through attempts to distract. In this case, it involved an adult experiencing pain, to whom Mikołaj (2;3), from the second subgroup of older children, said: "Don't be afraid. Build! Build!".

Considering the number of children who exhibited prosocial behavior in the diagnostic task, the number of children providing help in Variant I (toy) and Variant II (adult) is similar in most cases. However, when comparing the gradation of the message followed by these behaviors, it is clear that in Variant II, children reacted faster, and sometimes even before the adult's message (in two cases). This means they don't need much to accurately interpret the social situation and rush to help, offering what is required (this is clearly visible in the group of older children).

As for the occurrence of prosocial behaviors even before the message given by the researcher, research conducted by Warneken and Tomasello showed that children from post-infant age helped an adult (each child in at least one of the tasks) almost immediately after the need arose, often even before the adult looked at the object, and even more so before he or she verbalized his or her difficulty (the authors state that "84% of the helping acts occurred in the initial 10-second phase", Warneken, Tomasello, 2006).

It's worth noting that in the largest of the subgroups, subgroup IV (5 participants), there were two prosocial leaders, children who stood up and helped, both in Variant I of the teddy bear (toy) task and Variant II with an adult. This is an interesting result, demonstrating that children are not indifferent to displays of pain when in a group. Responsibility is not shared, and children do not wait for the one next to them who is also watching. They stand up and take

action; everyone wants to be first, everyone wants to help. This is the opposite of the pattern observed among adult participants in social situations (Le Bon, 1930).

The gradation (order) of the messages (M, MH, MHM) delivered by the adult (the researcher) on behalf of both the toy and herself was helpful, as it served as a scaffolding that allowed the child to use the gradual prompting to perceive and recognize the signaled need, and then to understand and take action to solve the problem (provide help in an appropriate manner).

Prosocial behavior was evident both in situations when the task was conducted with one child and when the children were together in a group.

Another interesting observation was that the children who decided to help were keenly interested in whether their help had the desired effect, asking if the medication had helped. All the children responded positively to thanks, usually smiling, and some, encouraged by the praise, wanted to repeat the action.

After repeatedly playing the recorded scenes and observing the children's behavior, it could be observed that in tasks where the children's toy "needed" help, a larger number of children behaved with more confidence than in tasks where it was the adult who needed help. This may be because children perceive an adult as independent, strong, and less likely to need help than a smaller, defenseless teddy bear. Furthermore, the behavior of adults may also play a role. Even in nurseries (e.g., out of haste, fear of getting the child's clothes dirty or damaged, but also a lack of confidence in the child's abilities) the adults often say things like, "No, I'll do it", "Sit down. That's what auntie is for". While working at the nursery where the research was conducted, an increasing emphasis on children's safety in a broad sense could be noticed. Everyday situations in which children are allowed to help and cooperate are gradually being eliminated. When I asked caregivers if they felt they were preventing children from acting, I was told that safety was paramount, and that children would still have time to learn the skill. However, many children in nursery settings demonstrate an incredible readiness to learn helpful behaviors. Later in a child's development, there will be time to learn other important skills, but many nursery caregivers don't perceive it this way.

The occurrence of prosocial behaviors in children at this age has been described by various authors (Brownell (2011, 2013, 2016), Svetlova, Nicholas, and Brownell (2010), Dunfield and Kuhlmeier (2013), Dahl (2015, 2017) and in a series of studies by the team led by Tomasello (2016). What distinguishes my research from the research plans carried out by the above-mentioned authors is the fact that my research took place in the peer environment in a nursery, i.e., in an institution that constitutes a specific, Bronfenbrenner-style microsystem in which the child is "nested" every day for a period of several years, and which is still perceived primarily as a place of typical childcare.

Analyzing the research results showed that when comparing the behavior of children in variant I of the diagnostic tasks (with a toy) with the behavior in variant II (with an adult), it can be clearly stated that the speed of the emergence of prosocial behaviors appeared in

relation to the level of communication which preceded it and the number of children who exhibited these actions. It was important that the tasks were conducted in two variants, one after the other, because **this contributed to an increase in the number of children who engaged in prosocial behaviors** thanks to the opportunity to gain experience and through the ongoing learning process.

Meanwhile, the manifestations of prosocial behavior observed during the designed diagnostic task indicate that they can serve as guidelines for activities that **stimulate the development of prosocial behavior in young children**. Furthermore, this task can be conducted in a nursery, contributing to the development of these skills in children in a group setting, in a collaborative manner, leveraging learning not only from adults (parents/guardians) but primarily from their peers.

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THE ETHICS OF ROOTEDNESS AS A NEW ETHICAL-ECOLOGICAL PARADIGM

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Purpose: The purpose of the article is to question the dominant paradigm of sustainable development as an insufficient response to the ecological crisis and to propose an alternative ethical concept – the ethics of rootedness. The text argues that authentic transformation of the human-nature relationship requires not only a change in practices, but also a reconfiguration of the ontological and cultural foundations of this relationship.

Design/methodology/approach: The article is theoretical and conceptual in nature. It is based on a comparative analysis of contemporary approaches to relational ecology (Haraway, Stengers, Wheeler) and on a reflection on the historical and epistemological transformations of the human-nature relationship – especially those associated with the shift to sedentary life, agriculture, and accumulation (e.g. Scott, Wengrow). The author integrates posthumanist perspectives, a critique of modernity, and local ecological knowledge to outline a new ethical-ecological model.

Findings: The article demonstrates that contemporary relational concepts, despite their innovativeness, remain embedded in academic discourse and do not lead to real changes in everyday life practices. In response, the ethics of rootedness is proposed – an approach based on local knowledge, care for specific forms of life, and ontological embeddedness in place. It is a culturally resonant, practical, and at the same time philosophically grounded proposal.

Originality/value: The article offers a new ethical proposal that combines posthumanist inspirations with the practice of everyday action. The ethics of rootedness goes beyond academic and ideological frameworks, proposing a local, inclusive, and ontologically grounded model of coexistence with the natural world. The text may be valuable for scholars in philosophy, environmental ethics, and practical ecology, as well as for all those interested in the cultural foundations of ecological transformation.

Keywords: relational ecology, ethics of rootedness, vernacular ecological ethics, sustainable development critique, posthumanist ethics, place-based ecological practice.

Category of the paper: Conceptual paper.

1. Introduction

Ecological ethics, instead of fulfilling a critical function, increasingly serves to legitimize the status quo – reinforcing dominant patterns of human-nature relations rather than challenging them. Many transformational models and ethical proposals are rooted in the logic of human interests – especially those of a human shaped by urbanized environments and a consumer-driven economy. This article attempts to go beyond this paradigm by formulating the concept of the ethics of rootedness – an approach grounded in local, affective, and material relations between humans and their natural surroundings¹. In order to properly situate this idea theoretically, it will be presented in relation to what may be called an ontology of kinship – a mode of thinking that emerges within the framework of the new relational ontology and finds expression, among others, in Donna Haraway's concept of "making kin" (2016). In this approach, kinship does not mean shared DNA or genealogy, but rather ethical and relational ties that constitute both the subject and their environment (Haraway, 2016; cf. Stengers, 2005).

2. Rejection of the Sustainable Development Paradigm

The idea of sustainable development has grown into the dominant paradigm in thinking about the relationship between humans and nature – both as a symbolic framework of imagination and as a pragmatic formula for action (Bali Swain, 2017; Mansfield, 2009). Within its bounds, environmental policies are constructed, so-called "best ecological practices" are defined, and the limits of acceptable interference with the non-human world are established. Despite its widespread popularity, this concept has not led to a deep ethical or mental transformation. What has changed is the language – marketing, institutional, and media-driven – but not the underlying foundations of the human-world relationship. Green capitalism, although wrapped in ecological slogans, does not mark the end of the exploitation of natural resources, but rather their continued instrumentalization and commercialization (Foster, 2002; Kovel, 2007).

¹ The concept of the "ethics of rootedness" emerges from the author's experience of gardening practice and life in close contact with nature, with a particular attachment to the Podhale region and daily rootedness in Kraków and its surroundings. It was in the context of an urban eco-garden, at the intersection of natural and urbanized environments, that the idea of the "ethics of rootedness" was born. Genuine closeness to nature and the local ecosystem serves as a philosophical inspiration, linking the dimension of everyday experience of the environment with reflection on the universal aspects of ecological ethics.

As a result, we are witnessing the aestheticization of nature – for example, “ecological” flowerbeds (cultivars alien to native flora) instead of wild meadows; spectacular but empty gestures (insect hotels placed in ecologically dead zones); and standardized slogans (“for future generations”, “for the good of the planet”) that ultimately conceal the preservation of the economic status quo. From a critical perspective, sustainable development does not challenge exploitation – it optimizes it (O’Neill, 2001; Mansfield, 2009).

The ongoing loss of biodiversity is not merely an ecological crisis – it is a symptom of a civilizational crisis. There is an urgent need to ask: How should we think about nature today? What kind of risk are we willing to take to genuinely protect it? What normative ethics should we develop in order to break with the logic of exploitation? Answers to these questions emerge, at least partially, from the perspective of relational ecological theories, which redefine the ontology of human-nature relations and point to the necessity of a fundamental paradigm shift (Kovel, 2007; Gorz, 1979; Foster, 2002).

3. Relational Concepts in Ecology

3.1. Donna Haraway and the Philosophy of Kinship

Contemporary philosophy – particularly within posthumanist and relational currents – offers compelling proposals for redefining the relationship between humans and nature. One of the most influential figures is Donna Haraway, whose thought significantly destabilizes the classical oppositions of modernist thinking (nature/culture, subject/object), opening space for an ontology of interdependence and for practices rooted in everyday life. In her book *Staying with the Trouble* (2016), Haraway argues for the necessity of practicing a way of life she calls “staying with the trouble” – a mode of living in tension, ambiguity, and in the constant interdependent entanglement of humans, animals, plants, soil, and technologies, without retreating into easy solutions. Her concept of *sympoiesis* – “making with” – proposes that being is not an autonomous process but a multi-species co-creation, opposing the idea of a self-sustaining subject (Haraway, 2016, pp. 55, 101). In parallel, she develops the notion of *multispecies storytelling*, which emphasizes the role of multi-species narrative as an ethical and creative medium for building community with other forms of life. This is not a narrative *about* nature, but a narrative *with* nature – one in which ethical and political values manifest through shared stories (Haraway, 2016, p. 12). The philosophy of relation does not formulate abstract norms; rather, it proposes a life lived with the ethics of coexistence: practices of *making kin*, stories that connect beings and places, and actions rooted in everyday co-being. In this way, Haraway redefines ethics: it is no longer a set of rules, but emerges as a way of life-rooted, local, and entangled.

3.2. Isabelle Stengers: Gaia as Intruder

Isabelle Stengers, drawing on the processual thought of Alfred North Whitehead, proposes an understanding of ecology as a politics of care, attentiveness, and sensitivity. Her reinterpretation of Gaia in *In Catastrophic Times* (2015) emphasizes that nature is not a passive backdrop but a force that cannot be domesticated by human cognitive, technological, or engineering systems. Gaia – whom Stengers names an “intruder” – functions as an *assemblage of forces* independent of our projects and expectations, introducing an element of unpredictability (Stengers, 2015a, p. 47; Clarke, 2017, p. 14).

Stengers firmly rejects universalism and what she calls the “solution imperative” (*le chantage à la solution*) – the reduction of thinking to management and optimization – and instead proposes an approach grounded in learning through situated, local practices: living relationships with place, and coexistence with Gaia’s force. Ecological transformation, in her view, will not occur until we abandon the ambition of domination and recognize ourselves as one among many actors co-creating the world (Stengers, 2015b).

3.3. Wendy Wheeler and the World as a System of Signs

Wendy Wheeler, as a biosemiotician², brings a unique perspective: the living world consists not only of networks of material dependencies but also of systems of meaning. Organisms – including plants, insects, and microorganisms – possess the subjectivity of semiosis: they are senders, receivers, and interpreters of signs. In Wheeler’s view, nature is not a resource but a living text – layered, situated, and local (Wheeler, 2006, 2016).

In the biosemiotic vision of ethics, life *is* communication: all biological processes are both conveyed and interpreted. The ethical message emerges not from the question of what humans do *to* nature, but from what nature communicates – what in its forms is growing and alive. All moral, cognitive, and ontological relations are embedded in the living world and depend on its internal interconnectedness. Morality does not concern human relations alone. On the contrary, it is *biorelativity* – life as a network of mutual relationships and interdependencies – that becomes the foundation of moral thought. A plant, an insect, a bacterium – these are not passive objects, but semio-active actors in the world (Beever, Hendlin, Tønnessen, 2015).

² Biosemiotics is an interdisciplinary approach, developed since the 1960s, that interprets life as a communicative and semiotic process – from the cellular level to interspecies relations (Sebeok, 1976; Hoffmeyer, 1996; Kull, 2001). Biosemioticians do not claim that living organisms act intentionally, but that they process signs: they respond to signals, modify behavior depending on the environment, and transmit information – chemically, behaviorally, or morphologically.

3.4. A Shared Message: Processuality, Relationality, Narrativity

The modern era was grounded in an epistemology of an ordered, classifiable world, in which the human stood as the central subject and nature functioned as a passive resource. Haraway, Stengers, and Wheeler – each in her own way – dismantle these foundations. These thinkers advocate for a processual, relational, semiotic, multispecies, and non-anthropocentric mode of thinking. Their visions shift the ecological transformation debate beyond the boundaries of classical ethical models (deontology, utilitarianism), redirecting it toward categories such as interdependence, affectivity, narrativity, locality, and the practice of everyday dwelling – as opposed to abstract principles and uncertain political declarations. This type of reflection constitutes the foundation of a new ethical paradigm, in which ecological transformation becomes a practice of dwelling, listening, and learning. It is no longer merely a moral or political obligation; it is a form of everyday activity.

4. The Ethics of Rootedness: Moving Beyond Academic Discourse

The reflections of these thinkers introduce important shifts in ecological thought. At the same time, they remain deeply embedded in the academic tradition and the language of high-level theorization. Concepts such as *multispecies storytelling* (Haraway), *cosmopolitics* (Stengers), or *biosemiotics* (Wheeler), while intellectually profound, are often difficult to apply in local practices and remain inaccessible to audiences outside academic circles. If ecological ethics is to genuinely influence the transformation of life, it must be communicated in more accessible ways. Paradoxically, it must also reach deeper – into the ontological roots of violence against nature. Haraway, Stengers, and Wheeler – each using a different theoretical language – identify in modernity a crisis in the human-nature relationship. They describe it as a consequence of the loss of our capacity to think in relational, complex, and embodied terms. This is a kind of shortsightedness. The instrumental treatment of nature, although intensified by modernity, has its roots deeper than Cartesian thought or the transformations of the Enlightenment. It reaches back to the agrarian revolution, when humans abandoned a nomadic way of life and began subordinating fire, earth, water, species, and life cycles to their will (Scott, 2017; Wengrow, Graeber, 2021).

4.1. The Concept of the Ethics of Rootedness

The concept of the ethics of rootedness calls for a reflective engagement with all (recognized) moments in which nature ceases to be a partner and becomes a resource or servant. From the history of humankind, we must extract instances of instrumentalization and the intensification of ecological destruction – name them, examine them, and seek to understand

why they occurred. For example, in the Middle Ages, nature and animals were exploited – albeit differently than in modern times (less mechanized, less systemic). Animals and plants occupied lower positions in the *scala naturae* – the great chain of being – and were expected to serve human purposes. Their existence had meaning only insofar as it fulfilled human spiritual or material needs. Forests were cleared, wetlands drained, animals treated as instruments³. There were occasional prohibitions against cruelty to animals (e.g., during religious festivals), and certain folk rituals signaled a kind of respect for the forces of nature. Yet such gestures did not stem from concern for the well-being of nature itself, but rather from the religious-magical order of the world.

The ethics of rootedness does not propose a return to the sacralization of nature (as in some Indigenous cultures), nor does it invoke magic or metaphysics. Its foundation is scientific and practical knowledge, combined with local memory: familiarity with native species, ecological processes, soil and life forms – knowledge given through joy, emotion, community, and the experience of nature. This approach requires no abstract justifications; it draws meaning from place and community. It is strengthened by contemporary ecological science and oriented toward action. Everyday gestures – planting native species, abandoning lawns, creating wetland or insect zones in gardens and parks – are not aesthetic trends but forms of local ecological patriotism. This is not about restoring some idealized version of nature, but about renewing broken relationships: soil-amphibians-insects-memory of a place that once was different. It is an ontological reversal – not a correction of modernity: the human ceases to be the master of nature and becomes a co-creator of life. Belonging to a place – to its water, air, micro-worlds, and history – means remaining in a kin relationship, one that arises from scientific knowledge (particularly evolutionary theory), not from metaphysics.

The ethics of rootedness draws inspiration from the concept of kinship, understood as a conscious entanglement with what is wild, unpredictable, and fallen – with leaves, fungi, bacteria, and dead matter. In the spirit of *chthonic kin*, it is about being *with* the earth, not with an abstract idea of “nature” – a relationship that demands responsibility and the stance of “staying with the trouble” (Haraway, 2016, p. 103). At the same time, the ethics of rootedness goes beyond this vision and its hermetic language, adding to it a conscious, local gesture: action in one’s proximate surroundings. This is a real transformation – quiet, consistent, pragmatic – carried out in gardens, parks, and forests. It is not a spectacular theory or ideology, but rather an activity that gives nature its rightful place. It is an ethics that cares for the well-being of nature – not its aesthetic. It says “no” to planting “pretty” but alien species. It says “no” to the importation of exotic animals kept in captivity – while caring for the possibility that local animals might find their place and be accepted in the realities of the present.

³ White Jr. (1967) argues that medieval Christianity – particularly its Western form – established the human as the master of nature, which laid the foundation for modern environmental exploitation. This thesis has been nuanced (Berry, 1988) and historically expanded (Merchant, 1980/2019).

5. Novelty, Originality, and Overcoming the One-Sidedness of Contemporary Paradigms (Further Considerations)

The ethics of rootedness constitutes a new proposal within the field of ecological ethics. Its aim is to overcome the one-sidedness of dominant approaches: sustainable development – focused on efficiency and the rhetoric of the future – and relational ethics, developed within posthumanist feminist thought, which emphasizes ontology of relations at the expense of practical criteria for action. The current condition of the environment is the result of both centuries-long natural transformations and human activity. Therefore, a profound understanding of the past of ecosystems becomes a prerequisite for diagnosing contemporary problems and forecasting the consequences of human actions. The ethics of rootedness emphasizes that nature conservation cannot be designed solely with reference to the future – as is the case in the discourse of sustainable development – but must be grounded in knowledge of the history of nature and its protection. History is not determined exclusively by humans and their interests; processes independent of human activity remain equally significant.

In the reflections of Donna Haraway, Isabelle Stengers, and Wendy Wheeler, a pronounced thread of critique of modernity's legacy is present. Similar to Carolyn Merchant in her classic work *The Death of Nature* (1980/2019), they argue that the scientific revolution and the Cartesian–modernist nature–culture dualism laid the foundations for the contemporary exploitation of nature. In their view, the ecological crisis stems from the epistemology and ontology of modernity – from the rationalist, anthropocentric subject who separated the human from other beings and objectified nature. The ethics of rootedness adopts a different perspective: it calls for the examination of all possible historical moments in which humans gradually turned away from nature. The aim is to reconstruct the processes through which the instrumentalization of nature became a taken-for-granted reality – even though it had not always been so in the past. Only by identifying these historical turning points can we understand why today the exploitation of nature appears as a “natural” mode of action. In this sense, the ethics of rootedness opens up a unique research program: rather than attributing blame to a single epoch, it reveals the complex genealogy of humanity's estrangement from the natural world.

The ethics of rootedness distances itself from the hermetic and poetic language characteristic of some strands of posthumanist reflection. Its premise is communicative normativity, grounded in a language accessible to a wider audience and rooted in local names of species, places, and practices. Understood in this way, language – alongside history, geography, and politics – becomes a tool of nature conservation, facilitating decisions concerning specific plants, animals, and landscapes in Poland. It is crucial to maintain binary distinctions (native-alien, local-invasive, wild-utilitarian) as indispensable instruments of protection. Approaches that programmatically blur these categories fail to provide sufficient decision-making criteria in conservation policies and practices (cf. Braidotti, 2013/2022, p. 12).

Practical distinctions – such as “healthy-poisonous”, “wet-dry”, or “local-global” – are not relics of the past but conditions of effective protection and precise communication.

The ethics of rootedness combines sensitivity to local practices with the rigor of nature conservation. Unlike standard models of community-based management or co-management (cf. Berkes, 2018), the ethics of rootedness allows for zones of impersonal protection, where the priority is not the utility of resources for communities but rather the ecological balance and the need for the regeneration of endangered species. This approach is more stringent than traditional community-based resource management (CBRM)⁴, as it presupposes the necessity of leaving certain areas free from use pressure. In this sense, the ethics of rootedness defends the value of ecosystem self-regulation, pointing to the need to maintain strict protection wherever the well-being of particular species (e.g., the Eurasian lynx, golden eagle, or Eurasian eagle-owl) requires it.

The proposal of the “ethics of rootedness” is a normative and ontological project that combines the rigor of nature conservation with local practices and language, while renouncing metaphysical justifications in favor of scientific knowledge and practices embedded in the Polish context. This concept introduces a new form of ecological conservatism – capable of overcoming political polarization and presenting nature conservation as a common good, independent of the left/right divide. In Polish public debate, ecological issues are often framed in terms of threats to sovereignty and national interests, as evidenced by discursive strategies toward the European Green Deal (Dulak, Kułakowska, 2024). The ethics of rootedness may serve as a counterweight to politicized narratives, highlighting local species, language, and landscapes as a shared foundation of care – beyond ideological divisions.

In summary, the ethics of rootedness introduces novelty on several levels. First, it does not limit itself to the future or to the “guilt of modernity,” but reconstructs various historical moments of humanity’s turning away from nature in order to explain the process of the growing instrumentalization of the natural world. Second, it preserves binary distinctions (native-alien, local-invasive) as indispensable tools of practical conservation – something largely absent in relational approaches. Third, it introduces a stringent demand for zones of “impersonal” protection, along with a communicative language rooted in local names and landscapes. In this way, it advances a new form of ecological conservatism, capable of overcoming political polarization and presenting nature conservation as a common good.

⁴ CBRM – community-based resource management, a system of managing natural resources in which the local community plays a key role; its aim is the sustainable use of resources through participation and co-decision-making (Berkes, 2018, pp. 163-185).

6. Conclusion

The currently dominant discourse of sustainable development – combining technocratic environmental management with the rhetoric of intergenerational responsibility – does not challenge the exploitative nature of the human – nature relationship; rather, it optimizes it. In the face of accelerating biodiversity loss and a global ecological crisis, what is needed is not only a change in social practices, but also a transformation of the ontological and ethical foundations of how we think about the world.

Inspired by the relational concepts of Donna Haraway (2016), Isabelle Stengers (2015a, 2015b), and Wendy Wheeler (2006, 2016), this article proposes the ethics of rootedness as a way to move beyond the limits of academic discourse and respond to the need for a deep, grounded transformation. In contrast to abstract ethical models, the ethics of rootedness is based on everyday practices of coexistence: knowledge of local ecosystems, care for specific life forms, and the continuation of relationships with place. This kind of ethics does not require linguistic sophistication. It draws on the traditions of native flora and fauna. It can be deepened through scientific tools – plant and animal lexicons, ecological classifications – but it doesn't have to be; the “ordinary” person knows that the nettle is a native plant. Here lies the paradox: the nettle is not as beautiful as *Buddleja davidii* (a plant native to China and Tibet), but it truly supports the existence of butterflies.

The essence of the ethics of rootedness is not the restoration of some idealized vision of nature. Its aim is the renewal of relationships – with the soil, with species, with local biological history. It is an existential, ethical, and even political act. The ethics of rootedness disrupts the simplistic message of contemporary politics, which tends to frame environmental protection as a left-wing idea. On the contrary, rootedness affirms an ecological conservatism: a care for the persistence of what is old, local, and life-giving. It does not require complex theory – only a garden without a lawn, a home for insects, and everyday knowledge of what is local and alive. This concept proposes a new ethical – ecological model – one that can be both philosophically grounded and accessible to everyday practice: beyond academia, beyond metaphysics, in defense of what is shared and rooted *here and now*.

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WHEN DOES TRAINING HAVE A MOTIVATIONAL FUNCTION? ANALYSIS OF INNOVATIVE TRAINING METHODS

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Purpose: The primary objective of this paper is to characterize key innovative training methodologies that exert the greatest influence on employee motivation for continuous development of both soft and hard competencies.

Design/methodology/approach: The analysis is further supported by qualitative data obtained through interviews with professionally active full-time and part-time students.

Findings: Based on the responses collected, a ranking of innovative training methods with motivational potential was established, accompanied by a detailed characterization of each method. Among the most highly valued methods identified by respondents were coaching, case study analysis, and hybrid training models. Additional methods recognized for their effectiveness included the use of virtual reality (VR)-based training, gamification techniques, and role-playing scenarios.

Research limitations/implications: It should be noted, however, that the study presents certain limitations. First, the research is exploratory in nature, constituting a pilot study; second, it was conducted among participants with relatively limited professional experience who may, as a result, display a somewhat subjective approach to the matter of training. Future research is intended to expand the scope through large-scale quantitative studies involving employees with greater job tenure, with a focus on exploring the multifaceted dimensions of training and development practices.

Practical implications: The training techniques identified in this study may serve as practical guidance for managerial staff in determining which learning interventions to implement when designing an organizational training strategy.

Originality/value: Identification of training methods that play the most significant motivational role in employee development.

Keywords: Training programs, training strategy, coaching, case study method, hybrid training.

Category of the paper: Literature review/ Research paper.

1. Introduction

Contemporary organizations build their strategies upon the knowledge, experience, and engagement of their workforce. So-called knowledge workers are increasingly recognized as the most valuable asset and a critical factor in achieving a sustainable competitive advantage. Consequently, in order to continuously enhance their competencies, organizations implement a variety of innovative courses and workshops tailored to individual developmental needs. These initiatives reflect the organization's learning philosophy- that is, the importance it places on employee training and development (Armstrong, 2003). It is worth noting that „to successfully navigate the complexities of innovation, companies are increasingly adopting novel technologies that facilitate the optimization of processes, stimulation of creativity, and facilitation of growth” (Kuzior et al., 2023, p. 280).

From the perspective of a learning organization, „training and employee development are understood as the creation of conditions and the initiation of a learning process through which individuals acquire new knowledge and enhance the skills and competencies necessary to perform effectively in their current and future roles. Simultaneously, this process contributes to the continuous improvement of the organization itself” (Woźniak, Kozioł, 2012, p. 182). „Training refers to bridging the gap between the current performance and the standard desired performance” (Elnaga, Imran, 2013, p. 139). As emphasized by J. Marciniak, effective innovation in training requires adherence to the following core assumptions (Marciniak, 1999):

- Comprehensiveness, understood here as ensuring training accessibility for all employee groups.
- Systemic approach, based on active collaboration between company representatives and employees in the design and implementation of training programs that crucially align with both organizational needs and employee expectations.
- Goal alignment, which involves incorporating the company's mission, organizational culture, and long-term development plans into the training strategy.
- Flexibility, which assumes that training planning and implementation should remain responsive to ongoing changes and emerging trends in methods and techniques aimed at enhancing employee skills and qualifications.

Therefore, the primary objective of this study is to identify and characterize key innovative training methods that have the greatest impact on employee motivation for continuous professional development. Given the wide spectrum of such methods, the selection was based on interviews conducted with both full-time and part-time students who possess professional experience. These respondents identified the training approaches they consider most significant in terms of motivating them to pursue career growth accompanied by a rationale for their choice. The research sample consisted of 60 individuals. Based on the responses given by the

participants during the group interviews, (which have been categorized), a ranking of innovative and simultaneously motivational training methods was developed.

The following section presents an overview of the most frequently mentioned methods.

2. Coaching

One of the most innovative and, at the same time, widely adopted training methods is coaching. It was the most frequently mentioned approach among respondents. Participants emphasized that, when facilitated effectively, coaching has the capacity to unlock individual potential and serves as a long-term source of inspiration for pursuing ambitious organizational goals.

Such opinions are fully justified, as coaching is widely recognized by experts as one of the most dynamic and rapidly evolving tools for personal and professional development (Świątek, 2017).

Polish organizations are increasingly recognizing the value of coaching as a strategic tool for developing their key employees. However, the effective implementation of coaching practices requires the establishment of an appropriate organizational culture- one in which employees are open, collaborative, and willing to share knowledge (Tokar, 2015). According to J. Ober, „one may attempt to formulate a universal framework of organizational culture that would serve as the foundation for a more universalistic model of management” (Ober, 2022, p. 94).

The subject literature offers numerous attempts to define and conceptualize the notion of coaching. As noted by E. Parsloe i M. Wray „it is a process through which knowledge acquisition and personal growth become possible, ultimately leading to the enhancement of skills” (Parsloe, Wray, 2008, p. 49). Coaching is also „an educational philosophy dedicated to supporting learners’ personal and professional development and growth and supporting them to reach their potential” (Atkinson et al., 2022, p. 441). It should raise participants’ awareness of their own expectations and learning needs (Parkes, p. 114).

Both individual and group coaching utilize specific techniques that enable the implementation of the outlined priorities. In summary, it is worth emphasizing that coaching offers a wide range of benefits. Among the most notable are (Dźwigoł- Barosz, 2017):

- Targeted on-the-job training, allowing employees to acquire specific competencies while performing their professional duties.
- Learning through practice, as coaching is embedded in the workplace environment.
- Recognition as one of the most effective methods of employee development.
- Relatively low implementation costs compared to other training methods.
- Improved employee productivity.

- Increased promotion opportunities for employees following coaching sessions.
- Reduced risk of losing top talent.
- Support in achieving both organizational and individual career goals.
- High effectiveness in addressing challenges arising from macroeconomic changes.

It is important to emphasize that the success of the entire training process largely depends on the coach, or facilitator. Although the coach is typically an experienced practitioner in a given field, they are not intended to serve as a role model, nor should they exercise formal authority. The coach's primary role is to draw on their professional experience to support the employee in diagnosing performance-related challenges and conducting an analysis aimed at resolving the identified problems. The effectiveness of this developmental approach depends not so much on the coach's technical expertise, but rather on their interpersonal competencies—particularly communication skills and the ability to build trust (Woźniak, 2012).

Therefore, in order to implement coaching effectively within an organization, it is necessary to employ highly qualified specialists with extensive experience and an appropriate approach toward the training participants.

3. Case study method

Another training method indicated by the respondents— one that motivates them not only to acquire new knowledge but, more importantly, to engage in creative action for the benefit of the organization is the case study method. Their view is consistent with the opinions of experts in this area, who also emphasize its positive impact on motivation.

In such analysis, "various difficulties and challenges are identified, along with their causes and sources, as well as potential corrective actions. Moreover, the process involves actively seeking effective solutions" (Lis, 2015, p. 57). In other words, this method involves a group of participants analyzing a case that presents a specific organizational problem. Its foundation is a concise account of an event, typically presented in written form (not exceeding one typewritten page), as an audio recording, or in the form of a video clip (Pacana, 2017). It is important to emphasize that the case description should not include all relevant information upfront. Following the introduction, presentation of the topic, clarification of the session's objectives, and familiarization with the case narrative, participants enter the information-gathering phase. A key principle of this method is withholding complete data initially, while responding precisely and selectively to the questions posed by participants (Pacana, 2017). After the problem scenario has been presented, participants engage in analysis and discussion to determine: alternative and potentially optimal solutions, preventive measures that should be implemented to avoid recurrence of the issue, and appropriate courses of action in the event of encountering a similar situation in the future (Pacana, 2017).

For the method to serve as an effective training tool, it must be emphasized that “the preparatory activities leading to the development of finalized educational products (business case studies) involve a series of procedural tasks related to data collection and information processing. The construction of such case studies requires not only alignment with instructional objectives (tailoring the content to the learners' needs), but also the implementation of appropriate information management systems throughout the preparation phase” (Zięba, Ziółkowski, 2015, p. 56). Moreover, “the activities aimed at developing a formalized method (procedure) for acquiring information for business case studies involve several steps that appear to be typical across all types of such studies. This implies the necessity of designing general (generic) frameworks that facilitate the construction and delivery of case studies within educational environments, addressing the training needs of various learner groups (including, among others, students and business professionals)” (Zięba, Ziółkowski, 2015, p. 56).

4. Hybrid training

Hybrid training programs were recognized by the students as a significant group of innovative learning methods. According to P. Głowicki i G. Łasiński „there is no single ideal method of instruction- the response to contemporary demands in knowledge acquisition lies in the attempt to combine traditional training programs with e-learning formats. Blended learning can thus be considered a new category of education, rather than merely a new mode of delivery” (Głowicki, Łasiński, 2009, p. 264). In the view of M. Gęborska, while the incorporation of emerging technologies into educational practice is unavoidable, the complete elimination of traditional instructional methods in favor of exclusively technology-based learning remains highly unlikely (Gęborska, 2012). „In common usage, the term e-learning refers either to remote education delivered via the Internet, or more broadly, to any form of instruction supported by information and communication technologies, not necessarily requiring an Internet connection (through the use of open educational resources” (Gęborska, 2012, p. 10). The vast majority of e-learning platform users still perceive distance education as a supplement to traditional forms of instruction- typically aimed at enhancing and reinforcing the content delivered during face-to-face sessions (Gęborska, 2012).

An essential aspect is the organizational readiness for the implementation of hybrid learning. The implementation framework of this system was compellingly addressed by P. Głowicki. He divided the entire implementation process into four main stages. The first stage is based on a comprehensive analysis of educational needs, technological capabilities, infrastructure development potential, and potential risks associated with the implementation (Głowicki, 2009). The second stage involves the design of the system. This is considered the most complex phase, as it requires careful planning and technical expertise. The development

of e-learning courses at this stage may involve the use of advanced authoring tools and digital learning platforms (Głowicki, 2009). The third stage involves the implementation of the system, which includes a pilot course, a pilot project, and the deployment of the hybrid learning system. The fourth and final stage is the evaluation and adjustment of the system. This process should be conducted on a quarterly basis or following the completion of individual training projects (Głowicki, 2009). Although this form of development can prove highly effective, it is nonetheless associated with several risks, such as employee resistance to training due to limited technological proficiency, as well as cognitive overload resulting from excessive information exposure.

Consequently, as noted by N. Rupic, “it is therefore a great challenge to create a digital learning experience that uses multimedia in a balanced way so that it is stimulating but not overwhelming, engaging but not frustrating and challenging but not overly complex. The right choice of multimedia has a positive effect on learners’ attitudes toward learning and the material presented, but it can also stimulate their reasoning, critical thinking and memory. It is important to arouse learners’ curiosity for new content but also to emphasize the most important learning points” (Rupic, 2024, p. 282).

5. Training programs incorporating Virtual Reality (VR)

When analyzing the statements of the surveyed students, particular attention should be paid to training programs that utilize virtual reality (VR). This form of training was highlighted for its significant educational and motivational value, primarily due to its ability to simulate real working conditions for a specific job role. Virtual Reality „is a technology that enables users to immerse themselves in a simulated, interactive environment. Using dedicated VR headsets, learners can see, hear, and experience a digitally created world as though they were physically present within it. This immersive quality makes VR a powerful tool for experiential learning, allowing organizations to utilize it for a variety of educational and developmental purposes” (Nagrabski, 2023, pp. 463-464). It is worth emphasizing that „an immersive environment allows learners to be totally immersed in a self-contained artificial or simulated environment while experiencing it as real. Immersive environments can offer learners rich and complex content-based learning while also helping learners hone their technical, creative, and problem-solving skills. Because immersive environments are so rich and visual, users tend to be highly engaged. There are several types of immersive environments: virtual worlds, web-based video games, massively multiplayer online games, multiuser virtual environments, simulations, augmented reality” (Velev, Zlateva, 2017, p. 35).

The application of virtual reality (VR) technologies appears to be particularly advantageous in training scenarios where real-life implementation involves a significant risk to human health or safety. Consequently, VR-based training programs are most commonly utilized in high-risk sectors such as medicine (virtual surgeries), nuclear energy (reducing workers' exposure to ionizing radiation), and mining (Grabowski, 2012).

An innovative application of the discussed training methods is their implementation in the field of Occupational Health and Safety (OHS). The use of Virtual Reality (VR) technology for training employees in safety and hygiene protocols has a demonstrably positive impact on workplace safety. This technology enables the creation of immersive virtual environments in which employees can be trained safely and effectively in response procedures to potential hazards specific to their occupational setting (Szóstak, Napiórkowski, 2023).

6. Gamification

Another technique highlighted by the respondents, valued not only for its educational benefit but also for its motivational impact, was gamification. It is regarded as “a modern tool that employs game mechanics to engage users in the completion of specific tasks. The foundation of gamification lies in the use of positive reinforcement-such as points and rewards- that encourages individuals to undertake and complete challenging activities” (Misztal, 2015, p. 102). An illustrative example of this approach may be the incorporation of a board game-style quiz into a training session. Participants, divided into small groups, engage in the game by advancing through spaces on the board. At each step, they are required to complete tasks associated with a specific field- primarily answering questions related to the knowledge conveyed during the training session (Woźniak, 2015).

It is worth emphasizing that „from the perspective of mechanisms activated by gamification, the benefits derived from engagement in gameplay outweigh the potential drawbacks of reduced opportunities to repeatedly review content with each move made by the participant” (Woźniak, 2015, p. 20). Moreover, through the application of game-based mechanisms, the employer is able to identify the employee's strengths demonstrated during gameplay and strategically align them with the individual's professional development within the organization (Czerska, 2017). Moreover, gamification can serve as an effective method of professional development by fostering experiential learning, self-improvement, and growth through interpersonal collaboration and cooperation. It also presents a valuable solution for learning organizations, where employees' tacit knowledge is codified and effectively leveraged in the implementation of innovative social projects (Winnicka-Wejs, 2015).

K. Filarski and A. Włodarczyk highlight additional benefits derived from the application of this method, such as (Filarski, Włodarczyk, 2014):

- Transferring development from the training room to the workplace- gamification integrates training activities into a cohesive framework, enabling learning to occur in real work contexts rather than isolated classroom settings.
- Introducing elements of fun and excitement into the training process- this increases the likelihood that the tools and techniques acquired during training will be applied in everyday work scenarios and internalized as habitual behaviors.
- Providing continuous feedback- training participants receive ongoing information about changes in their behavior and have the opportunity to compare their own actions with those of other participants, fostering self-awareness and encouraging improvement.

Considering the above aspects, it can be unequivocally stated that gamification constitutes a highly attractive form of training effectively motivating employees to engage in the comprehensive development of both hard competencies (including domain-specific knowledge) and soft skills (such as communication and broadly understood teamwork within employee groups). An essential condition for the effective implementation of this method within an organization is the selection of a game that reflects organizational realities.

7. Role-playing

The final technique highlighted by the respondents was role-playing. This method is primarily associated with the development of soft skills, such as interpersonal communication, empathy and teamwork. Given that the possession of such competencies is increasingly valued by modern employers, employees are demonstrating a growing willingness to engage in these types of training programs.

Role-playing involves both the training participant and the facilitator assuming specific roles (employer and employee) to simulate real-life workplace interactions. The primary objective of this method is to demonstrate appropriate behavioral responses to situational challenges. Errors made during these simulations are reframed as valuable experiential learning opportunities, contributing to the participant's professional growth. This instructional approach familiarizes employees with difficult or high-pressure scenarios and provides a safe environment for exploring alternative courses of action (Pawlak, 2003). Moreover, this technique focuses on enhancing cognitive empathy, understood as the ability to recognize, comprehend, and take into account another person's perspective (Bandach, 2013) or it also facilitates knowledge transfer and renewal (Kołodziejczyk-Olczak, 2015).

Conclusions

„Many researchers agree that education and skills will be a key factor in increasing competitiveness, and one of the most important preconditions for achieving this goal is quality lifelong education” (Kuzior et al., 2023, p. 2).

Contemporary managers are increasingly seeking answers to the question of which training methods to select in order to meet employee expectations and foster continuous development of their competencies. In order to develop an effective training strategy, the first essential step is to identify the specific training needs of the workforce (Belina, 2017) (using structured questionnaires). Subsequently, it is essential to select training programs that align with the expectations and professional profiles of the workforce. As demonstrated by the aforementioned analysis, a wide range of diverse instructional methods is available, each offering comprehensive opportunities for high-level skill development. The respondents expressed the highest appreciation for coaching, case study analysis, as well as hybrid training. Training formats incorporating virtual reality, gamification, and role-playing were also highly valued. These methods ensure a high level of interaction among participants, thereby facilitating effective knowledge acquisition. Naturally, the success of the entire training process hinges on the trainer, who must be capable of inspiring participants to engage actively in the course while emphasizing the practical application of acquired knowledge in the workplace.

Given that the subject addressed in this study is highly relevant, it is planned to conduct future research (this time quantitative) on a much broader scale, among employees with longer work experience, with particular attention devoted to the diverse aspects of training.

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POLISH SEAPORTS AND INNOVATION

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Purpose: The aim of this article was to show the significant impact of innovation on the competitiveness of seaports.

Design/methodology/approach: The main research method used was the analysis of professional literature, both domestic and foreign.

Findings: The significant impact of innovation on the competitiveness of seaports was demonstrated. It showed that in recent years, seaports have undergone significant transformation, utilizing modern technologies and adapting to changing supply chains in the age of globalization.

Originality/value: This article highlights current innovations implemented in Polish seaports. It also provides a basis for further research and analysis of the impact of various innovations on building the competitive advantage of individual seaports.

Keywords: innovations, transport infrastructure, seaport, modern technologies, digitalization.

Category of the paper: Literature review, General review.

1. Introduction

Modern seaports are no longer merely physical locations where goods and passengers are transshipped, but are becoming modern and technologically advanced logistics systems. Modern ports combine transport, warehousing, information, and industrial elements. Recent years have seen a noticeable increase in competitiveness among ports located in the Baltic Sea region, and innovation is becoming a key element in building a competitive advantage. Polish seaports located in the Baltic Sea region compete with ports in Germany and Russia, among others. This competitive advantage not only allows the seaport to acquire new customers but also provides the opportunity to maintain business relationships with existing contractors. A seaport is not only a business entity but also a crucial element for the economic functioning of a country. In the current geopolitical situation, seaports also play a significant role in military matters.

2. Innovation and competitiveness of modern seaports

In the twenty-first century, alongside competitiveness, innovation is a crucial element. These two concepts are closely related. However, the literature offers varying definitions of the terms competitiveness and innovation. Because a business entity must implement innovations to be competitive in today's market, it must also be innovative. Simultaneously, implementing various types of innovations leads to an increase in its competitiveness. Therefore, it is difficult to separate innovation from competitiveness. This principle also applies to seaports.

The determinants of business innovation can be divided into two groups. The first are external conditions, and the second are internal factors. External conditions are institutional in nature and concern processes and phenomena that influence the global environment in which a given business entity operates. The external determinants of innovative activity depend on factors such as the functioning of markets, the degree of openness of the national economy, technological advancement, and membership in various international groupings or organizations. Internal factors influencing a given business's innovation performance are those stemming from its internal resources. These include economic, technological, human, and organizational factors. Depending on the business's resources in these internal factors, innovation activities can be shaped. In other words, an entity with the appropriate resources of these factors is able to create innovations, implement them, and build its competitiveness.

Various models of innovation creation within a company can be found in the literature. Among them are Roy Rothwell and Walter Zegveld's interactive model of "innovation creation" and the recently gaining popularity of the open innovation model. Roy Rothwell and Walter Zegveld's interactive model emphasizes that, in order to create innovations, a company should prioritize research and development (R&D), marketing, and production and service areas (Rothwell, Zegveld, 1985). In the open model, however, significant importance is placed on ensuring the flow of innovation between market entities. The idea is for an economic entity that has developed an innovation to share this idea with others, even competitors. This would enable faster knowledge dissemination and more effective use of ideas that have already been developed (Zorska, 2009). This type of approach would also reduce the costs associated with innovation activities, as it would not be necessary to develop similar or identical solutions in another economic entity. Therefore, acquiring knowledge about innovation and research results from outside is crucial (Oniszczyk-Jastrzabek, 2013).

According to scientific literature, innovation should be one of the key elements of the modern economy and the entities operating within it. This is because innovative entities increase their competitiveness and simultaneously contribute to the economic development of the region and the entire country. This, in turn, provides opportunities for building prosperity and civilizational progress.

Based on the literature on the subject, four basic types of innovation can be distinguished. Product, process, organizational, and marketing innovations (Oslo Manual, 2005). Innovations implemented in economic entities are, in turn, a derivative of trends emerging in the global economy. These trends, in turn, are linked to technological progress, social and political processes, and institutional influence. Therefore, innovation and innovativeness are processes deeply embedded in the environment in which the entity implementing the innovation operates.

3. Innovation trends

Currently, global innovation trends include: satellite applications, big data, clean technologies, the collaborative economy, smart factories, the Internet of Things, servitization, advanced materials, and sustainable raw material supply (Szymanowska, Dąbrowski, Klimek 2024).

Satellite applications, as tools based on technologies developed by the space industry, enable the improvement of numerous processes, including those related to logistics, supervision, and data transfer. They enable the introduction of innovative solutions in many sectors of the economy, including seaports, where issues related to the movement of goods and their proper security are particularly important. They enable, among other things, the control of devices used within the port and the monitoring of the entire logistics chain between the port and the customer. Satellite applications are associated with Industry 4.0, a new stage of the industrial revolution.

Another element related to innovation processes is big data. This concept refers to large data sets that require advanced IT technologies for their processing. Currently, the use of artificial intelligence in analytical processes based on big data is gaining importance. Artificial intelligence enables faster and more precise analysis of large data sets and the presentation of specific relationships, which enable optimal decision-making. Big data sets offer enormous analytical and predictive capabilities, but due to the enormous amount of data obtained from various sources, it is necessary to constantly develop IT tools that allow for the proper analysis of such large data sets. Big data comes from cameras, antennas, microphones, mobile devices, readers, wireless sensors, and other types of devices. Without the use of modern computer systems, analyzing such a large data set would be impossible.

Another element related to innovation is clean technologies, also known as low-emission technologies. Implementing low-emission solutions can result in reduced negative environmental impact or improved energy efficiency. Currently, low-emission trends are gaining popularity. On the one hand, applicable regulations mandate the use of technological solutions that reduce harmful emissions into the environment. On the other hand, these actions are, in a sense, forced upon them by potential contractors, who, when choosing a product or

service, often consider the manufacturer's approach to low-emissions. The situation is no different in seaports, where potential contractors are increasingly paying attention to how the port and entities operating within the broader port entity impact the natural environment. It's worth emphasizing that low-emissions can be divided into several areas. First, there are issues related to the use of renewable resources (e.g., energy from photovoltaic panels, wind turbines, or biofuels). Another area involves recycling and the management of used products and waste generated by seaport operations (e.g., the disposal of used machinery and equipment, which can be a source of valuable raw materials). Another element is the use of fuels. It is of significant importance for the operation of a seaport and the ships it serves. This includes both low-emission fuels (LNG) and renewable fuels (hydrogen). Furthermore, electrification, broadly defined, contributes to reducing emissions generated by a seaport. This refers to the replacement of combustion engines with electric motors (e.g., in machinery and equipment used within the port to transport goods and people). The use of heating, ventilation, and air conditioning systems characterized by low energy consumption and high energy efficiency is also crucial. All these activities contribute to building a positive image of the business entity in the eyes of stakeholders, and this is related to corporate social responsibility (CSR) policies (Szymanowska, Dąbrowski, Klimek, 2024).

Another important trend related to innovation among contemporary businesses is the collaborative economy. It should be emphasized that this trend is distinct from the sharing economy. The sharing economy is a subset of the collaborative economy, which is a broader concept. The collaborative economy involves engaging potential or current consumers in the production or service process. The goal is to engage recipients of a given good or service in the production process and incorporate their comments, expectations, preferences, ideas, and suggestions so that the final product or service better meets the expectations of future buyers. This concept is relatively new, having originated in the first decade of the 21st century. The collaborative economy also aims to build a bond between the producer/service provider and the future customer, creating a bond based on trust and cooperation (Jastrzębska, Legutko-Kous, 2017).

Another important trend related to innovation is the phenomenon known as smart factories. These facilities are almost entirely autonomous in terms of their operations. Such entities, which significantly utilize modern ICT tools, robotics, and intelligent technologies, are able to significantly reduce operating costs, significantly optimize processes within the facility, and contribute to increased efficiency. This approach opens up new opportunities, not only for factories, understood as manufacturing sites for specific products, but also for businesses whose functions include extensive logistics. Seaports are an example of such an entity, which must adequately utilize their transshipment, transport, and warehousing capabilities. The use of modern tools allows for increased efficiency and effectiveness and an improved position in an aggressive market. Furthermore, better utilization of available resources, including energy, contributes to reducing harmful emissions into the environment. The use of modern tools and

modern applications allows for better coordination of the entire logistics process within a seaport. This allows for shorter loading and unloading times and more efficient use of available cargo space. The development of modern technology and increasing digitization are providing new opportunities for creating increasingly better and more technologically advanced systems that can be used in complex logistics processes.

Another important innovation-related issue is the Internet of Things. The Internet of Things allows for the wireless (e.g., WiFi, Bluetooth, or NFC) or wired connection of various types of objects, thus creating a specific network. This network can include both large objects such as machines, devices, and means of transport, as well as small elements such as employee identification cards, RFID tags, thermometers, humidity sensors, cameras, mobile phones, and computers. The use of modern technologies allows for the collection and processing of data, which enables more efficient and easier management of individual logistics, organizational, and control processes. However, the use of the Internet of Things in seaports also enables the appropriate security of specific goods, monitoring of port space, more efficient communication with contractors, and better forecasting of emerging trends in the logistics industry. The Internet of Things is inextricably linked to the concepts of big data and blockchain (Malucha 2018).

Another emerging trend in the innovation landscape is servitization, also known as the digitalization of service services. It involves expanding existing services with a set of additional benefits that can be implemented through the use of modern communication channels. The internet, of course, plays a significant role in the digitalization of service services. It allows for the development of new opportunities for interaction between service providers and recipients. The digitalization of service services also plays a significant role in the operation of seaports, as it allows for the expansion of existing service offerings with modern and more convenient solutions. It enables better management of the entire logistics process between service users and service providers, i.e., the seaport. The servitization phenomenon is related to the concept of the servitization of the economy. The servitization of the economy refers to the concept of a three-sector economic structure, where the service sector is gaining importance, while the agricultural and industrial sectors are losing importance (Szymańska, 2015). While the concept of servitization of the economy is not new, the concept of digitalization of service services is a phenomenon that has been developing significantly recently, and this development is made possible by the development of the internet. The digitalization of service services offers new opportunities for building a competitive advantage for businesses. By creating appropriate and customer-friendly digital tools (e.g., applications or websites), it not only allows for the acquisition of new markets but also enables the creation of a secure bond between service providers and customers, which is crucial in today's economy.

Another important trend related to innovation is the use of advanced materials. This applies both to materials used in the construction of a broadly defined seaport and those used in vessels operated by seaports. The use of appropriate materials for the construction and equipment of

a seaport reduces carbon dioxide emissions, contributes to better thermal insulation, improves the durability of buildings and machinery, and reduces operating costs. The use of modern materials allows for weight reduction without compromising strength and durability. An example of such a material is carbon fiber, which is increasingly used in various types of machinery and equipment. Modern materials characterized by high levels of tightness, strength, and plasticity are also gaining importance, and are used in the production of various types of tanks and installations for the storage and transport of chemical substances with very small structures. Hydrogen is an example of such a chemical. At the same time, considering the development of hydrogen technologies and plans to use hydrogen as an energy fuel, seaports must be prepared to store this type of fuel. Health-related issues must also be considered. Using appropriate materials with antibacterial properties in the construction of railings and balustrades, for example, helps reduce the spread of harmful bacteria and germs.

Another trend emerging today within the innovative approach is the sustainable supply of raw materials, which is related to the circular economy. The circular economy aims to reduce the generation of waste that pollutes the natural environment by using it as a source of raw materials. The circular economy, therefore, involves reusing resources, thus reducing the generation of new waste or pollution. This approach is intended to contribute to sustainable development and reduce the negative impact of economic processes on the planet (Szczech-Pietkiewicz, Czerniak, 2024). A sustainable supply of raw materials, based on a circular economy, also offers the opportunity to achieve greater freedom and independence in the sourcing of raw materials, especially those considered critical. A greater emphasis on recycling allows for the reduction of imports of certain raw materials from countries and regions that do not guarantee stable and continuous supply. In this way, seaports can also build a strong and independent position in the global market, as they are less dependent on unreliable supplies. At the same time, by adopting a circular economy, they build a positive image of their operations in the eyes of potential and current contractors. This approach can be considered corporate social responsibility (CSR), which also translates into strengthening their position in a competitive market as an entity that cares not only about economic aspects but also those related to environmental protection.

4. Generations of seaports

Several classifications of seaport generations can be found in the literature. It should be emphasized that the divisions into individual generations of seaports are not sufficiently clear-cut, and it is sometimes difficult to assess and classify a given port into a specific generation of seaports. Available classifications of seaport generations are changing due to evolving

information technology and the rapid development of technology (Kaliszewski, 2017). Below is a classification of seaport generations covering six generations.

First-generation ports are classic conventional ports that perform a transport function by typically handling bulk cargo, usually in the form of one-off and simple transport operations. Fulfilling the transport function requires providing the port with appropriate structures and tools that allow for the handling of cargo and passenger transport (Kuźma, Szczepaniak). These ports were characteristic until the 1960s. Despite the generational development of seaports over the years, ports that can still be classified as first-generation ports operate in certain regions of the world. Due to the low cargo flows experienced in certain regions of the world, ports of this generation do not necessarily have to be considered obsolete or redundant. They continue to function and fulfill their essential role. First-generation ports include yacht harbors and fishing ports.

Second-generation ports were developed between the 1960s and 1980s. This was a time when seaports had to adapt to the rapid growth of maritime trade. One of the challenges seaports faced was the introduction of standardized containers for the transport of goods. The introduction of containers for the transport of various types of goods significantly improved and accelerated the entire logistics process related to loading and unloading. Furthermore, the use of standardized containers made it easier to transport them using various means of transport. The introduction of containers into the logistics process was a monumental change in the world of transport (Bartosiewicz, 2013). Second-generation ports were also called industrial ports. This name was associated with the fact that industrial areas were located within port areas or in their immediate vicinity. This provided industrial entities with easy access to the port and transport services. The industrial development of ports necessitated further investment in the transport infrastructure located within the port area and in increasing the transshipment capacity of the ports themselves. The process of port industrialization also resulted in the expansion of port facilities. This, in turn, meant that ports increasingly influenced the development of cities located nearby. Second-generation ports began to be perceived as important transport hubs, supporting not only maritime transport but also road, river, rail, and sometimes even air transport (Grzelakowski, Matczak, 2012).

Third-generation ports began to emerge in the early 1980s. These ports were characterized by extensive logistics capabilities and a steady increase in the volume of cargo handled. These ports became a crucial element of the logistics chain, and through their efficiency and effectiveness, they influenced the functioning of the entire extended supply chain. Third-generation ports continued to develop until roughly the end of the 20th century. It is also worth emphasizing that third-generation ports were no longer characterized by the rapid development of industrial functions as was the case with second-generation ports. This stemmed from difficulties in acquiring new land located near seaports for further industrial investments. In this way, third-generation ports are becoming a crucial element of developing

logistics systems. In turn, the industrial and transport functions are being increasingly emphasized towards the transport (transshipment) aspect (Christowa, 2005).

Fourth-generation ports are ports that originated at the turn of the 20th and 21st centuries. The dynamic development of technology, the advancement of digitalization, and increasing globalization have enabled the creation of fourth-generation ports. These ports are characterized by very high transshipment efficiency, which is associated with the use of modern technological and IT solutions (Paixao, Marlow, 2003). Fourth-generation ports are also referred to as network ports, as they constitute a significant element of an extensive chain of global logistics connections (logistics network). Furthermore, these ports are characterized by high-quality sustainable development management and the use of innovation and modern technologies. Terms such as Economy 4.0 and Logistics 4.0 are associated with fourth-generation ports. A fourth-generation port is a transshipment hub of supra-regional importance.

Fifth-generation ports are characterized by the use of cutting-edge technological solutions and a commitment to environmental protection. They also place a strong emphasis on customer satisfaction and building long-term business relationships. Fifth-generation ports have the capacity to handle the largest vessels, and through the use of advanced transshipment, transport, and IT systems, this process is efficient and effective. Currently, these are the highest and newest generation of seaports.

Sixth-generation ports. Scientific literature also refers to sixth-generation ports. This category refers to ports of the future, which will be possible after implementing cutting-edge technical and IT solutions. These ports will be characterized by a high degree of autonomy through the implementation of modern ICT solutions. In such a port, the process of transshipment and transport of goods will be largely automated. This will enable even more efficient and effective transshipment and transport operations within the seaport. The use of modern solutions will also reduce operating costs and contribute to better environmental protection. Artificial intelligence holds significant potential for the development of sixth-generation ports.

5. Examples of innovations used in Polish seaports

5.1. OPS System

The OPS (Onshore Power Supply) system provides power to ships moored at the port quay from land. This solution allows ships in port to turn off their onboard generators and use power supplied from the quay. This means that ships in port do not emit harmful substances resulting from the combustion of fuels needed to power the generators, and at the same time, they do not emit noise. This approach allows for better environmental protection and creates more friendly

conditions for both port employees and ship passengers. The OPS solution has already been implemented at the ports of Gdynia and Świnoujście. Documentation is currently being prepared to introduce this system at the port of Gdańsk. This innovative solution will improve the quality of services offered at Polish seaports and contribute to their increased international competitiveness (Gospodarkamorska.pl).

5.2. Sea area landing

A third deepwater terminal has been opened at the Port of Gdańsk, which can handle the largest container ships. This investment increased the transshipment capacity of the Port of Gdańsk and facilitated the handling of the largest cargo vessels. The construction of "artificial peninsulas" in the Baltic Sea created additional storage areas, while the new section of the outer port, extending into the Baltic Sea, created new coastlines. This investment strengthened the Port of Gdańsk's position among European cargo ports. Furthermore, modern cranes were installed at the newly opened container terminal, allowing for the loading and unloading of the largest container ships (Portgdańsk.pl).

5.3. Expansion of road and rail infrastructure at the Port of Gdańsk

Investments in road and rail infrastructure were carried out at the Port of Gdańsk to improve access to the transshipment terminals. The expansion and modernization of this infrastructure facilitated the transport of goods to, from, and within the port. Increased road and rail capacity allows for the transport of larger volumes of goods while maintaining appropriate safety and comfort requirements by reducing traffic congestion. The expansion of the rail network at the Port of Gdańsk has allowed for smoother freight train traffic and increased capacity, thus facilitating the easier delivery of goods to the port via rail. Furthermore, a railway siding was built within the port, allowing for easier loading and unloading of trains served there. This solution is significant because it allows for greater use of rail for freight transport, which is considered one of the most environmentally friendly modes of transport after water. Thanks to this investment, the Port of Gdańsk gains new transshipment capabilities and becomes more environmentally friendly (baltichub.com).

5.4. eBrama system

The eBrama system is a modern IT system implemented at the Baltic Hub container port. It enables faster and more efficient management of the logistics process at the Baltic Hub container terminal. The system consists of a mobile application installed on the mobile phone of the truck driver transporting container cargo, as well as RFID tags affixed to the truck's windows. Upon entering the container terminal, the truck driver receives information via the application about the specific location of the terminal where the truck should park. After positioning the truck in the designated spot, the driver confirms this via the application.

An automated crane then drives to the designated point and, using RFID tags located on the truck's cabin, identifies the vehicle and begins the container loading or unloading process. The eBrama system allows for more efficient and effective transshipment management, positively impacting the competitiveness and efficiency of the Port of Gdańsk. This is an example of innovation that leverages modern ICT technologies (baltichub.com).

5.5. Szczecin-Świnoujście fairway deepening

In 2022, the investment involving the deepening of the fairway connecting the ports of Szczecin and Świnoujście (approximately 62 km of the route) was completed. As a result of the completed work, the depth of the new deepened fairway is 12.5 m, allowing for a maximum draft of 11 m for vessels entering the port. Previously, the maximum draft was approximately 9 m. This investment allows larger cargo vessels to enter the Port of Szczecin, increasing the transshipment capacity and competitiveness of the Szczecin-Świnoujście port complex. As a result of the investment, in addition to deepening the fairway, the coastal slopes were also modernized, and the fairway itself was widened to 100 m. The dredged material resulted in the creation of two islands with a total area of approximately 370 hectares. These islands will be used, among other things, to create new habitats for local bird species. The completed investment not only provides new development opportunities for the entire Szczecin-Świnoujście port complex but also contributes to the protection of the natural environment (ums.gov.pl).

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EMOTIONAL RESILIENCE AND SOCIAL SKILLS – FOUNDATIONS OF QUALITY OF LIFE IN TIMES OF CRISIS AND CHANGE

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Purpose: The purpose of this article is to demonstrate how emotional resilience and social competencies function as interrelated foundations of adult well-being in times of uncertainty and change.

Approach: The text draws on both current psychological theories and practical experience working with adults in educational, therapeutic, and professional contexts. It presents definitions and mechanisms for building resilience, highlights the importance of interpersonal skills, and offers strategies for supporting the development of these competencies in everyday life.

Findings: The article shows that emotional resilience and social competencies are key resources that determine an individual's ability to cope with contemporary challenges without losing mental health, life meaning, or self-worth. The ability to regulate emotions, cognitive flexibility, empathy, communication skills, and conflict resolution all contribute to individual well-being and enhance society's capacity to recover from crises and act collectively.

Research implications: Empirical studies conducted over the past decade clearly indicate that emotional resilience and social skills are significant predictors of psychological well-being and an individual's ability to adapt in conditions of stress and uncertainty. Future research should focus on the long-term effects of developing these competencies across different age and social groups.

Social implications: Strengthening collective resilience and social competencies is a strategic necessity for societies that must deal with crises such as pandemics, migration challenges, or climate change. Communities that are able to collaborate, share resources, and communicate constructively are more likely to restore balance and take coordinated action.

Originality/value: The article offers a new perspective on the significance of emotional resilience and social competencies as interrelated psychological resources. It is intended for psychologists, therapists, educators, and organizational leaders who aim to foster the development of these competencies within their communities.

Keywords: emotional resilience, social competencies, well-being, adult education.

Category of the paper: Viewpoint, general review.

1. Introduction

The dynamics of change in the contemporary world affect all aspects of societal functioning — professional, health-related, and emotional. Human existence is now closely tied to experiencing global crises that destabilize not only the socio-political landscape but also profoundly impact the human psyche. The rise in feelings of threat, uncertainty, and loss of control is influenced by wars, migration crises, pandemics, as well as the ongoing digitization and automation of everyday life (World Mental Health Report, 2022, pp. 248-249). In the face of these challenges, more and more individuals experience chronic stress, burnout, difficulties in maintaining interpersonal relationships, and problems with emotional regulation. Mental disorders contribute to a reduced quality of life and the inability to work. Currently, one in eight people worldwide lives with a mental health condition (World Mental Health Report, 2022, p. 15), which makes the ability to adapt, manage stress, and build supportive relationships a necessity in today's world.

Emotional resilience and social skills — often unfairly underestimated as "soft skills" — are proving to be essential psychological resources. These are the abilities that determine whether an individual can cope with contemporary challenges without losing their mental health, sense of purpose, and self-worth. The capacity for emotional regulation, cognitive flexibility, empathy, communication, and conflict resolution are competencies that not only enhance individual well-being but also foster a society's ability to recover from crises and act collectively.

Investing in the development of emotional resilience and social skills contributes to greater psychological stability, better relationships, higher motivation, and a longer capacity for work and personal growth (Gross, 2014; Southwick et al., 2014). These competencies also significantly impact professional life, where they are strong predictors of team effectiveness, leadership, and innovation (Goleman, 2012, p. 365). Furthermore, they are skills that — although to varying degrees — can be developed by every adult, regardless of past experiences or current life circumstances.

The aim of this article is to demonstrate how emotional resilience and social competencies function as interrelated foundations of adult well-being in an era of uncertainty and change. The text is based on both current psychological theories and practical experiences in working with adults in educational, therapeutic, and professional contexts. It will present definitions and mechanisms for building resilience, the significance of interpersonal skills, as well as strategies to support the development of these competencies in everyday life. In times when change becomes the only constant, it is worth viewing mental health not as the absence of problems, but as an actively shaped process of resilience, grounded in a conscious approach to emotions and relationships with others.

2. Emotional Resilience – Theoretical Perspective

According to the APA Dictionary of Psychology, psychological resilience is the ability to adapt effectively to challenging life circumstances through flexible thinking, emotional regulation, and the capacity to adjust to both external and internal demands. How well someone copes with adversity depends on several factors, including:

- how the person perceives and reacts to reality,
- the social support they can rely on (e.g., relationships with family and friends),
- the coping strategies they use during difficult times.

Psychology shows that resilience is not an innate trait, but a skill that can be developed and strengthened through practice and experience (Resilience, 2018).

Emotional resilience refers to an individual's ability to adapt to challenging situations, cope with crises, and return to emotional balance effectively. Key components of resilience include the capacity for emotional regulation, a sense of purpose, self-awareness, flexible thinking, and optimism (Southwick et al., 2014, p. 5). Resilience does not mean the absence of stress or suffering, but rather the ability to move through difficulties without losing functionality. In the context of positive psychology, the concept of post-traumatic growth is often discussed — the possibility of personal development despite negative experiences (Calhoun, Tedeschi, 2012, p. 2).

Developing emotional resilience is a dynamic process involving both internal resources and environmental factors. Internal resources include the ability to realistically assess situations, make decisions under uncertainty, and skills related to emotional self-regulation. External factors include access to social support, a sense of belonging, and stable interpersonal relationships.

Differences in how people regulate their emotions influence their emotional tendencies — that is, how they typically respond emotionally in various situations. This means that distortions in information processing, such as biases in perceiving or interpreting emotional stimuli, may serve as emotion-regulating mechanisms (MacLeod, Grafton, 2014, p. 508). Many established psychological theories suggest that a tendency to focus attention on specific (e.g., negative) emotional stimuli may increase both chronic vulnerability to negative emotional states and the risk of developing emotional disorders, such as anxiety or depression.

Research shows that emotionally resilient individuals experience lower levels of depression and anxiety, cope better with stress, and are more likely to take action in uncertain situations (Kalisch et al., 2015). It is important to emphasize that resilience is not an innate trait — it can be cultivated through psychological practices, training, and conscious experiences. A supportive environment, constructive role models, and self-reflection are all factors that foster its development.

Neuroplasticity — the brain's ability to reorganize itself in response to experiences — enables the development of new coping strategies even after traumatic events (Ozbay et al., 2007, p. 37). This makes it possible for individuals who regularly practice stress management techniques — such as meditation, mindfulness, or self-reflection — to strengthen brain structures responsible for emotional balance.

From a therapeutic perspective, emotional resilience is also linked to an individual's narrative identity — how they tell the story of their life, how they assign meaning to their experiences, and how they interpret adversity. People who can constructively reinterpret past events tend to demonstrate greater optimism and openness toward the future, which supports their further emotional and social development.

3. The Importance of Social Skills in Adult Life

Social skills are a set of competencies that enable individuals to function effectively and appropriately in various social situations. They include both verbal communication (e.g., conversation, assertiveness) and non-verbal communication (e.g., eye contact, gestures), which together allow for the effective formation of relationships, conflict resolution, and understanding of others' emotions (Social Skills, 2018). Key among these are empathy, communication, assertiveness, conflict resolution, cooperation, and the ability to adapt socially. Individuals with well-developed social skills tend to manage better in both professional and personal relationships, are less likely to experience isolation, and exhibit higher levels of psychological well-being.

Empathy, understood as the ability to recognize and understand others' emotions, is the foundation for building trust and connection. Empathetic individuals are better at interpreting others' needs, which facilitates conflict resolution and the ability to engage in constructive dialogue (Decety, Cowell, 2015, p. 12). The ability to actively listen and express emotions clearly also helps to prevent misunderstandings and strengthen interpersonal relationships. Assertiveness — the ability to express one's needs and opinions while respecting the boundaries of others — is essential for maintaining emotional balance in relationships. Assertive individuals are less likely to experience frustration from suppressing emotions and are able to protect their boundaries without becoming aggressive. Conflict resolution, both in private and professional settings, requires a combination of rational analysis and emotional understanding of the other party. People with this skill not only function more effectively within groups but are also more likely to become leaders, capable of building trust and motivating others. Social skills are also closely linked to emotional intelligence — the ability to recognize, understand, and manage one's own emotions and those of others. Daniel Goleman (2012) points

out that emotional competencies are as important as — and in some cases more important than — cognitive abilities when it comes to achieving professional and personal success.

In an era of globalization and digitalization, where communication increasingly takes place indirectly (e.g., online), social competencies have become even more crucial. The ability to build relationships, interpret non-verbal emotional cues, and respond constructively in social situations is now one of the most important pillars of mental health and professional effectiveness.

4. The Synergy of Emotional Resilience and Social Skills

Emotional resilience and social competencies are deeply interconnected, together forming a support system that enables individuals to cope with the challenges of everyday life. Emotionally resilient people are more likely to maintain healthy social relationships, express emotions constructively, and take initiative in difficult situations. At the same time, a solid level of social skills enhances one's sense of belonging and support, which in turn reinforces psychological resilience. Today, there is a growing recognition of the need to integrate these two areas into educational, developmental, and professional practices. Schools and workplaces that promote open communication, empathy, cooperation, and emotional reflection not only improve the well-being of their members but also build resilient communities capable of responding effectively to crises. In therapeutic and developmental practice, training in interpersonal skills is increasingly combined with techniques for building emotional resilience. This integrated approach yields lasting outcomes, including better adaptation to change, lower levels of anxiety, and greater life satisfaction.

The COVID-19 pandemic served as a clear example of a situation in which emotional resilience and social skills were put to the test. Research conducted during lockdowns showed that individuals with higher levels of emotional self-awareness and empathy experienced lower stress levels and functioned more effectively in family and professional relationships (Killgore et al., 2020). Similar findings have been observed in the context of migration, climate, and war-related crises. Communities capable of cooperation, resource-sharing, and constructive communication recover their balance more quickly and are more likely to engage in collective action (Masten, Motti-Stefanidi, 2020). Thus, strengthening collective resilience and social competencies is not only an individual matter but also a strategic imperative. Public authorities, NGOs, and educational institutions should invest in preventive and educational programs that promote these skills across different age and social groups.

5. Developing Resilience and Social Competence in Adults

The process of developing emotional resilience and social skills in adults is not only possible but also crucial in light of the challenges posed by modern life. Psychological maturity does not automatically equip individuals with these resources — in fact, adulthood often reveals deficiencies in emotional regulation or effective communication. However, with well-designed interventions, adults can systematically develop these competencies and integrate them into their lifestyle and identity. The development of emotional resilience is based on several key pillars:

- Emotion regulation training, such as emotion-focused therapy (Greenberg, 2011) or mindfulness practices (Kabat-Zinn, 2021), helps individuals recognize, accept, and transform difficult emotions without suppressing them. Regular mindfulness exercises lead to reduced cortisol levels, improved concentration, and a greater sense of agency.
- Building personal narrative and a sense of meaning draws from narrative therapy and logotherapy techniques. Activities such as writing letters to one's future self, reconstructing life stories, or exploring core values help individuals shift perspective and give meaning to life experiences, thus enhancing psychological resilience and reducing existential anxiety.
- Strengthening self-awareness and reflectiveness, or the ability to observe one's reactions and emotional states from a meta-level, is a key component of internal stability. As Gross (2014) notes, reflective individuals tend to be more emotionally flexible and less impulsive when facing strong affective states.
- Neuroplasticity-based exercises utilize the brain's capacity to form new neural connections in response to experience. Programs such as Cognitive Flexibility Training or Positive Affect Journaling help create adaptive cognitive patterns, improving the individual's ability to cope with change and uncertainty (Davidson, McEwen, 2012).

Social competencies, though often mistaken for politeness or sociability, are in fact a set of deep and complex cognitive-emotional skills. Their development can take place through:

- Interpersonal communication workshops, which teach precise expression of thoughts, emotions, and needs, as well as active and empathetic listening. Models like Nonviolent Communication (NVC) are often used to reduce conversational tension (Rosenberg, 2016).
- Empathy and assertiveness training, which are crucial for building respectful and trusting relationships. Empathy involves not just emotional but also cognitive understanding of others' perspectives (theory of mind). Assertiveness allows one to set boundaries without violating those of others.

- Learning conflict resolution through the win-win model, which focuses on finding solutions that meet the needs of all parties, rather than fighting for being right. Rogers and Farson (2015) emphasize the importance of active listening and emotional validation as core elements of effective mediation.
- Social scenario simulations and teamwork exercises (e.g., case studies, role-playing, drama-based learning) offer participants controlled environments to practice social behaviors. This enhances adaptability, fosters flexible reactions, and supports learning through experience.

For actions aimed at developing resilience and social competencies to be effective, several key conditions must be met:

- Facilitation by experienced professionals with psychological, pedagogical, and instructional expertise. Trainers should foster a safe environment and support group dynamics.
- Cyclical and systematic structure — while one-time workshops offer limited benefits, extended programs allow for deep integration of skills and their application in daily life.
- High level of practicality — sessions should employ active methods that engage participants in reflection and action. The more grounded in real-life contexts the exercises are, the more lasting their effects.
- Feedback and individualization — learning must include constructive feedback and be adapted to the participant's individual resources, learning style, and needs.
- Space for experimentation and mistakes — development requires room for trial and error. Only in a non-judgmental, supportive environment can authentic change take place.
- Link to personal and professional goals — motivation increases when participants understand how new skills impact their quality of life, relationships, work, and long-term aspirations.

The development of emotional resilience and social competence should not be seen as a short-term “fix,” but as a lifelong developmental process. In societies based on collaboration, diversity, and rapid change, these skills form the foundation not only of individual well-being but also of social cohesion. In everyday adult life, it's worthwhile to adopt practices that strengthen both resilience and relationships. Examples of such techniques include: keeping an emotion journal, practicing gratitude and positive reflection, engaging in active listening and paraphrasing in conversations, using emotional pause techniques in conflict situations, performing regular self-analysis and evaluation of social behavior, participating in support groups and learning communities, incorporating daily self-empowerment rituals (e.g., affirmations, meditation, movement).

By integrating simple practices into daily routines, individuals can gradually cultivate resilient and prosocial attitudes, leading to better well-being, health, and quality of personal and professional life.

6. Analysis of Empirical Research on Emotional Resilience and Social Skills

Empirical studies conducted over the past decade clearly indicate that emotional resilience and social competence are significant predictors of psychological well-being and an individual's ability to adapt under stress and uncertainty. This chapter discusses selected studies analyzing these relationships both at the individual and social levels. Studies have been presented that allow for an in-depth analysis of emotional resilience and social skills.

In a study by Tugade and Fredrickson (2004) involving over 500 adults, it was shown that individuals with higher emotional resilience exhibited greater positive affect, fewer depressive symptoms, and better social functioning. Moreover, resilience served as a buffer against chronic stress — participants coped more effectively in demanding professional and family situations requiring high emotional flexibility. Similarly, Kalisch et al. (2015) found that resilient individuals not only recover more quickly from crises but also experience post-traumatic growth more frequently.

In an experiment conducted with students and young adults in the U.S., Seppälä et al. (2020) demonstrated that interventions aimed at developing social skills — including empathy, mindfulness, and interpersonal communication — significantly reduced stress symptoms and improved psychological well-being. Participants in the eight-week training program reported greater sense of agency and better interpersonal relationships. In another study involving emergency service workers and healthcare personnel, it was found that high levels of interpersonal competence and availability of social support significantly reduced the risk of developing PTSD and occupational burnout (Ozbay et al., 2007). Importantly, the job performance of these individuals remained high even under prolonged stress conditions.

A meta-analysis of 29 intervention studies assessed the effectiveness of emotional resilience programs among adults. The results showed that both short-term (4-6 weeks) and long-term interventions led to significant improvements in emotion regulation, self-awareness, and reduced levels of anxiety and depression (Joyce et al., 2018). In another study, Kotsou et al. (2019) examined the impact of a workplace program aimed at enhancing emotional intelligence and social competencies. Participants reported improved ability to understand others' emotions, better conflict management, and increased job satisfaction. These effects were still present six months after the training had ended.

The cultural context in which resilience and social skills are developed also plays a crucial role. Masten and Motti-Stefanidi (2020) emphasized that communities with high levels of social capital (trust, cooperation, communication) recovered more quickly from crises such as the pandemic or migration crises, and provided better support to their members. For example, local communities in Greece and Italy that implemented educational programs focused on soft skills demonstrated greater cohesion and collective resilience.

7. Conclusion

In an era of change, crises, and instability, emotional resilience and social skills have become key components of proper human functioning. They are fundamental resources that determine the quality of life, relationships, health, and productivity. This is why adult education should prioritize the development of these competencies—not only in times of crisis but as a permanent element in building resilient and supportive communities.

In the face of dynamic changes and global crises, emotional resilience and social competencies are becoming indispensable resources that influence quality of life, mental health, and professional effectiveness. Contemporary challenges, such as pandemics, migration crises, and climate change, highlight the importance of developing these skills on both individual and societal levels. Emotional resilience—understood as the ability to adapt and cope with adversity—and social competencies—including communication skills, empathy, and cooperation—are crucial for building healthy relationships and supportive communities.

This article demonstrates that investing in the development of these competencies yields tangible benefits in both personal and professional life. Individuals with high emotional resilience and well-developed social skills are better at managing stress, more flexible in the face of change, and more effective in interpersonal communication. Educational and preventive programs that support the development of these skills can significantly improve individual well-being and organizational effectiveness.

Individuals with high emotional resilience are able to regulate their own emotions (e.g., anxiety, frustration), and thanks to their social skills, they can communicate clearly and support others. At the group level, these same individuals become 'stabilizers' within the team – their attitude reduces tension and fosters constructive problem-solving. This builds collective resilience, as the group as a whole is less prone to panic, can adapt more quickly to change, and seek solutions together. In the social context, strengthening collective resilience and social competencies is a strategic imperative for societies that must cope with crises. Communities capable of collaboration, resource sharing, and constructive communication recover balance more quickly and are better equipped to take joint action. Public authorities, non-governmental

organizations, and educational institutions should invest in programs that foster these skills across various age and social groups.

To conclude, emotional resilience and social competencies are not only key resources but also the foundation of healthy and effective communities. In the face of contemporary challenges, the development of these skills has become a necessity—bringing benefits to both individuals and society at large. Therefore, investing in adult education is essential to build resilient and supportive communities capable of effectively responding to crises and working together.

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ENVIRONMENTAL CONSEQUENCES OF FUEL OIL TANKER DISASTERS: RISKS, ECOSYSTEM IMPACTS, AND MITIGATION MEASURES

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Purpose: To analyze the environmental consequences of heavy fuel oil tanker disasters in the Black Sea, identify their impact on the ecosystem, and propose mitigation measures and recommendations for future crisis responses.

Design/methodology/approach: The research employed comprehensive analysis of pollution, integrating meteorological data and dispersion modeling. A mathematical model was developed to predict the degradation dynamics of fuel oil components over one year. The study also reviewed literature and international legal instruments.

Findings: Fuel oil spills cause irreparable damage to marine flora and fauna (dolphins, seabirds) through toxicity and oxygen depletion. Modeling indicates a prolonged negative impact (asphaltenes stable for up to 19 years). The disaster was exacerbated by the use of outdated tankers, linked to military expenditures.

Research limitations/implications: Major limitations include restricted access to the affected area. Future research should focus on developing less toxic pollution control methods and advanced digital technologies for real-time monitoring.

Practical implications: The findings enable authorities to assess ecological risks and develop effective, coordinated international response measures and minimize damage. This supports the necessity of deploying environmentally safe sorbents and mobile monitoring systems.

Social implications: The study highlights the need to enhance international maritime law for regulating hazardous transport and strengthen vessel monitoring. It emphasizes holding perpetrators accountable and initiating measures to restore the Black Sea ecosystem.

Originality/value: The paper provides a comprehensive analysis of spills in the Black Sea, directly linking accidents to the geopolitical context and lack of vessel modernization funding. It presents an original mathematical model for degradation dynamics and an integrated mitigation approach. Valuable for policymakers and researchers.

Keywords: environmental disaster, fuel oil, Black Sea, marine ecosystems, oil spill.

Category of the paper: Research paper.

1. Introduction

Russia has caused significant damage to Ukraine's environment (Shevchenko, 2024). This complicates Ukraine's and the EU's efforts to achieve climate neutrality. The issue of environmental crimes should remain in the focus of national and global media attention. The war in Ukraine, initiated by the Russian Federation, has caused not only a large-scale humanitarian crisis, but also serious environmental consequences (Khrushch, 2023), affecting various components of the environment (Shekhunova et al., 2023; Levchenko et al., 2023). We have previously studied environmental pollution by heavy metals in the war zones (Krainiuk et al., 2023). The war has serious negative consequences for both the Ukrainian people and the rest of the world (Khrushch et al., 2023).

The armed invasion of Ukraine has created significant threats to the Black Sea environment, with oil spills posing particular dangers. For instance, in 2022, Russian forces attacked an abandoned tanker containing 600 tons of diesel fuel, leading to large-scale sea contamination (Astashieva, Cheban, 2023). These incidents have had a significant impact on biodiversity, harmed marine ecosystems, and created long-term risks for the natural environment (Malovanyy, Bohach, 2021).

The constant threat of shelling increases the risk of human-made disasters with transboundary effects (Ivaniuta, 2022). Some researchers (Kharytonov et al., 2024) emphasize the need to recognize environmental crimes during the war as a component of genocide or as a separate international crime.

A particularly critical incident was the catastrophe involving tankers carrying fuel oil. On December 15, 2024, in the Kerch Strait, two Russian tankers, "Volgoneft-212" and "Volgoneft-239", transporting fuel oil, were severely damaged by a storm. This led to a massive spill of petroleum products into the Black Sea. Estimates suggest that 3000 to 4000 tons of fuel oil were released, causing severe pollution of the coastal areas and water resources.

Another oil spill occurred on December 7, 2024, when the Russian oil tanker 'Volgoneft-109' was involved in an accident in the Black Sea. This was the third such event within a short period, highlighting the growing environmental risks of transporting oil products in the region.

Similar incidents have occurred in the past, such as the 2007 accident in the Kerch Strait, during which 1300 tons of fuel oil were spilled into the sea. The toxic substances released into the water posed a serious threat to marine flora and fauna, particularly dolphins and birds, and had a long-lasting negative impact on the ecosystem.

Maritime disasters significantly impact the marine environment. Maritime transport and related accidents contribute to the emission of harmful gases and water pollution, disrupting underwater food chains and altering hydrographic conditions. Studies (Klenkin, Agapov, 2011) indicate that, following accidents in the Kerch Strait, changes in oil pollutant concentrations have been observed in the aquatic ecosystem (Nedelcu, Rusu, 2022). Long-term monitoring

starting in 2011 revealed differences in the concentrations and distribution of petroleum hydrocarbons in the Azov and Black Seas after oil spills. During regular oil spill monitoring in the eastern part of the Black Sea in 2011 and 2012, unprecedentedly large oil slicks of marine origin were detected. These oil slicks were primarily observed in the Russian sector of the sea. The presence of large oil slicks was confirmed through optical satellite imagery, suggesting tanker washing operations and illegal discharges of oil products (Ivanov, Kucheiko, 2014). In the Ukrainian coastal area of the Black Sea, pollution levels were significantly lower, pointing to a cleaner environment. This was the case before Russia's occupation of Crimea and the full-scale war beginning in 2022.

To assess the consequences of oil and chemical spill disasters, various models such as GNOME and PISCES-II are used. These models help identify accident 'hot spots' and evaluate the toxic effects of pollutants (Aşan et al., 2020; Yıldız, 2021).

Considering that the environmental impact during armed conflicts is almost always transboundary in nature. Kozmuliak (2022) analyzed the provisions of international instruments regulating this issue. These include the 1972 Stockholm Declaration, the World Charter for Nature, the 1992 Rio de Janeiro Declaration on Environment and Development, the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, the Additional Protocol to the Geneva Conventions of August 12, 1949, concerning the protection of victims of international armed conflicts, and the Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and Their Destruction. It has been established that all of these documents call on the international community to take measures to prevent or minimize the destructive impact on the environment during military operations.

The aim of this study is to analyze the environmental consequences of this catastrophe, particularly its impact on the Black Sea ecosystems, as well as to identify ways to mitigate the damage and develop recommendations for improving responses to similar crises in the future.

The fuel oil spill created a large slick that spread due to currents and wind, contaminating significant areas of the sea and coastline. The oil film disrupted the oxygen balance in the water, threatening marine life, particularly dolphins. The contamination of the seabed and soil endangers spawning areas and salt marshes, causing long-term toxic effects.

The tanker accident is not directly related to military actions; however, due to Russia's expenditures on the war against Ukraine, funds for vessel modernization are lacking. Outdated tankers, some as old as 50 years, unsuitable for stormy seas, are being used, which led to this disaster. The deployment of such vessels in stormy conditions without proper modernization and permits violates safety regulations and could have been a cause of the accidents.

After the incident, the fuel oil spread along the coastline of the Taman Peninsula and later, due to a change in wind direction, moved towards the Crimean Peninsula (Fig. 1). By January 15, 2025, the pollution had spread not only to the Crimean coast but also to the Odesa region. Maps of the pollution's spread reflect the dynamics of the process and wind directions that

contributed to the substance's transport. These data are crucial for risk assessment and for planning mitigation measures. However, the fact that the fuel oil reached Ukrainian territories confirms the need for immediate action.

In the first days following the accident, the pollution spread along the Taman Peninsula coastline under the influence of prevailing northern and northwestern winds. However, by December 21, 2024, maps indicate a change in wind direction, shifting towards the Crimean Peninsula. This immediately resulted in the transfer of fuel oil remnants southeastward, creating a risk of contamination along the Crimean coastline.

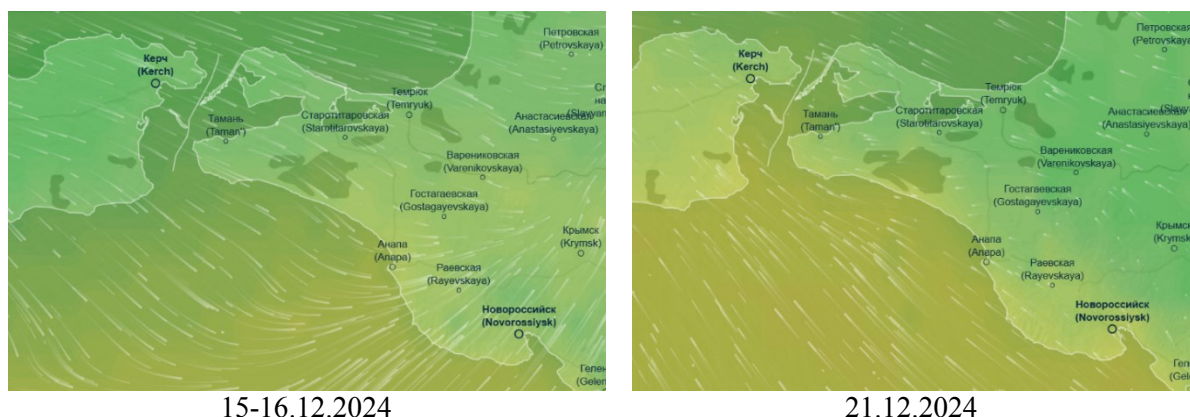


Figure 1. Dynamics of fuel oil pollution spread along the Black Sea coastline depending on the wind direction (15-21 December 2024).

The fuel oil spill contaminated approximately 50 kilometers of the Black Sea coastline, including the beaches of Anapa (Fig. 1). Since late December 2024, pollution has been recorded along the Crimean coast (Kerch, Yevpatoria), and by mid-January 2025, even in the Odesa region. The accumulation of petroleum products on the shores poses a serious threat to the regional ecosystem.

2. Materials and Methods

The research methods applied in this study are based on a comprehensive analysis of the Black Sea pollution processes caused by fuel oil spills from tanker accidents. The study considered the specifics of the regional ecosystem, utilized meteorological observation data, and modeled pollution dispersion depending on weather conditions. Additionally, a review of literature sources was conducted to assess the impact of toxic substances on marine life and their persistence in the ecosystem. This approach allowed the development of recommendations for minimizing environmental risks and improving response measures.

3. Data analysis

Fuel oil is a residual product of oil distillation with a complex chemical composition and belongs to the group of heavy organic substances. Its chemical composition is determined by the source crude oil and processing conditions. From a chemical perspective, fuel oil contains the following components (Table 1).

Table 1.

Main groups of chemical substances in the composition of fuel oil

Category	Subcategory	Examples of substances	Chemical formula
	Aromatic	Naphthalene	$C_{10}H_8$
		Phenanthrene	$C_{14}H_{10}$
	Saturated	Docosane	$C_{22}H_{46}$
		Hexacosane	$C_{26}H_{54}$
	Cycloalkanes	Cyclopentane	C_5H_{10}
		Decalin	$C_{10}H_{18}$
Heteroatomic compounds	Sulfur	Thiophene	C_4H_4S
		Benzothiophene	C_8H_6S
	Nitrogen	Quinoline	C_9H_7N
		Indole	C_8H_7N
	Oxygen	Phenol	C_6H_5OH
Asphaltenes and resins	Asphaltenes	High-molecular compounds	$C_{40}H_{50}O_4S$
	Resins	Intermediate components	$C_{20}H_{30}O_2$
Metals	Metalloporphyrins	Vanadyl porphyrin	$C_{30}H_{36}N_4O_4V$
		Nickel complex	[Ni- complex]
Residues	Minerals	Chlorides	$NaCl, MgCl_2$
	Water	Free and emulsified	H_2O

Diagram 2 describes the main processes of oil spills: light components rise to the surface, forming a film, while heavy ones settle to the bottom, harming bottom-dwelling organisms. Evaporation, oxidation, and emulsion formation occur, with oil interacting with water particles, promoting settling. Light fractions partially decompose, but asphaltenes remain stable for years. Currents and storms increase the area of contamination, creating a complex environmental issue that requires specialized cleaning methods. These aspects complicate the cleanup and demand specialized approaches for neutralizing oil spills in water. The entry of oil into the water leads to a series of chemical reactions that can be predicted based on the composition of the oil and environmental conditions (salinity, temperature, oxygen availability, sunlight). Toxic substances are formed, contaminating water, soils, and affecting the marine ecosystem. The consequences of chemical reactions of oil in seawater can be catastrophic for the ecosystem and the environment (Table 2).

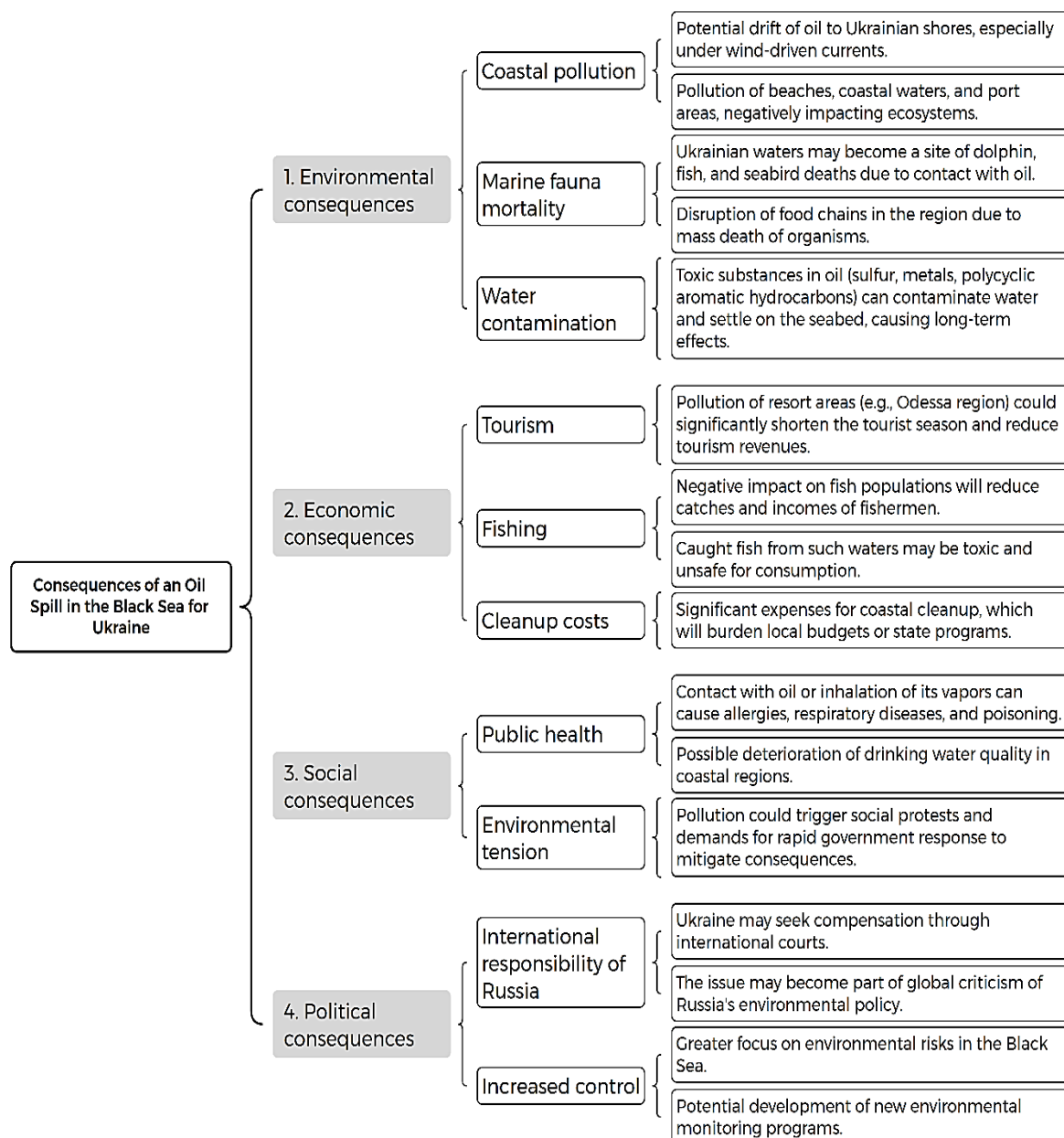


Figure 2. Stages of fuel oil pollution spread.

Table 2.

Consequences of chemical reactions of fuel oil in seawater

Aspect	Process	Consequences
Water Pollution	- Physical pollution: formation of an oil film on the water surface, reducing oxygen and light penetration, disrupting photosynthesis. - Chemical pollution: formation of toxic substances (hydrogen sulfide, organic acids, oxygenated compounds).	- Mass death of fish, molluscs, and plankton due to oxygen deficiency. - Disruption of food chains in the marine ecosystem.
Formation of Toxic Substances	- Hydrogen sulfide (H_2S): high concentration is dangerous for aquatic organisms, pollutes the atmosphere. - Surfactants (PAHs): carcinogenic substances accumulate in living organisms.	- Toxicity for fauna, bioaccumulation. - Harm to humans consuming seafood.

Ecosystem Destruction	- Polymerization of asphaltenes and resins: formation of sediments that cover marine ecosystems. - Hydrolysis and oxidation of organic substances, creating acidic environments.	- Destruction of biocenoses. - Reduction of biodiversity.
Deposition of Heavy Metals	Vanadium, nickel: settle in water or accumulate in bottom sediments.	- Long-term pollution of benthic ecosystems. - Toxic effect on organisms in contact with the bottom.
Interaction with Seawater Salt	Formation of emulsions that impair the water's self-purification ability.	- Prolonged duration of pollution. - Deterioration of living conditions in the affected region.
Impact on the Coastline	Oil causes soil erosion and poisons vegetation.	- Destruction of coastal ecosystems. - Reduction in the population of birds and animals that come into contact with contaminated surfaces.
Socio-economic Consequences	Contamination of fish and seafood, reduction of fishing potential. - Polluted beaches and deterioration of tourist attractiveness.	- Financial losses for local populations. - Deterioration of human health due to contact with toxic substances.

Accidents involving the spill of fuel oil into the marine environment have long-term and multi-dimensional consequences that affect not only the ecosystem but also human health and the economy. The marine environment is chemically aggressive and can accelerate certain chemical reactions (Table 3).

Table 3.
Reaction Rates in the Marine Environment

Process	Mechanism and Conditions	Reaction Rate
Oxidation of hydrocarbons	Occurs in the presence of oxygen. In surface layers with access to air, the reaction occurs faster. In the deep zones of the Black Sea, where oxygen may be deficient, the rate significantly decreases.	Surface layers: from months to a year; deep zones: decades.
Photo-oxidation	Under the influence of UV rays, polycyclic aromatic hydrocarbons (PAHs) are broken down in the surface layers. The efficiency depends on the water transparency and light penetration depth.	Several days to months in surface layers; practically absent in deep layers.
Hydrolysis	Breakdown of organic compounds by water. Formation of secondary toxic substances such as organic acids, hydrogen sulfide. For large molecules of fuel oil, the process is very slow.	Simple compounds: from weeks to months; large molecules (asphaltenes): years.
Biodegradation	Microorganisms break down organic compounds. The influence of seasonal temperature and salinity: activity is higher in summer. Lighter fractions degrade faster than heavier ones.	Light alkanes: a few weeks; heavy fractions (resins, asphaltenes): decades.
Formation of emulsions	Fuel oil mixes with water, forming water-organic emulsions. These "black ice" can persist for years and slow down other degradation processes.	Formation of emulsions: days; stability of emulsions: years.
Formation of solid deposits	Polymerization of heavy hydrocarbons (asphaltenes, resins), which then settle at the bottom. This process is active in areas with low water dynamics (deep zones).	Months to years.
Sedimentation of heavy metals	Reactions of heavy metals in fuel oil with salts of seawater (chlorides, sulfates). Sedimentation is more active in coastal areas with high salt and organic concentrations.	A few days to weeks.
Formation of hydrogen sulfide (H ₂ S)	Decomposition of sulfur compounds in fuel oil under anaerobic conditions. In the Black Sea, this process is active in deep layers, contributing to water contamination with hydrogen sulfide.	From a few weeks to months.

To estimate the total degradation time of fuel oil in the Black Sea, the main processes considered are evaporation, oxidation, degradation, and sedimentation. Each process influences the overall dynamics. For calculation, we use exponential dependence laws:

$$M(t) = M_0 \cdot e^{-k \cdot t} \quad (1)$$

where:

$M(t)$ – the mass of the component at time t ;

M_0 – the initial mass of the component (total fuel oil 4000 tons);

k – the rate constant of the process (depends on temperature and type of process);

t – time.

Let's determine the degradation time for each component. Based on the calculations, we obtain the degradation time for the components (Table 4).

Table 4.

Table 4 Degradation time of fuel oil components

Components	Half-life, days	Time for complete degradation (until 1% of initial mass remains), days
Oxidation of alkanes (C ₁₀ -C ₄₀)	≈70	460 (≈1,5 years)
Degradation of aromatic compounds (benzene, naphthalene, PAHs)	≈140	1380 (about 4 years)
Polymerization of resins and asphaltenes	670 (about 2 years)	6900 (19 years)
Sulfide (H ₂ S) release	230 (8 months)	1535 (4-4,5 years)

Let's try to build a system of differential equations that describe the degradation of fuel oil components in the Black Sea:

1. Evaporation of volatile components:

$$\frac{dM_{let}(t)}{dt} = -k_{let}M_{let}(t) \quad (2)$$

2. Oxidation of alkanes:

$$\frac{dM_{alk}(t)}{dt} = -k_{alk}M_{alk}(t) \quad (3)$$

3. Degradation of polycyclic aromatic hydrocarbons (PAHs):

$$\frac{dM_{PAV}(t)}{dt} = -k_{PAV}M_{PAV}(t) \quad (4)$$

4. Formation of Asphaltenes:

$$\frac{dM_{asf}(t)}{dt} = k_{alk}M_{alk}(t) + k_{PAV}M_{PAV}(t) - k_{asf}M_{asf}(t) \quad (5)$$

where k_{asf} – rate constant of asphaltene sedimentation.

5. Sedimentation to the bottom:

$$\frac{dM_{don}(t)}{dt} = -k_{don}M_{don}(t) \quad (6)$$

Numerical methods can be used to solve this system of equations (for example, the Runge-Kutta method). The model allows for predicting the dynamics of oil degradation by calculating the mass of remaining components over time.

The model built using Python shows the following results (Fig. 3): the reaction rates are extremely low in winter at a water temperature of 7°C. The fastest process remains the evaporation of volatile components, but even it proceeds very slowly. Other reactions practically stop, as the low temperature significantly slows the chemical transformations.

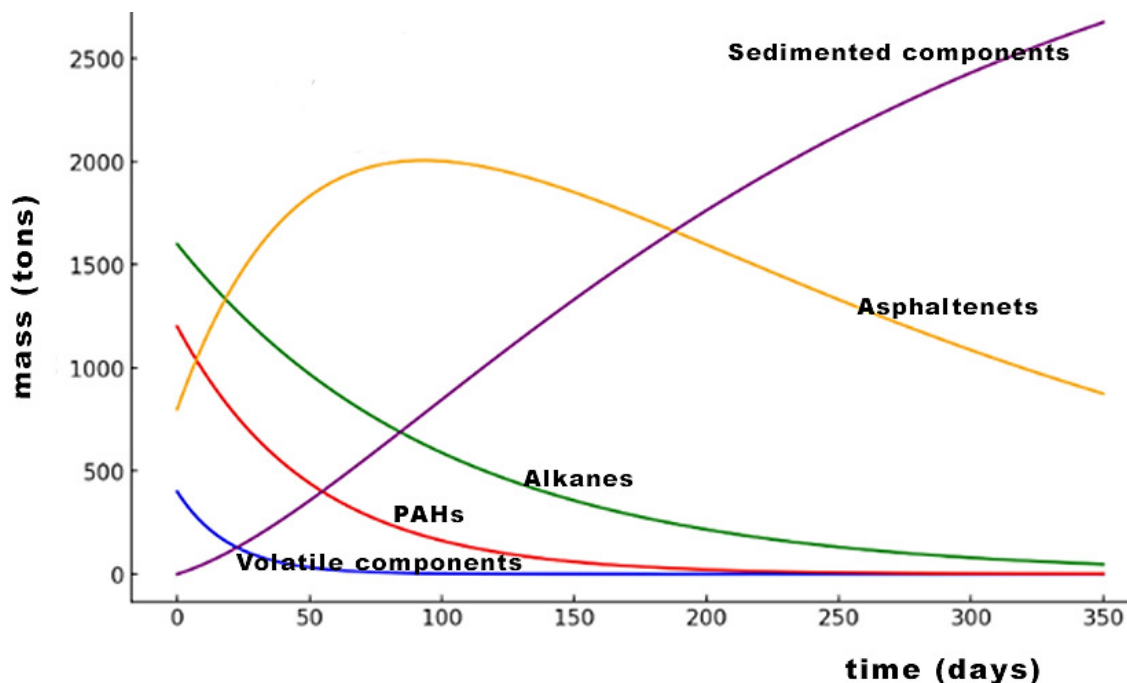


Figure 3. Dynamics of oil degradation in the Black Sea considering different components.

4. Results

In Figure 3, the forecast of the changes in the mass of components of the crude oil in the Black Sea over the course of one year is presented:

- Volatile components (blue line) quickly evaporate during the first weeks. They decrease rapidly within the first 50 days due to evaporation. This is a natural process, as the light fractions of crude oil have a low boiling point and gradually evaporate even at low temperatures.
- Alkanes (green line) degrade slowly due to the low oxidation rate. They gradually decrease over time through oxidation, but the process is quite slow due to the low reaction rate under cold conditions.
- Polycyclic Aromatic Hydrocarbons (PAHs, red line) degrade even more slowly, remaining active pollutants. They increase for a certain period because they are formed as a result of chemical reactions, but over time their quantity starts to decrease due to degradation.

- Asphaltenes (orange line) gradually increase due to the transformation of alkanes and PAHs, but later part of them settles. They are formed as a secondary product, and their amount grows gradually, but insignificantly.
- Sedimented components (purple line) accumulate on the seabed, forming a long-term source of pollution. They continuously increase, which corresponds to the formation of heavy components and their settling to the sea floor.

Thus, the overall forecast:

- Initial consequences (1-3 months): Degradation of light alkanes, partial formation of resins, and a decrease in oxygen levels can be expected.
- Medium-term consequences (1-2 years): These will be associated with the prolonged toxic impact of PAHs and the accumulation of H_2S in the bottom layers.
- Long-term consequences (10 years): These will be related to the settling of heavy fractions (asphaltenes) to the seabed and ecosystem changes due to the reduction of oxygen.

The spill has affected numerous marine inhabitants (Figure 2). Toxic oil has covered the water's surface and settled on the seabed, causing harm to fish, mollusks, dolphins, and waterfowl. Birds, in particular, have proven to be especially vulnerable: the oil covering their feathers prevents them from flying, regulating their body temperature, and foraging for food, which inevitably leads to death.

Limited access to the affected area significantly complicates an objective assessment of the scale of the environmental disaster. Currently, only Russian organizations have direct access to the site, raising concerns about the reliability of available data. The critical situation is further exacerbated by adverse weather conditions, which hinder satellite imagery analysis. Nonetheless, available video evidence confirms the severe ecological impact – including an extensive oil slick near the Anapa coastline, an event unprecedented in the history of the Black Sea.

5. Discussion

Marine organisms, especially dolphins, suffer significantly from the consequences of oil and fuel pollution, which forms a toxic film on the water's surface and contaminates coastal areas. These effects are multifaceted, impacting both the physiological condition of the animals and the ecosystem as a whole, including:

1. Physical contact with fuel oil causes skin and mucous membrane injuries in dolphins. The acute chemical components of oil cause burns, eye irritation, and respiratory organ issues. This impairs their ability to swim, hunt, and breathe normally.

2. Disruption of respiratory function is related to dolphins' breathing by surfacing. Toxic fumes from oil and dispersants that form above the water surface can damage their lungs, leading to difficulty breathing and even suffocation.
3. Poisoning from consuming food. Dolphins, being at the top of the food chain, consume fish and other marine creatures that accumulate toxins from the water. This can lead to chronic poisoning and liver, kidney, and nervous system damage.
4. Pollution affects social behaviour, including communication and navigation. Noise from rescue operations and chemical pollution interfere with their ability to use echolocation, which is critical for hunting and communication within the group.
5. Reduction in reproductive potential. Prolonged exposure to toxic substances disrupts hormones, affecting reproductive capabilities. Pollution can cause miscarriages in pregnant females or the birth of non-viable offspring.

The oil spill significantly impacts the marine ecosystem, particularly by depleting the food supply. The death of small organisms, such as plankton, which are the primary food source for many fish and dolphins, leads to a food shortage. This triggers a chain reaction of hunger at all levels of the food chain. Moreover, pollution alters the chemical composition of the water, which becomes incompatible with the life of many marine organisms. These changes cause chronic stress for dolphins, forcing them to adapt to unfavorable conditions in their natural habitat.

Dolphins are not only key species in marine ecosystems but also demonstrate a high level of intelligence and social organization. Their health serves as an indicator of the overall condition of marine ecosystems. Protecting dolphins is not only an ethical imperative but also crucial for maintaining the integrity and biodiversity of the world's oceans.

Thus, any water and shoreline cleaning measures should aim to minimize harm to marine life, particularly by developing less toxic pollution control methods.

Another highly vulnerable group is seabirds. Their reliance on the aquatic environment for feeding, resting, and migration makes them particularly sensitive to toxic substances. Oil pollution presents multiple threats to the physiology, survival, and behavior of birds:

1. *Damage to feathers by oil* disrupts the natural water-repellent structure of the feathers, which is crucial for thermoregulation. Contaminated feathers become matted, losing their ability to retain heat, leading to hypothermia in birds, even in relatively warm waters.
2. *Difficulty flying and swimming due to matted feathers*, which increase the bird's weight and impair aerodynamics, making flight more difficult. On the water, these birds become less maneuverable, making them easy prey for predators.
3. *Ingesting oil* while attempting to clean their plumage leads to damage to the digestive system, kidneys, and liver. Even small amounts of oil can be lethal due to its chemical toxicity and the resulting dehydration.

4. *Starvation due to the destruction of the food base.* Oil contaminates bodies of water where fish, mollusks, and other organisms that birds feed on are found. Polluted food becomes dangerous, and often inaccessible, leading to starvation.
5. *Pollution affects bird reproduction.* Toxins can reduce egg quality, decreasing the likelihood of viable offspring hatching. In some cases, contaminated areas become unsuitable for nesting.
6. *Oil-contaminated birds spend most of their time cleaning themselves* instead of searching for food, nesting, or caring for their offspring. This significantly reduces their chances of survival.

The 2010 oil spill in the Gulf of Mexico caused the mass death of species such as shearwaters, pelicans, and terns. After the disaster, high mortality rates were observed even in birds that appeared externally healthy, as prolonged contact with toxins caused internal damage.

Protecting birds requires swift responses to ecological threats, particularly to mitigate the harm caused by oil spills. To achieve this, implementing environmentally safe sorbents is crucial, as they allow for the effective and rapid collection of pollutants and the development of specialized bird rehabilitation programs, including the establishment of cleaning and treatment centres. A key priority is developing monitoring systems and rapid response mechanisms to prevent spills. The preservation of seabirds is of great importance not only from an ethical standpoint but also from an ecological perspective.

To correct the current dire environmental situation, it is essential to develop and implement urgent legal and political measures aimed at minimizing the harmful impact on the environment. In particular, it is necessary to continuously record all environmental crimes committed on the territory of Ukraine and document the damage caused (Kopytsia, Semenchenko, 2022). Furthermore, special attention should be given to developing a reconstruction plan for Ukraine that includes measures for environmental restoration and conservation.

Addressing oil spills in the Black Sea resulting from the Russian invasion requires leveraging international expertise and advanced technologies from the United States and other countries. Addressing this challenge necessitates a combination of regulatory frameworks, technological advancements, and coordinated international efforts.

The Convention on the Protection of the Black Sea Against Pollution, signed in 1992, was designed to promote sustainable marine management. However, its effectiveness has been undermined by geopolitical instability and ongoing conflict (Astashova, Cheban, 2023). In parallel, the International Environmental Information Center for the Black and Caspian Seas (BCSEIC) serves as a critical platform for the exchange of expertise and strategies related to the prevention and mitigation of oil spills.

Technological advancements play a significant role in responding to oil spills. Numerical modeling has proven to be a valuable tool for predicting the movement and environmental impact of oil pollution, enhancing preparedness and response measures (Korotenko, 2018).

Additionally, satellite monitoring enables real-time detection and analysis of spills, improving risk assessment and facilitating timely interventions (Mityagina, 2019).

The United States' experience offers valuable insights into effective oil spill management. The U.S. oil spill response system integrates federal, state, and local agencies to ensure a coordinated and rapid reaction to pollution incidents (Astasheva, Cheban, 2023). The case of the Exxon Valdez disaster has further underscored the necessity of comprehensive response strategies, many of which could be adapted for Ukraine's specific needs.

Effective oil spill remediation requires a combination of mechanical, physicochemical, and biological methods, each aiding in the efficient removal of oil contamination from marine environments. The implementation of modern digital technologies for automated environmental monitoring in the Black Sea can enhance response efforts by providing real-time oil spill data. This facilitates prompt decision-making and enables proactive measures to minimize ecological damage (Gavardashvili et al., 2024).

6. Conclusion

Oil spills caused by tanker accidents in the Black Sea, resulting from Russia's military aggression, have created serious ecological threats to the regional ecosystem. The analysis showed that pollution causes irreparable damage to marine flora and fauna, particularly dolphins and seabirds, due to the toxicity of oil, which disrupts the oxygen balance in the water and alters the chemical composition of the environment. It was found that effective response requires a comprehensive approach, including the implementation of innovative cleaning methods, enhanced safety measures for the transportation of hazardous goods, and the improvement of international maritime law.

Reducing ecological risks further requires developing and utilizing mobile monitoring systems, deploying environmentally safe sorbents, and strengthening international cooperation to address environmental challenges. A key priority is holding perpetrators accountable under international law and initiating measures to restore the Black Sea ecosystem.

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PROACTIVE MANAGEMENT OF OCCUPATIONAL SAFETY AS PART OF A COMPANY'S SUSTAINABLE DEVELOPMENT STRATEGY – TOWARDS IMPROVING HEALTH, QUALITY OF LIFE AND IMAGE OF THE ORGANIZATION

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Purpose: The objective of this article is to examine how proactive occupational safety management can be a strategic element of sustainable development in modern enterprises. The research aims to investigate the relationship between safety culture, employee engagement, and organizational performance, especially in the context of ISO 45001 standards and corporate social responsibility.

Design/methodology/approach: The study uses a mixed approach, combining a review of national and international literature from 2019-2024 with empirical research conducted in Polish manufacturing companies. The methods include structured surveys, document analysis, and the assessment of key performance indicators (KPIs). The theoretical scope covers occupational safety, organizational behavior, sustainable development, and proactive leadership.

Findings: The findings reveal that companies promoting proactive safety behaviors—particularly among operational staff—experience higher levels of reported safety climate and more frequent improvement initiatives. Structured feedback systems, leadership commitment, and internal motivation were found to be critical in fostering proactive attitudes. The research confirms that occupational safety should not be seen solely as a compliance tool but as a source of innovation, trust, and strategic advantage.

Research limitations/implications: The study is based on a sample of medium and large manufacturing companies in Poland, which may limit the generalizability of results to other sectors or regions. Future research could expand the scope to include other industries or cross-cultural comparisons.

Practical implications: The study highlights the importance of incorporating proactive occupational safety management into business strategy. It provides recommendations for improving employee engagement, feedback systems, and safety leadership. The findings can help companies develop more effective safety programs and track their impact using proactive indicators.

Social implications: A proactive occupational safety culture in an organization contributes to improved employee well-being, trust, and overall quality of life. It also strengthens the organization's reputation and is consistent with broader CSR and sustainability goals, potentially influencing industry standards and public policy.

Originality/value: The article presents a comprehensive framework linking proactive occupational safety behaviors with sustainable development. It provides new insights based on practical research, aimed at managers, decision-makers, and safety professionals.

Keywords: Proactive safety management, sustainable development, ISO 45001, safety culture.

Category of the paper: Research paper.

1. Introduction

In modern business management, occupational safety has evolved from a reactive obligation to a strategic pillar of sustainable development. Organizations increasingly recognize that ensuring a safe and healthy work environment is not only a legal and ethical imperative, but also a driver of human capital development, innovation, and long-term performance. This article analyzes the concept of proactive occupational safety management as a key element of a sustainability-oriented strategy in manufacturing companies.

The article combines original empirical research conducted between 2019 and 2024, including the results of the author's doctoral thesis, with a comprehensive review of the literature on international standards, scientific research results in the field, and industry practices. The main focus is on the integration of proactive work safety behaviors in organizations and the mechanisms that stimulate such engagement-leadership, organizational climate, internal motivation, and structured feedback systems. The research was conducted in medium-sized and large manufacturing companies, which provide a representative context for assessing the maturity of safety culture.

In response to the ISO 45001 standard, a proactive approach to management was analyzed as a means of risk prediction and well-being improvement. The article also analyzed the relationship between safety initiatives and corporate social responsibility (CSR), brand image, and competitive advantage. Particular attention was paid to the development and use of proactive indicators and key performance indicators (KPIs) as tools for assessing the effectiveness of occupational safety practices.

By emphasizing the need to move from reactive compliance to proactive value creation, this study aims to contribute to the evolving discussion on occupational safety as a dynamic, integrative, and forward-looking function of sustainable business development.

2. Sustainable development and proactive occupational safety management

The inclusion of occupational health and safety (OHS) in sustainable development strategies is becoming a key issue for modern businesses. According to the International Labour Organization (ILO), the proactive promotion of safe working conditions has a significant impact on sustainable social development (ILO, 2025). The ISO 45001:2018 standard (ISO, 2018) further reinforces the need not only for organizations to comply with the legal framework, but also to proactively manage risk through a systematic approach such as the PDCA cycle (Claro et al., 2025). In this context, OHS management is not merely a function of ensuring compliance with regulations, but a strategic tool for long-term resilience and value creation (Kubasiński, 2023).

2.1. The importance of proactivity for organizational culture and corporate values

Organizations that embed proactivity into their occupational safety strategy reflect a high degree of internal accountability, commitment, and ethical maturity at all levels of management. Rather than responding to incidents post-factum, proactive organizations engage in the anticipation of risks, continuous monitoring of processes, and preventive intervention (Patel et al., 2022). This behavior translates into a shared organizational mindset in which safety is not merely a procedure but a core cultural value.

As highlighted in ISO 45001 standard (2018), cultivating a culture of prevention and participation is central to improving occupational health and safety outcomes. Clause 5 of the standard emphasizes the leadership's role in ensuring consultation, active involvement, and communication of values that support a safety-first culture. Proactivity in this context is not limited to hazard prevention - it becomes a strategic principle that is integrated with leadership behavior, team communication, and personal responsibility.

Empirical research confirms that companies fostering such cultures report significantly fewer accidents, stronger compliance behaviors, and higher levels of employee trust and satisfaction (Proactive occupational safety..., 2023; Claro et al., 2025). These organizations create a psychologically safe environment in which employees feel empowered to report near misses, share improvement suggestions, and engage in continuous learning. As Kubasiński (2024) notes, this transparency increases internal cohesion while also reinforcing external reputation and employer branding.

Furthermore, the integration of proactivity into organizational values aligns with the Social dimension of the ESG (Environmental, Social, and Governance) agenda. The "S" in ESG demands that companies account for human capital, health, and workplace well-being. Proactive safety practices - such as near-miss reporting systems, behavioral safety observations, and regular communication of safety KPIs - are now viewed as indicators of social responsibility and ethical governance. As Wen H. (2024) and ILO (2025) point out,

this alignment is becoming not only desirable but essential for companies seeking long-term sustainability and stakeholder trust.

Ultimately, proactivity in safety is not a standalone program, but a cultural enabler that influences decision-making, strengthens values, and fosters shared responsibility. It bridges the gap between formal systems and lived organizational realities, making it an indispensable element of sustainable business development.

2.2. Stimulating factors of proactive attitudes and their organizational impact

The development of proactive attitudes in a company depends on several internal and external factors. These include leadership style, internal communication, autonomy, and clarity of responsibilities (Da Silva, Amaral, 2023). A study conducted by Kubasiński (2023) found that employees who have access to structured feedback mechanisms and opportunities for empowerment are significantly more likely to exhibit proactive behaviors in the context of work organization and safety.

The implementation of ISO 45001 (ISO, 2018) promotes proactivity by requiring organizations to consult with employees and involve them in decision-making processes related to occupational safety (Boulfoul et al., 2025). This participatory approach increases the sense of responsibility for safety performance at all levels of the organization and encourages innovation in identifying hazards. Companies that recognize and reward preventive initiatives, thereby promoting employee activity, create a positive cycle of engagement and improvement (Safety culture..., 2023; ILO, 2025).

Stimulating proactive attitudes among employees requires the implementation of organizational mechanisms that promote initiative, responsibility, and a participatory safety culture. Companies that prioritize proactive safety management typically employ several well-documented strategies, both procedural and psychological, to increase engagement and encourage continuous improvement.

One key factor is internal motivation, often reinforced through recognition systems, freedom in performing tasks, and clearly communicated expectations regarding safety performance, including occupational health and safety. Employees who feel empowered and supported are more likely to take the initiative in reporting hazards, suggesting improvements, and following preventive practices (Neal, Griffin, 2006; Kubasiński, 2023).

Leadership style also plays an important role in this regard. A transformational and servant leadership approach that emphasizes inspiration, ethical behavior, and team development has been found to significantly increase proactive employee engagement (Guldenmund, 2010; ISO, 2018). Occupational safety specialists also play an important role, serving as role models and communicating the strategic importance of proactive measures for maintaining a safe working environment.

Another important mechanism is the presence of structured reporting and feedback systems. These include anonymous safety suggestion programs, digital incident reporting tools, and regular reviews of safety performance. Research shows that when such systems are transparent and linked to organizational learning, employees perceive them as valuable tools for change rather than merely bureaucratic procedures (ILO, 2025).

Another important aspect is the organizational climate, in particular openness, support for innovation, and shared responsibility, which also correlates strongly with proactive behavior. A culture that promotes cross-functional cooperation and encourages learning from potentially dangerous situations fosters collective awareness and resilience. Companies often support this through safety days, participatory workshops, and team problem solving (Kubasiński et al., 2024).

Finally, training, instruction, and competency development programs focused on risk anticipation, root cause analysis, and behavioral safety contribute to building employee confidence and their ability to respond to potential hazards. Combined with career development paths and incentive systems, they represent a long-term investment in proactive engagement. All these factors together influence the maturity of an organization's safety culture and its ability to move from compliance-based safety management to proactive safety management.

2.3. Identification of proactivity-enhancing factors: own and literature-based findings

An integrated analysis of literature and empirical research indicates that the following factors most effectively foster proactive behavior among employees (Kubasiński, 2024; ILO, 2025):

- intrinsic motivation: individuals who perceive safety as a personal value are more inclined to act without external prompts,
- organizational climate: trust, fairness, and open communication form the psychological foundation for expressing concern,
- leadership: supportive leaders who model safe behaviors influence the entire workforce,
- reporting systems: platforms for reporting near misses and proposing improvements must be accessible and non-punitive.

These elements were identified not only in the theoretical models but also through field research conducted among employees in medium-sized manufacturing enterprises. The author's case studies reveal that proactive attitudes are particularly robust in companies where those factors coexist and are reinforced through organizational routines and culture.

Data collected from survey instruments and qualitative interviews confirm that employees in such environments are more likely to engage in risk assessments, suggest preventive or corrective actions, and actively monitor the implementation of safety protocols (Kubasiński, 2023). These observations provide strong empirical support for the thesis that proactive

behavior is not solely a function of personality traits but also a result of systemic reinforcement mechanisms.

The findings are consistent with previous studies by Wen L. (2024), who emphasized cognitive awareness and psychological readiness, and Mangler et al. (2021), who demonstrated the importance of embedded behavioral training and policy alignment. When organizations integrate these factors into their safety strategies, they build the foundation for a mature safety culture, in which proactivity becomes the norm rather than the exception.

Overall, the identification of these factors offers both diagnostic and strategic value. Diagnostically, they allow for safety culture audits and targeted interventions. Strategically, they inform leadership development, training design, and structural adjustments that collectively contribute to a resilient and forward-looking organization.

2.4. Models for evaluating the effectiveness of proactive measures

Assessing the effectiveness of proactive safety measures within an organization requires a shift away from traditional reactive indicators toward comprehensive performance indicators. Modern occupational safety frameworks increasingly rely on both leading and lagging indicators, as well as proactive indicators, to capture the full range of safety outcomes (Da Silva, Amaral, 2023).

Leading indicators and proactive indicators are predictive measures that reflect the state of preventive actions. They include the number of near-miss reports, the frequency of safety training, participation in hazard identification, and the results of internal audits (Enhancing OSH performance..., 2025). These measures serve as early warning signals and support decision-making before events occur. Outcome indicators, on the other hand, include traditional measures such as accident rates, lost time injuries (LTIs), and occupational diseases. Although they measure results, they do not provide information on causes.

Kubasiński (2023) proposed an original methodology for assessing proactive actions in the context of systemic OSH management. This method combines behavior observation, task-based risk analysis, and dynamic tracking of proactive KPIs at both the individual and organizational levels. This hybrid model enables the creation of feedback loops that reinforce the continuous improvement cycle.

According to the literature, effective safety management systems in organizations integrate both types of indicators, enabling real-time monitoring and strategic adjustment (Frontiers in Environmental Health, 2025). Organizations that adopt this approach gain greater resilience, lower risk exposure, and higher employee engagement.

Proactive assessment models often rely on visualization tools such as dashboards and heat maps that illustrate the maturity of safety in individual departments. These tools are increasingly supported by digital platforms and artificial intelligence, as highlighted in research by Wen H. (2024), which demonstrated the use of knowledge graphs to assess real-time risk prediction capabilities.

3. Methods

The research presented in this article is based on a combination of actual empirical research and a literature review conducted mainly between 2019 and 2024. A significant part of the empirical results comes from the author's doctoral thesis, which included a multi-year assessment of proactive practices in occupational safety management.

The data was collected from a sample of employees working in medium-sized and large industrial companies in Poland. These companies were selected due to their advanced implementation of occupational safety systems and their declared interest in incorporating a proactive safety strategy into their broader sustainable development policy. The organizations surveyed reflect different levels of safety culture maturity and include various levels of management and operational staff.

The literature review focused on both Polish and international sources, including scientific journals, monographs, and normative documents such as ISO 45001 (ISO, 2018). Methodological triangulation combines survey results, structured interviews, and document analysis, offering a holistic approach to understanding the dynamics and impact of proactive health and safety behaviors.

The research process was divided into three main stages:

1. Identification and classification of factors stimulating proactive attitudes in the workplace.
2. Assessment of the relationship between proactive behaviors and organizational outcomes, such as employee well-being, absenteeism, and employer image.
3. Evaluation of an original method for measuring the effectiveness of proactive actions within an OHS management system.

In order to obtain qualitative information, in-depth interviews (IDI) were conducted with OHS specialists. Quantitative data was collected using a structured questionnaire (PAPI/CAWI), and the results were analyzed using descriptive statistics to identify trends and correlations. The study covered medium and large industrial companies operating in Poland.

The conceptual basis of the study is the PDCA (Plan–Do–Check–Act) cycle used in safety systems, the proactive/reactive safety model, and the integration of OHS indicators (proactive, leading and lagging) as tools for measuring safety and strategic effectiveness.

4. Results

The results presented in this chapter are based on empirical research conducted among occupational health and safety specialists and employees at various levels from 78 selected companies. They constitute a sample of comprehensive research that formed the basis for developing a method for assessing the effectiveness of proactive measures in systematic occupational safety management. The research focused on the relationship between proactive attitudes, organizational factors, and the effectiveness of safety systems.

Respondents participating in the study provided their answers in structured interviews and questionnaires. The following key areas were assessed:

- employee awareness and initiative in reporting hazards and proposing improvements,
- effectiveness of feedback systems for reporting,
- management commitment to promoting a safety culture,
- access to resources supporting proactive behavior (training, internal campaigns, suggestion reporting systems).

The results show that over 68% of respondents actively participated in reporting potentially dangerous situations, and 61% said that their suggestions led to specific changes in procedures or technical safeguards. The most frequently cited factors motivating proactive behavior included support from supervisors, clear communication, and a transparent reward system for reported safety initiatives (Figure 1).

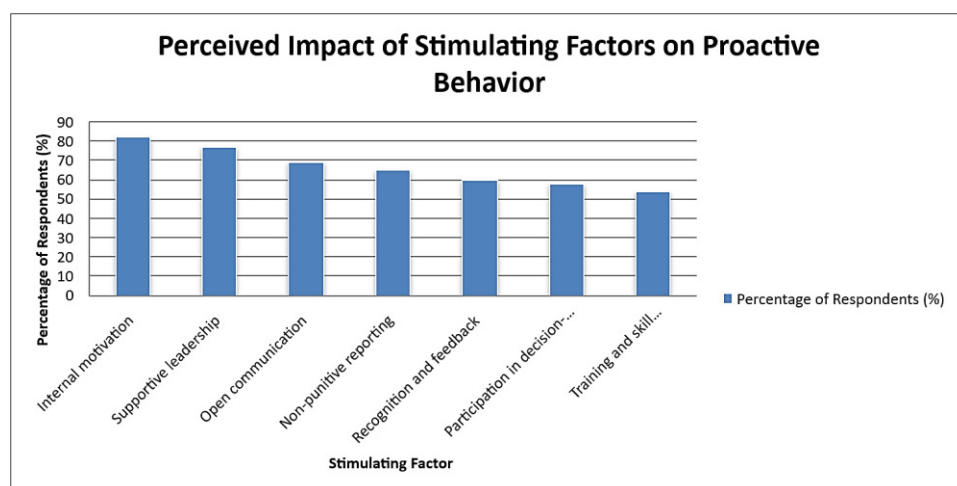


Figure 1. Factors motivating proactive behavior.

Source: own compilation.

Figure 2 illustrates the percentage of proactive engagement at different levels of the organization. The highest rate was recorded among front-line employees in companies with mature safety management systems based on ISO 45001 (ISO, 2018).

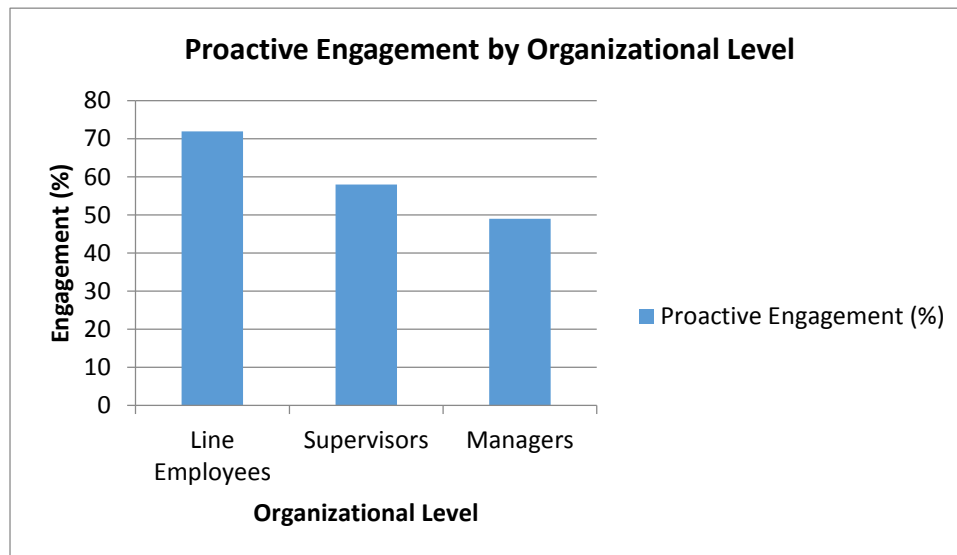


Figure 2. The percentage of proactive engagement at different levels of organization.

Source: own compilation.

This chart shows how proactive engagement decreases with the level of hierarchy, suggesting a need for integration strategies at the management level. Operational-level employees show the highest level of proactive engagement, indicating strong bottom-up commitment to safety culture.

In addition, interviews showed that in organizations that had implemented cyclical feedback systems and visual scoreboards, the number of safety suggestions was on average 35% higher than in organizations without structured systems (Figure 3).

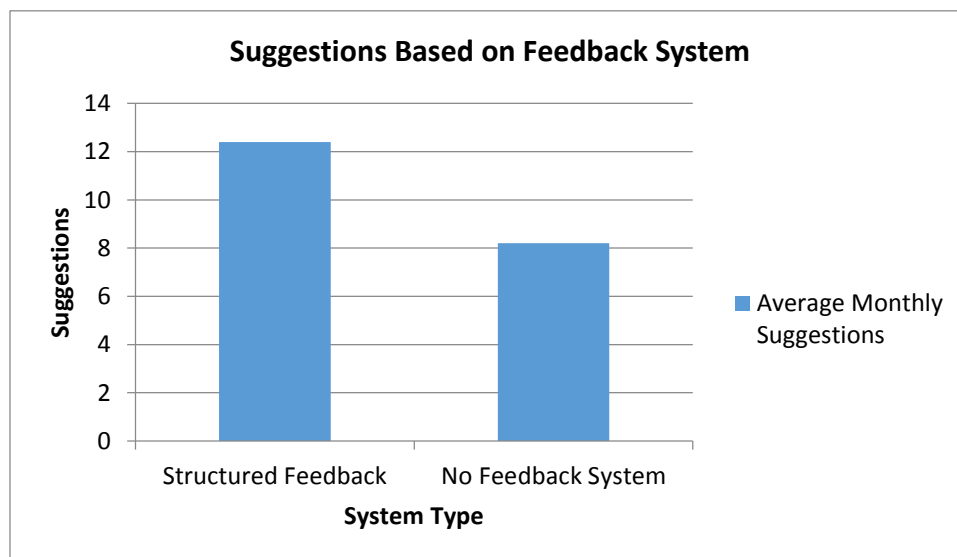


Figure 3. Safety suggestions based on the feedback system.

Source: own compilation.

The data confirm that structured suggestion collection systems significantly improve proactivity in reporting problems. Organizations with structured feedback systems report more safety suggestions from employees.

Another important finding was the high correlation ($r = 0.71$) between employees' perception of the safety climate and the number of proactive behaviors reported each quarter (Figure 4). This confirms that the atmosphere in an organization plays a significant role in mobilizing preventive actions.

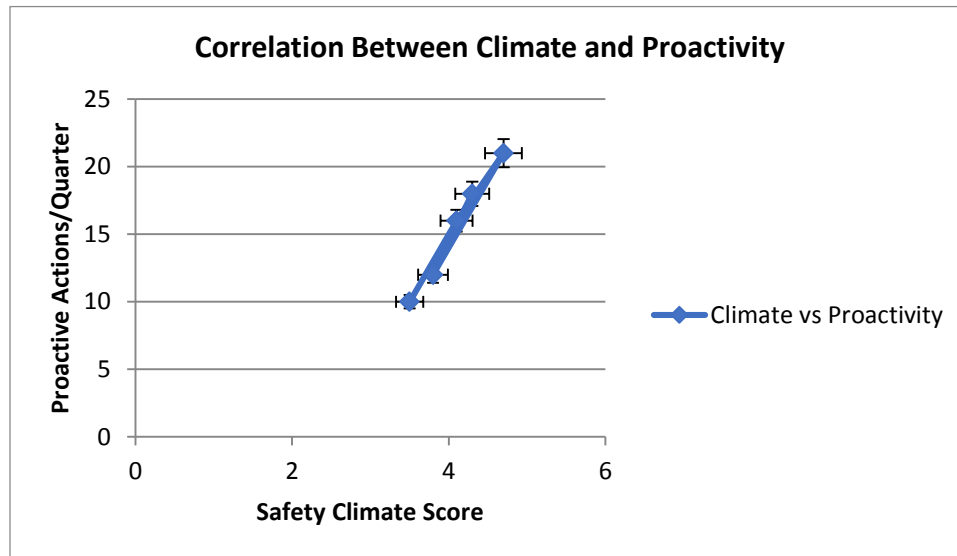


Figure 4. Correlation between safety climate and proactivity.

Source: own compilation.

A strong positive correlation can be observed, confirming the influence of the organizational climate on safety-related attitudes.

5. Discussion

The results of the study presented in Chapter 4 clearly show the importance of a proactive approach to shaping occupational safety management, especially when it is part of a broader sustainable development strategy. Quantitative data, supported by qualitative insights, indicate that companies with higher levels of proactive engagement, especially at the employee level, also report a better internal safety climate and more frequent preventive behaviors. This correlation is consistent with research findings that emphasize the importance of a preventive culture based on employee engagement and internal motivation (Neal, Griffin, 2006; Kubasiński, 2023).

The study also highlights the role of structured feedback systems and open communication mechanisms, which significantly increase the frequency of safety suggestions. These systems appear to serve both as a diagnostic tool and a catalyst for continuous improvement, as confirmed by the latest interpretations of the ISO 45001 standard (ISO, 2018).

It is important to note the differences between operational employees and management in terms of proactive engagement in safety in the companies surveyed. While operational (line) employees showed a 72% rate of proactive participation, this figure dropped significantly among middle and senior management. This result may reflect a gap between strategy and practice—a well-known problem in many hierarchical organizations (Reason, 1997). This suggests a need for targeted training and initiatives involving management to strengthen accountability for safety at all levels of management.

The discussion also covers the broader implications of a proactive approach to safety for organizational culture and social responsibility. Employees who feel empowered and have the tools to report hazards and suggest improvements contribute directly not only to reducing accidents but also to improving morale, trust in the organization, and the employer's image (Guldenmund, 2010; ILO, 2023). In this sense, occupational safety goes beyond its traditional role and becomes a strategic factor for competitiveness and sustainable development.

The limitations of the study include the relatively small number of organizations that participated and the anonymity of the entities, which limits the generalizability of the results to other sectors. Nevertheless, the patterns identified provide valuable information for practitioners and can serve as a reference point for future research in various sectors.

6. Summary and conclusions

The article analyzes the role of proactive occupational safety management as an integral part of sustainable development strategies in modern enterprises. Based on empirical data from Polish manufacturing companies and a review of the literature from 2019 to 2024, it was confirmed that an initiative-taking approach to safety significantly contributes to strengthening organizational culture, improving employee well-being, and enhancing the overall image of companies. The inclusion of ISO 45001 (ISO, 2018) standards, internal motivation, leadership, and structured feedback systems proved to be a decisive factor in promoting preventive behavior at all levels of the organization.

The results of the study argue in favor of moving away from reactive compliance to proactive value creation in occupational safety management. They also highlight the need to develop key performance indicators (KPIs) to effectively assess the effectiveness of safety initiatives. Furthermore, differences in the commitment of operational and managerial staff indicate a need for systemic adaptation and integrative leadership. The study also confirms that investing in proactive workplace safety not only supports regulatory compliance but also creates long-term value and competitive advantage.

In summary, promoting a proactive approach to workplace safety-through management involvement, feedback systems, employee motivation, and integration with sustainability strategies-delivers tangible benefits for businesses and society. These insights provide food for thought for those responsible for safety in organizations and practical applications for improving workplace safety within the framework of sustainable development.

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TOWARDS ETHICAL AI: LEGAL REGULATIONS AND MORAL FRAMEWORKS FOR BUSINESS USE OF AI IN THE EUROPEAN UNION

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Purpose: This paper critically examines ethical challenges arising from AI's application in business, focusing on human rights violations. It analyzes the EU's regulatory responses (DSA, AI Act) and discusses limitations in translating ethical aspirations into enforceable standards, challenging conventional assumptions about ethical frameworks

Design/methodology/approach: The research uses a qualitative, analytical approach. It reviews AI misconduct examples, analyzes key EU policy documents on AI ethics, and evaluates implementation challenges based on empirical findings regarding ethical guidelines' limited influence on professional conduct.

Findings: AI's rapid adoption in business (social media, e-commerce) has led to significant human rights violations. The EU has developed robust "hard law" frameworks (DSA, AI Act) grounded in human rights. However, a crucial gap exists between these aspirations and practical implementation, exacerbated by formal regulations preceding informal norms and erroneous assumptions about ethical awareness. Regulatory lag persists, and economic incentives often override ethics, leading to "ethics washing."

Research limitations/implications: This research relies on literature and policy reviews, limiting empirical depth. Future work should include empirical studies and stakeholder interviews to understand implementation barriers. Findings imply a need for research into innovative enforcement, ethical AI design, and educational approaches to bridge the cognitive-behavioral gap.

Practical implications: Policymakers must focus on robust enforcement and multi-level governance. Businesses need to deeply integrate ethics into AI design and corporate culture, moving beyond "ethics washing." Effective frameworks must address behavioral aspects, providing actionable tools and fostering accountability.

Social implications: Failure to implement AI ethics effectively can perpetuate human rights violations and deepen inequalities. Successful implementation of the EU's human-centric approach can foster a more just and equitable digital society, ensuring technology serves humanity.

Originality/value: This paper offers original value by analyzing the interplay of AI innovation, ethical challenges, and EU regulation. It highlights the unusual sequence of formal institutions

preceding informal ones in AI ethics and questions the efficacy of traditional ethical frameworks without robust enforcement. It contributes to responsible AI governance discourse.

Keywords: AI Ethics, UE regulations in AI, Ethical codes, ethical attitudes, ethical work place.

Category of the paper: Conceptual paper, Literature review.

1. Introduction

One of the primary goals of business ethics, as an applied field, is to propose ethical standards of conduct relevant to business activities. Following Michael Walzer's (1987) method of interpretation, as reinterpreted in "Ethics and Human Rights in Business: In Search of a Method" (Sroka, 2016), research in business ethics typically begins with an attempt to describe the existing situation. Based on this assumption, the starting point for research conducted by business ethicists often revolves around current events and trends related to corporate activities. This perspective similarly guides the present article.

The pervasive integration of Artificial Intelligence (AI) into contemporary business models has undeniably propelled unprecedented innovation and economic growth across diverse sectors. From optimizing resource allocation to personalizing services, AI-driven solutions offer substantial societal and environmental benefits (European Parliament & Council of the European Union, 2024; PARP, 2020). Indeed, a significant majority of companies are actively leveraging or exploring AI applications, with rapid acceleration in adoption observed globally and substantial investments being made, including in countries like Poland (IBM, 2023; Maslej et al., 2025; Uchwat, 2025). In this article, we are interested in the ethical challenges related to the application of Artificial Intelligence (AI) in the business models of enterprises. Specifically, we focus on the potential negative impact of using AI systems by enterprises on human rights and fundamental rights within the European Union. In business, AI ethics refers to developing and using AI technology within a strict ethical framework based on values related to non-discrimination, privacy, individual rights, and non-manipulation (Lawton, 2023; Waseem, Kumar, 2017). Businesses that prioritize ethical AI don't merely stay within legal limits; they often set policies that exceed legal requirements to ensure the AI they develop and use causes no harm (Maryville University, 2023).

The ethical implications of AI in business are particularly evident in areas such as social media and e-commerce. For instance, the algorithms underpinning social media platforms, designed to maximize user engagement and advertising revenue, have been implicated in facilitating psychological and physical violence, contributing to mental health issues, and even enabling acts of genocide (Fisher, 2022; Pariser, 2011; Sunstein, 2001; Wu, 2016; Zuboff, 2019). Similarly, the e-commerce industry, while fostering economic growth, grapples with ethical dilemmas stemming from dishonest sales practices, intellectual property infringement, and the exploitation of vulnerable individuals through sophisticated profiling and micro-

targeting techniques (Gray et al., 2018; Hong, Kim, 2018; Livingstone, Helsper, 2008; Turow, 2011; Waseem, Kumar, 2017). These examples highlight a broader spectrum of ethical challenges associated with AI's commercial application, including the amplification of biases, data privacy violations, and issues related to accountability and explainability (Lawton, 2023; Simonova, 2022).

In response to these escalating concerns, international bodies, most notably the European Union (EU), have proactively engaged in developing robust regulatory frameworks. The EU's initiatives, such as the European Declaration on Digital Rights and Principles for the Digital Decade (European Commission, 2023a), the Ethics Guidelines for Trustworthy AI (High-Level Expert Group on Artificial Intelligence, 2019), the Digital Services Act (DSA) (European Parliament & Council of the EU, 2022), and the landmark AI Act (European Parliament & Council of the European Union, 2024), collectively aim to establish a human-centric approach to AI governance. These legislative efforts seek to embed fundamental rights and ethical principles—including human agency, safety, privacy, transparency, fairness, and accountability—into the design, development, and deployment of AI systems. The DSA, for example, mandates comprehensive risk assessments for very large online platforms, explicitly targeting potential negative effects on fundamental rights and civic discourse, while the AI Act introduces stringent regulations for high-risk AI systems.

Despite these significant strides in formalizing AI ethics through "hard law", a persistent gap remains between regulatory intent and practical implementation. Empirical evidence suggests that ethical guidelines and codes of conduct, when lacking robust enforcement mechanisms, often have a negligible impact on the actual decision-making of technology professionals (McNamara, Smith, Murphy-Hill, 2018). This "regulatory lag"—where formal institutions struggle to keep pace with rapid technological advancement—means that many unethical practices and human rights violations by AI-driven businesses become entrenched before comprehensive regulations can effectively address them (Smuha, 2025; Zuboff, 2019). This paper argues that while the EU's proactive regulatory stance is commendable and crucial, the effectiveness of these formal institutions is undermined by the premature emergence of regulations prior to the development of widespread informal ethical norms, coupled with a fundamental misunderstanding of how ethical principles translate into practical conduct. The aim of this article is to indicate sample strategies for implementing ethical frameworks that can effectively shape new institutions within an economy increasingly reliant on advanced digital solutions, especially in the field of AI systems. This framework aligns with the statement on the role of ethics articulated by Paul Ricoeur (1992): "aiming at a good life lived with and for others in just institutions".

This paper proceeds as follows: Section 2 delineates the existing landscape of AI misconduct in business, providing illustrative examples of human rights and fundamental rights violations by AI-powered enterprises. Section 3 examines the key declarations, recommendations, and legislative acts introduced by the European Union to address ethical

considerations in digital solutions and AI, highlighting their core values and regulatory mechanisms. Finally, Section 4 critically analyzes the challenges inherent in the implementation of these ethical regulations, discussing the limitations of current enforcement mechanisms and the pervasive disconnect between aspirational ethical frameworks and actual corporate conduct.

2. The existing situation - examples of AI misconduct in business

As noted in the introduction, we begin our research with an attempt to describe the existing situation, starting with the presentation of selected examples of human rights and fundamental rights violations by business. These enterprises base their business models, including products and services, as well as methods of introducing these products and services to the market, on solution utilizing AI. The use of AI in companies is becoming increasingly popular. According to an IBM survey, approximately 82% of all companies are either currently using or exploring the application of AI (IBM, 2023). The number of newly funded generative AI startups has nearly tripled, and AI adoption in business accelerated significantly in 2024 (Maslej et al., 2025). Forecasts indicate that the global AI market will reach over \$190 billion by 2025, with as many as 97% of the largest international companies implementing AI-based solutions (Polska Agencja Rozwoju Przedsiębiorczości [PARP], 2020). Poland is also actively participating in this trend, investing 1.8 billion PLN in AI technologies in 2024 and intensively developing its local AI ecosystem (Uchwat, 2025).

One of the most thoroughly examined areas of AI in business models from an ethical standpoint is social media (Zuboff, 2019). These platforms primarily generated revenue from advertising sales. The more people see a particular advertisement, the greater the benefits for the owners of digital platforms (Wu, 2016). However, this is only one element of this business model. Another aspect is the precise targeting of the advertisement to recipients who may be particularly interested in a given product or service. Therefore, these platforms collect detailed information about users (Zuboff, 2019). This allows for the creation of an exact user profile and enables precise delivery of marketing message. Thus, the task of algorithms used by digital platform is to capture the attention of a user as long as possible and to determine their profile as accurately as possible (Wu, 2016; Zuboff, 2019). To accomplish this, algorithms suggest increasingly radical content to users, allowing for greater emotional and temporal engagement on the platform (Pariser, 2011; Sunstein, 2001). As a result, as demonstrated by numerous researchers (Fisher, 2022), the way algorithms operate has led to acts of psychological and physical violence, mental health issues for users, suicides, and even cases of genocide.

Another example. Online stores also utilize customer profiling and micro-targeting mechanisms. The e-commerce industry fosters economic growth for individual companies, but its activities also come with ethical challenges. These include dishonest sales practices, infringement of intellectual property, and the exploitation of vulnerable individuals who are particularly susceptible to manipulation, such as children, the elderly, or those struggling with mental illnesses (Waseem, Kumar, 2017).

The e-commerce industry fosters economic growth for individual companies, but its activities also come with ethical challenges (Waseem, Kumar, 2017). These include dishonest sales practices (Grazioli, Jarvenpaa, 2000), infringement of intellectual property, and the exploitation of vulnerable individuals, such as children (Livingstone, Helsper, 2008), the elderly (Hong, Kim, 2018), or those struggling with mental illnesses, who are particularly susceptible to manipulation through micro-targeting and dark patterns (Gray et al., 2018; Turow, 2011).

As the United Nations B-Tech paper on business models reflects, despite the positive impacts of technological innovation on society, technology company business models are increasingly criticized for creating or exacerbating human rights harms, threatening democratic values, and deepening inequalities (B-Tech Community of Practice, 2021). For example, business models that seek to increase engagement encourage divisive and inflammatory content that leads to online and offline harms (Gorwa, Caplan, 2019; Tucker, Roberts, 2020); short-term rental platforms that escalate rental prices and reduce housing stocks disproportionately impacting poorer residents (Barron et al., 2018; Wachsmuth, Weisler, 2018); and gig-economy companies that make a profit from workers delivering services without basic labor rights protection (De Stefano, 2016; Schor, Attwood-Charles, 2019).

George Lawton (2023) lists eight main ethical challenges related to the use of AI in business. He includes the following: *Distribution of harmful content; Copyright and legal exposure; Data privacy violations; Sensitive information disclosure; Amplification of existing bias; Workforce roles and morale; Data provenance; Lack of explainability and interpretability*. Margarita Simonova (2022) points out that we need to try to develop ethical answers to the following questions related to an economy based on AI: *How do we deal with unemployment?; How can we equitably distribute the wealth created by machines?; Can machines influence our behavior and interactions?; How do we guard against possible detrimental mistakes?; Can we eliminate AI bias?; How do we protect AI from adversaries?; How can unintended consequences be avoided?; Is there any way we could remain in total control of AI?; Should humane treatment of AI be considered?* An ethical discussion around these questions is still ongoing. One of the key platforms for this discussion is the European Union, specifically its institutions. Let's take a closer look at the attempts made by EU institutions to address the ethical challenges associated with the application of AI in business.

3. European Union declarations, recommendations, and legislative acts that encompass ethical considerations and digital solutions and AI

Over the past few years, the European Union has developed several important declarations, recommendations, and legislative acts that contain ethical considerations and digital solutions, including AI. Below, four selected documents will be presented: the European Declaration on Digital Rights and Principles for the Digital Decade (European Commission, 2023a), Ethics Guidelines for Trustworthy AI (High-Level Expert Group on Artificial Intelligence, 2019), Digital Services Act (European Parliament & Council of the EU, 2022) and AI Act (European Parliament & Council of the European Union, 2024).

3.1. General norms and main values in EU documents regulating AI

European Declaration on Digital Rights and Principles for the Digital Decade was proclaimed by the European Parliament, the Council, and the Commission in December 2022. Through this Declaration, the EU institutions aim to promote the European path to digital transformation, where people are at the forefront, based on European values and the fundamental rights of the EU. It reaffirms universal human rights, benefiting all individuals, businesses, and society as a whole. The document emphasizes that in the digital transformation of the European Union, the human being is paramount. Technology should serve and benefit all people residing in the EU, enabling them to full and safety purpose their aspirations while respecting their fundamental rights.

The authors of the Declaration pointed out that technology should be used to connect people, not to divide them. The digital transformation should foster a just and inclusive society, as well as a fair and inclusive economy in the EU. In this way, they addressed the key negative impacts on fundamental rights of companies using AI. The document discusses fundamental rights in the context of risks associated with the digital economy. It is worth noting that the EU associates the ethics of new digital technologies with human rights and fundamental rights, placing human well-being at the centre of AI ethics (European Parliament, Council, & European Commission, 2023).

This is not surprising, especially considering that such an approach was presented in the first significant document commissioned by the European Commission from the High-Level Expert Group on AI titled “Ethics Guidelines for Trustworthy AI” from 2019. As stated in the Guidelines, the aim is to promote trustworthy AI. Trustworthy AI possesses three characteristics that must define a system equipped with it throughout its lifecycle: a. it should be in compliance with the law, meaning it adheres to all applicable legal regulations and executive orders; b. it should be ethical, ensuring conformity with ethical principles and values, and c. it should be robust from both a technical and societal perspective, as AI systems can use

unintended harm even when used in good faith (High-Level Expert Group on Artificial Intelligence, 2019).

Key guidance derived from Chapter I of this document include following tips: First of all it is necessary to develop, deploy and use AI systems in a way that adheres to the ethical principles of: respect for human autonomy, prevention of harm, fairness and explicability. Then it is recommended acknowledge, and address the potential tensions between these principles. Document pays also particular attention to situations involving more vulnerable groups such as children, persons with disabilities and others that have historically been disadvantaged or are at risk of exclusion, and to situations which are characterized by asymmetries of power or information, such as between employers and workers, or between businesses and consumers (High-Level Expert Group on Artificial Intelligence, 2019).

Authors of this document underlined that while bringing substantial benefits to individuals and society, AI systems also pose certain risks and may have a negative impact, including impacts which may be difficult to anticipate, identify or measure e.g. on democracy, the rule of law and distributive justice, or on the human mind itself. The document recommends adopting adequate measures to mitigate these risks when appropriate, and proportionately to the magnitude of the risk. One of the recommendations assumes ensure that the development, deployment, and use of AI systems meets the seven key requirements for Trustworthy AI: *1. human agency and oversight, 2. technical robustness and safety, 3. privacy and data governance, 4. transparency, 5. diversity, non-discrimination and fairness, 6. environmental and societal well-being and 7. accountability* (High-Level Expert Group on Artificial Intelligence, 2019). Companies should consider technical and non-technical methods to ensure the implementation of those requirements. The above-mentioned Guidelines proposed a comprehensive standard of ethical AI and various tools which allow practical implementation ethical standard into companies using solutions based on AI.

Regulators, in this context, generally represent a worldwide consensus, as the meta-analysis of 22 ethical guideline concludes. Values which appear in at least 3/4 of analysed documents are: privacy protection, fairness, non-discrimination, justice, accountability, transparency, openness, safety, cyber security, common good, sustainability and well-being (Hagendorff, 2020). This remarkable convergence of principles across diverse regulatory and ethical frameworks underscores a global acknowledgement of AI's profound societal implications and the shared imperative for its responsible development and deployment. However, as extensive academic analysis reveals, the agreement on high-level principles often belies significant challenges in their concrete interpretation, operationalization, and prioritization in practice (Voeneky et al., 2022). For instance, the concept of 'fairness' in AI can involve intricate trade-offs between different definitions of equity (e.g., individual vs. group fairness), while ensuring 'transparency' or 'explainability' remains a complex technical and ethical hurdle, particularly for advanced AI systems (Smuha, 2025). Moreover, establishing robust 'accountability' mechanisms for AI's impacts, especially in complex, distributed systems, necessitates

innovative legal and governance solutions beyond mere adherence to abstract principles (Voeneky et al., 2022). This ongoing negotiation between aspirational ethical guidelines and the multifaceted realities of AI development and deployment represents a crucial frontier in contemporary policy and academic discourse.

3.2. Social media and digital platform regulations

As mentioned above, one of the most well-documented unethical consequences of utilizing AI in business models pertains to social media and, more broadly, digital platforms. Therefore, it is worth paying attention to the regulations of the European Union known as the Digital Service Act.

There are more than 10,000 platforms in the EU, with over 90% being small and medium-size enterprises, according to Commission estimates (European Commission, n.d.). However, this regulation introduces the strictest ethical criteria for the largest platforms and search engines, i.e., those over 45 million active users in Europe. This is because they have the greatest social impact, also in terms of influencing respect for fundamental rights. In 2022, 18 platforms belonging to 12 companies declared over 45 million active users in Europe, which means they will be subject to new regulations for very large platforms and search engines resulting from the Digital Service Act. Among all platforms, YouTube declared the highest number of active users – over 401 million, which is almost 90% of the EU population. In second place is the search engine Google (over 332 million), followed by Google Maps (278 million). The list includes two search engines, two app stores, four marketplaces, Wikipedia, Google Maps, and a total of eight social media services. Alphabet - the parent company of Google has five services on this list, Meta and Microsoft have two each, and the remaining companies have one each. Amazon, Apple, Pinterest, Alibaba, and Booking.com only indicated that they have over 45 million active users in the EU, without specifying the exact number (Chabros, 2023). It is worth emphasizing that among the companies declaring to exceed the threshold, not a single one is European.

For this paper, it is particularly pertinent to examine Article 34 of the Digital Services Act (European Parliament & Council of the European Union, 2022), which mandates that covered entities, especially Very Large Online Platforms (VLOPs) and Very Large Online Search Engines (VLOSEs), conduct a comprehensive risk assessment, or 'risk map.' This requirement signifies a pivotal shift in platform accountability, moving beyond mere reactive content moderation towards a proactive identification and mitigation of systemic risks. These assessments must be specific to the service and proportionate to the potential harms, taking into consideration both their severity and probability.

Crucially, Article 34 defines an expansive scope of systemic risks that platforms must address. Beyond the immediate concern of disseminating illegal content, the regulation explicitly targets any actual or foreseeable negative effects on fundamental rights, including human dignity, private life, data protection, freedom of expression and information (including

media pluralism), non-discrimination, the rights of the child, and high-level consumer protection. Furthermore, the required risk analysis extends to potential harms to civic discourse and electoral processes, public security, gender-based violence, public health, and minors, as well as serious negative consequences for individuals' physical and mental well-being.

This broad and detailed enumeration of risks underscores the EU's holistic understanding of the profound societal impact of digital platforms and AI-driven business models. As scholars in the field highlight, requiring platforms to internalize and proactively manage such a diverse array of systemic harms represents a significant step towards greater corporate responsibility (Voeneky et al., 2022). It moves beyond traditional liability for individual harmful acts to address the inherent design choices and algorithmic amplifications that can create or exacerbate societal-level problems. The inherent complexity in identifying, measuring, and mitigating these multifaceted 'foreseeable negative effects'—ranging from threats to democratic processes to subtle impacts on mental well-being—presents substantial technical and ethical challenges for platform operators (Smuha, 2025). This robust risk assessment framework, therefore, represents a foundational component of the EU's comprehensive effort to define an ethical and human-centric framework for business models based on AI, reflecting a global consensus on the values AI systems should uphold while pushing the boundaries of regulatory oversight.

3.3. High risk AI

The last of the documents worth highlighting in the context of presenting the European Union's approach to AI ethics is AI Act (European Parliament & Council of the European Union, 2024). It is the world's first regulation prepared for artificial intelligence. It pertains specifically to high-risk AI systems, those that pose a risk to health and safety or a risk of adversely affecting fundamental rights. The authors of the document emphasize that AI is a rapidly developing group of technologies that can bring various socio-economic benefits in all industries and areas of social activity. AI-based business models and solutions enable better forecasting, optimization of operations and resources allocation, and customization of services provided, resulting in outcomes that are beneficial from a social and environmental perspective. This provides business and the European economy with a crucial competitive advantage. Such actions are particular needed in high-impact sectors, including climate change, environmental protection and health, in the public sector, in finance, mobility, internal affairs, and agriculture. The same element and techniques that bring socio-economic benefits from the use of AI are also associated with new types of risks and adverse consequences experienced by individuals or society. Therefore, hard law on AI based of ethical standards proposed by over-mentioned EU documents is needed.

As an example of formal institutions, the requirements in this regard contained in an article 49 of the Regulation on a Single Market For Digital Services can be cited. According to the article 49 the Member States shall designate one of the competent authorities as their Digital Services Coordinator. The Digital Services Coordinator shall be responsible for all matters

relating to supervision and enforcement of this Regulation in that Member State, unless the Member State concerned has assigned certain specific tasks or sectors to other competent authorities. The Digital Services Coordinator shall in any event be responsible for ensuring coordination at national level in respect of those matters and for contributing to the effective and consistent supervision and enforcement of this Regulation throughout the Union. For that purpose, Digital Services Coordinators shall cooperate with each other, other national competent authorities, the Board and the Commission, without prejudice to the possibility for Member States to provide for cooperation mechanisms and regular exchanges of views between the Digital Services Coordinator and other national authorities where relevant for the performance of their respective tasks (European Parliament & Council of the EU, 2022). This multi-level governance structure, with national Digital Services Coordinators playing a central role in conjunction with EU bodies, is critical for the effective and consistent application of the DSA across the Union's diverse legal landscapes (Smuha, 2025). However, ensuring seamless cooperation and uniform interpretation across Member States presents inherent challenges, particularly given the rapid evolution of digital services and the cross-border nature of their operations, which are often discussed in scholarly analyses of digital governance (Voeneky et al., 2022).

In the AI Act, the EU also requires the Member States to establish appropriate bodies responsible for overseeing the implementation and enforcement of regulations regarding artificial intelligence. An article 30 called notifying authorities describe that each Member State shall designate or establish a notifying authority responsible for setting up and carrying out the necessary procedures for the assessment, designation and notification of conformity assessment bodies and for their monitoring. It means that Member States may designate a national accreditation body (European Parliament & Council of the European Union, 2024). This specific requirement for national notifying authorities underscores the granular, technical infrastructure deemed necessary for the effective governance of AI. By entrusting Member States with the designation of bodies responsible for conformity assessment and monitoring, the AI Act implicitly acknowledges the need for specialized technical expertise and localized oversight crucial for ensuring high-risk AI systems meet stringent regulatory standards (Smuha, 2025). This decentralized yet harmonized approach is key to translating the Act's ambitious legal requirements into actionable, verifiable compliance across diverse sectors and national contexts (Voeneky et al., 2022).

The implementation of the Digital Services Act (DSA) in Poland has faced notable challenges, highlighting difficulties inherent in transposing comprehensive EU digital regulations into national law (Traple.pl, n.d.). Despite the deadline passing in February 2024, Poland had not fully adopted the necessary national legislation to enforce the DSA, a delay that prompted the European Commission to initiate formal infringement proceedings. This situation exemplifies broader complexities in multi-level governance within the EU, where the

effectiveness of Union-wide digital policy often hinges on robust and timely national implementation frameworks (Smuha, 2025).

As an interim measure, the President of the Office of Electronic Communications (UKE) was temporarily appointed as the Digital Services Coordinator. However, this temporary role is primarily for technical and organizational obligations, lacking the full authority to make binding decisions against intermediary service providers and users (Trapple.pl, n.d.). This limited empowerment of national oversight bodies can hinder the consistent and effective enforcement crucial for regulations like the DSA, potentially creating a gap between legislative intent and practical application (Voeneky et al., 2022). The main impediment to the DSA's effective operation in Poland is indeed the absence of a comprehensive national act that would establish proper oversight mechanisms, define penalties for non-compliance, and outline administrative and appeal procedures, thus hindering the full protection intended for internet users. Furthermore, the Ministry of Digital Affairs is actively working on these legislative gaps, including careful consideration of mechanisms for blocking illegal content to safeguard constitutional guarantees of freedom of speech (Trapple.pl, n.d.), a critical balance that continues to be a central point of academic debate in digital governance and human rights scholarship (Smuha, 2025).

3.4. Regulatory policies – summary

As a crucial conclusion drawn from this analysis, it can be asserted that in the contemporary landscape of AI utilization in business, the establishment of formal institutions – specifically regulations and designated oversight organizations – is, unusually, preceding the robust formation of informal institutions, such as widely accepted norms and customs. This represents a significant departure from historical patterns of institutional development, where emergent social practices and informal understandings typically laid the groundwork for subsequent formalization through law (Smuha, 2025). This reversal is primarily driven by the unprecedented speed of technological advancement and the rapid emergence of novel AI-driven business models, products, and services that quickly scale and impact society before societal consensus or customary practices can coalesce (Voeneky et al., 2022).

Despite this altered sequence, the persistent challenge of regulatory lag remains unchanged. Formal institutions, even when proactively developed, still tend to emerge too late to prevent many unethical practices of companies, as well as recurring instances of human rights violations. The "age of surveillance capitalism", as described by Zuboff (2019), vividly illustrates how data exploitation and algorithmic manipulation became entrenched business models long before comprehensive regulations like the GDPR or DSA began to address them. Similarly, concerns around algorithmic bias, privacy infringements (Acquisti et al., 2015), the spread of misinformation (Pariser, 2011; Sunstein, 2001), dark patterns in user interfaces (Gray et al., 2018), and the precarity in platform work (De Stefano, 2016; Schor, Attwood-Charles, 2019) became widespread issues well before the advent of specific "hard law"

instruments. This persistent gap underscores the dynamic tension between rapid technological innovation and the necessarily slower, deliberative pace of ethical and legal institutionalization, emphasizing the ongoing need for adaptive and anticipatory governance frameworks in the digital age.

4. Implementation of the ethical regulations and conduct

Ethical regulations often lack a robust system for enforcement, and there are generally no immediate repercussions for deviations from established ethical codes. Even when ethics are formally integrated into institutions or corporate policies, they tend to serve primarily as a marketing tactic or "ethics washing", rather than truly guiding practice (Hagendorff, 2020). In practical terms, AI ethics is frequently viewed as something extraneous, an optional addition to technical concerns, or an unenforceable framework imposed by external institutions upon the technical community. This perception is often exacerbated by the fact that economic incentives frequently take precedence over ethical principles and societal values (Frey, Oberholzer-Gee, 1997; Zuboff, 2019). Consequently, this pervasive misalignment means that the development and application of AI systems may not inherently associate with fundamental societal values or human rights, including principles like beneficence, non-maleficence, justice, and transparency, which are widely recognized as cornerstones of trustworthy AI (High-Level Expert Group on Artificial Intelligence, 2019; Voenekey et al., 2022). This gap between ethical aspiration and practical implementation underscores the limitations of "soft law" approaches alone and highlights the persistent challenge of translating high-level principles into actionable and enforceable standards for the rapidly evolving digital economy.

Additionally, empirical experiments underscore the limited influence of ethical guidelines on the practical decision-making of software developers. A primary discovery from a study conducted by McNamara, Smith, and Murphy-Hill (2018) indicated that the effectiveness of ethical guidelines or codes is nearly negligible, failing to significantly impact the behavior of professionals within the technology community. This finding provides concrete empirical support for the argument that ethical regulations often lack robust enforcement mechanisms and can be perceived as an unenforceable framework, as discussed previously.

The study rigorously examined 63 software engineering students and 105 professional software developers, presenting them with eleven scenarios involving ethical decisions related to software development. These scenarios covered critical areas such as responsibility to report, user data collection, intellectual property, code quality, honesty to customers, and time and personnel management. The aim was to assess whether the mere presence of ethics guidelines had a discernible influence on ethical decision-making across six different situations. Their findings were stark: "No statistically significant difference in the responses for any

vignette were found across individuals who did and did not see the code of ethics, either for students or for professionals" (McNamara, Smith, Murphy-Hill, 2018, p. 245). This empirical evidence strongly suggests that merely promulgating ethical codes or principles, without robust enforcement, accountability mechanisms, or deeply integrated ethical training, is insufficient to guide behavior in practice. Such observations reinforce critical discussions within AI ethics scholarship regarding the limitations of "soft law" approaches and the necessity of complementary "hard law" regulations, as seen in the Digital Services Act (European Parliament & Council of the European Union, 2022) and the AI Act (European Parliament & Council of the European Union, 2024), to ensure compliance and uphold societal values beyond voluntary adherence (Hagendorff, 2020; Smuha, 2025).

It should be no surprise then, given the empirical findings, that ethical guidelines often fall short in practice. Nevertheless, when there's a demand to familiarise moral perspectives in response to an increasing array of new ethical challenges or when a moral crisis unfolds within a particular domain of public life or a specific profession, we typically resort to, all too familiar, regulatory tools. The initial method to address the emergence of a moral crisis is to endeavour to regulate the objectionable conduct, and in such situations, a conventional approach is to formulate an ethical code. Ethic professionals, in fact, have known for quite a while that codes of conduct do not automatically foster better behaviour (Hagendorff, 2020). As the empirical study by McNamara, Smith, and Murphy-Hill (2018) demonstrated, the mere presence of such codes had a negligible impact on software developers' ethical decision-making, reinforcing the long-standing understanding that principles alone are often insufficient to drive behavioral change in complex professional environments. This consistent reliance on codes, despite known limitations, underscores a pervasive challenge in translating ethical aspirations into tangible, enforceable conduct.

This situation is built upon two commonly held but erroneous assumptions that often undermine the efficacy of ethical frameworks. Firstly, many people naively and somewhat unrealistically hold a belief in ethical intellectualism. They assume that merely identifying and labeling morally objectionable attitudes and behaviors will automatically result in people behaving morally. However, recognizing a moral wrong is just the initial step in defining what a moral action truly entails. As articulated through Ovid's enduring confession, "Video meliora, proboque, deteriora sequor" (I see and approve of the better, but I follow the worse) (*Metamorphoses*, 7.20-21), it has been widely accepted for centuries that taking morally upright actions requires more than just an awareness of our moral obligations. This cognitive-behavioral gap explains why the empirical findings on the limited impact of ethical codes on developers' decisions are unsurprising (McNamara, Smith, Murphy-Hill, 2018).

The second false assumption is that individuals desire clear, unambiguous, and definitive instructions on how to act morally. If individuals possess a formal right, a set of procedural rules, or a code of conduct, they tend to view it as the ultimate guide for determining what is morally right. In such a situation, they don't need to contemplate "what I should do"; they can

simply check "what the code requires" (Kucz, 2019). In essence, this type of prescriptive instruction alleviates them from the constant need to carry personal responsibility when confronted with complex moral challenges and allows them to depend on a code to discern what is considered moral. The very need to frame such codes is cyclical, emerging predominantly in professions and public institutions facing a crisis, or where there is "insufficient" ordinary honesty and personal uprightness. As Środa (1994) succinctly put it, "The weaker individual decency, the more demands for codes". This highlights a critical challenge for the implementation of AI ethics, as it points to a potential over-reliance on formal guidelines as a substitute for fostering intrinsic ethical reasoning and accountability within organizations (Hagendorff, 2020).

Leszek Kołakowski, in his classic essay "Etyka bez kodeksu" (Ethics without a Moral Code), provides a profound philosophical basis that shatters any misconceptions about the inherent efficacy of codes of ethics. Kołakowski highlights fundamental shortcomings of "codex-ridden thinking" that are intrinsically linked to the very concept of codifying ethical principles. He introduces the concept of the asymmetry of duties and claims, arising from the tension between the duties we undertake ourselves and the assertion of a right to demand similar duties from others, such that everyone in a comparable situation recognizes the same duty.

Kołakowski points out that the fundamental distinction between legal and moral standards lies in the fact that legal standards are universally binding and enforceable, while moral standards are often only binding or truly meaningful in specific, nuanced cases. He further notes that the most morally valuable actions are precisely those that cannot be demanded from everyone as an absolute, universal duty. True moral heroism, he argues, is rooted in the unique, often supererogatory nature of an action taken, rather than mere compliance with a universal obligation (Kołakowski, 2010). This resonates strongly with the empirical findings that ethical guidelines have minimal influence on developers' actual decisions (McNamara, Smith, Murphy-Hill, 2018), as it suggests that the most impactful ethical behaviors may transcend simple rule-following.

Kołakowski emphasizes the "cogito factor" as the final element in defending the asymmetry of duties and claims. This implies that not all moral decisions can be translated into a universal duty. For instance, a personal decision regarding the choice between one's own interests and someone else's interests cannot, in a specific situation, simply reference an assessment that a third party has the right to universally endorse this decision. Attempting to formulate such a personal moral choice in the third person, as a universal prescription, leads to an inherent contradiction (Kołakowski, 2010). Building on this philosophical foundation, Kołakowski asserts that every ethical code will inherently have flaws because these flaws stem from the intrinsic nature of any attempt to create an ultimate, universally applicable moral guideline, rather than from a mere misformulation of a particular principle (Kołakowski, 2010). This comprehensive critique thus reinforces the arguments from the preceding paragraphs that a reliance on codes alone shifts responsibility and fails to foster genuinely ethical behavior,

particularly in complex and rapidly evolving domains like artificial intelligence, where moral challenges are often highly contextual and resistant to rigid codification (Kucz, 2019; Środa, 1994).

Because we acknowledge the very possibility of crafting an ethical code, we must also be prepared to grapple with inherent conflicts between different values. Given Kołakowski's "cogito factor", it becomes apparent that it is impossible to establish a universal rule that definitively dictates which value should take precedence over another in every given situation (Kołakowski, 2010). In this complex context, it is crucial to consider Kołakowski's profound conclusion that each moral choice is simultaneously a form of resignation – an acknowledgment that choosing one path means foregoing others (Kołakowski, 2010). This realization is essential both to gather the strength to cope with the adverse consequences of making difficult choices and to maintain an open perspective for alternative choices in similar future situations. Furthermore, this awareness is vital for accepting the choices of others that may not align with our own. Without such critical awareness, we might incorrectly conclude that codes and regulations provide complete instructions on how to become an "ideal individual" (Kucz, 2019). Even worse, rigid adherence to a code can deceive us into thinking that we are already ideal, absolving us of deeper moral scrutiny (Hagendorff, 2020).

We can therefore conclude that in the context of AI development, the distributed nature of responsibility across various technical and organizational roles, combined with a lack of critical awareness regarding long-term and broader societal consequences, might lead software developers to feel disconnected from the full moral significance of their work and a diminished sense of personal accountability. This diffusion of responsibility, often inherent in large-scale technological projects, allows potentially harmful outcomes to materialize without a clear point of ethical intervention (Zuboff, 2019; Voenekey et al., 2022). The challenges highlighted by Kołakowski thus gain renewed relevance, emphasizing that genuine ethical conduct in AI necessitates more than just adherence to codified rules; it demands continuous individual moral deliberation, an acceptance of ambiguity, and a profound awareness of the far-reaching societal impacts of technological decisions.

4.1. Implementation of moral conduct

To explain our approach to the implementation of moral conduct, we must return to the definition of ethics by Paul Ricoeur, as recalled at the beginning of this analysis. This definition, broadly encompassing the will of the individual, the perspective of "being with and for the other", and the role of institutions, provides a holistic framework for understanding ethical action (Ricoeur, 1992). To fully grasp the issue at hand, it is important to recognize that the moral aspect of our actions comprises several elements: a cognitive awareness of the moral nature of our conduct; an emotional response, such as empathy, sadness, fear, or a pang of conscience, which prompts us to take action; and finally, the decision to act, driven by the perceived moral challenge.

In the context of moral conduct, it is crucial to also consider the role of incentives. Similar to the creation and reliance on ethical codes, the use of external incentives can, to some extent, allow organizations to avoid directly addressing the issue of genuine individual moral responsibility. This is because another decision-maker – typically management or an organizational system – determines which actions are desirable and what incentives should be offered to employees. In such a scenario, the primary focus shifts to the second and third components of moral conduct: how to persuade individuals to act in alignment with what is externally deemed "right" (Frey, Oberholzer-Gee, 1997). However, the fundamental challenge is that external stimuli often supplant genuine intrinsic moral motivation and begin to dictate choices, leading to an externalized locus of ethical control (Zuboff, 2019). This echoes the earlier finding that economic incentives frequently override ethical principles, creating a misalignment with societal values.

The crucial starting point, therefore, is to establish the right framework for cultivating an ethical attitude among professionals (Orbik, Pliszka, 2021). A first and crucial point is the ethical education of professionals, particularly those involved in developing and deploying AI systems. This education needs to start by presenting reliable examples showcasing the profound importance and commonness of moral aspects in AI. The goal of that process is to genuinely convince programmers, developers, and technicians that their work is not merely a neutral technical activity but bears great moral significance, and that they are the ones who should take responsibility for the outcomes of their professional activity (Voeneky et al., 2022). Crucially, the goal of that step shall never be the creation of an impression of certainty about what ought to be done in a given situation. On the contrary, the main focal point of the process should be putting forward the view that ethical dilemmas are by definition multifaceted problems, and there are often many possible solutions that need to be carefully considered (Kuzior et al., 2022, Smuha, 2025). This approach directly counters the "codex-ridden thinking" critiqued by Kołakowski (2010), by emphasizing nuanced moral deliberation over simplistic rule-following.

4.2. The role of phronesis

The second step in fostering moral conduct, the response driven by the will of "being with and for the other", can be significantly nurtured by practical wisdom, also known as *phronesis* or prudence (Ricoeur, 1992). This virtue, famously described by Aristotle, is rooted not merely in abstract knowledge but in the desire to do what is morally right and to acquire the appropriate competence through lived experience. Practical wisdom is cultivated through individual experiences and assists us in effectively discerning and pursuing the right course of action in specific, often ambiguous, situations. In essence, it uniquely combines the willingness to act ethically with the ability to put that willingness into practice, enabling individuals to understand when and how to make judicious exceptions to established rules when circumstances genuinely demand it.

To be truly guided by *phronesis*, individuals must cultivate a capacity for improvisation and avoid becoming overly rigid in their adherence to predefined norms. Schwartz and Sharpe (2010) vividly illustrate this by likening a prudent person to a jazz musician. While a jazz musician has a musical score with some notes (equivalent to rules), they also possess the freedom to improvise, thereby building musical competence by bending or temporarily suspending rules as the context requires. Applying this analogy to ethics, too many "notes" or rigid rules can paradoxically hinder a professional's development of moral competence or even lead to a loss of intrinsic interest in ethical performance. In this context, an ethical code therefore becomes a set of valuable guidelines that can be consulted and utilized, but it is fundamentally understood that these instructions should not be blindly followed as an absolute blueprint (Schwartz, Sharpe, 2010). This perspective directly challenges the "codex-ridden thinking" that over-relies on universal prescriptions, as critiqued by Kolakowski (2010), advocating instead for a dynamic, context-sensitive approach to morality.

Cultivating practical wisdom is thus vital for effectively addressing the complex and rapidly evolving challenges presented by the development and deployment of artificial intelligence. *Phronesis* aids significantly in resolving ethical dilemmas by inherently accounting for the inherent complexity and ambiguity of moral situations, such as evaluating the trustworthiness of AI systems or conducting comprehensive risk assessments (High-Level Expert Group on Artificial Intelligence, 2019; Voenecky et al., 2022). Furthermore, practical wisdom can promote an approach that actively seeks solutions beneficial to all parties when creating AI code and providing sound products to customers, thereby embodying Ricoeur's emphasis on "being with and for the other". Implementing these recommendations in one's professional life can elevate individuals from mere rule-followers to the status of moral role models within their teams, fostering a culture of responsible innovation that transcends mere compliance.

4.3. The Role of Institutions

Developing practical wisdom (*phronesis*) is not a straightforward task; it requires a concerted effort and the active support of organizational institutions and leadership. Specifically, managers must provide genuine opportunities for their staff to engage with the perspective of the people they serve, fostering an empathetic understanding that extends beyond immediate technical requirements. Even the most well-meaning individuals will eventually give up if they are constantly forced to "swim against the current" of an unsupportive organizational culture. Firms driven solely by the income motive are inherently challenged in creating the right management culture that nurtures righteous motives and ethical conduct within its employees (Frey, Oberholzer-Gee, 1997; Zuboff, 2019). This is a particularly challenging task because, to foster practical wisdom, a certain degree of improvisation must be permitted within professional roles, even with the inherent risk of making occasional mistakes, as highlighted by the jazz musician analogy (Schwartz, Sharpe, 2010). However, nurturing this virtue can lead to significant benefits, including increased job satisfaction, enhanced intrinsic motivation,

and indeed, genuine innovations that are both technically sound and ethically responsible. Encouraging practical wisdom allows individuals to cultivate their ethical virtues and apply them discerningly in the right circumstances and at the right time.

Phronesis, or practical wisdom, is uniquely positioned to foster an approach that seeks solutions adding value to all stakeholders when creating algorithms, developing code, and providing sound guidance to customers. By encouraging professionals to consider the broader implications and diverse perspectives, practical wisdom helps navigate the complex ethical dilemmas prevalent in AI development, such as assessing trustworthiness and mitigating risks (High-Level Expert Group..., 2019; Voeneky et al., 2022). Applying these recommendations in one's professional life can also elevate individuals to the status of moral role models within their team, contributing to a virtuous cycle of ethical development within the organization. Furthermore, the cultivation of practical wisdom can be significantly facilitated by creating environments that encourage learning from qualified, experienced, and wise colleagues, fostering a community of practice where ethical challenges are discussed and navigated collectively. Nurturing practical wisdom within institutions is therefore essential to effectively address the multifaceted challenges posed by artificial intelligence, moving beyond mere compliance with codes to a deeper, more adaptive ethical engagement (Kołakowski, 2010; Ricoeur, 1992).

4.4. Bridging the Gap: Integrating Legal Frameworks with Moral Conduct

The challenges and solutions outlined in the preceding sections, particularly concerning the inherent limitations of ethical codes and the imperative of cultivating practical wisdom, are critically intertwined with the findings and obstacles presented in the legal landscape. The emergence of robust "hard law" regulations, such as the Digital Services Act (European Parliament & Council of the European Union, 2022) and the Artificial Intelligence Act (European Parliament & Council of the European Union, 2024), signifies a global recognition that "soft law" approaches—like voluntary ethical guidelines—are insufficient on their own to address the multifaceted ethical challenges posed by digital technologies and AI. As empirical evidence suggests, these guidelines often lack a robust system for enforcement and minimally influence developers' decision-making (McNamara, Smith, Murphy-Hill, 2018; Hagendorff, 2020).

However, while "hard law" provides a necessary baseline for accountability and seeks to operationalize ethical principles through legally binding obligations, it cannot, by its very nature, resolve every nuanced moral dilemma. The "legal part" of this analysis highlighted the inherent difficulty in translating abstract principles into unambiguous rules, a problem compounded by the rapid pace of technological change and the complex, distributed nature of responsibility within digital ecosystems (Tucker, Roberts, 2020). This limitation directly parallels Kołakowski's (2010) philosophical critique, where he argues that ethical codes are inherently flawed because moral action often requires more than simply identifying wrong or

following a universal dictate. Relying solely on legal compliance or an "ethical intellectualism" to guide conduct risks perpetuating the illusion that professionals can merely check "what the code requires" rather than engaging in genuine moral deliberation, thereby alleviating them from personal responsibility (Kucz, 2019).

Therefore, effectively implementing moral conduct, as envisioned by Ricoeur (1992), requires going beyond mere legal adherence. Institutions, particularly those driven by profit motives that can override ethical considerations (Zuboff, 2019; Frey, Oberholzer-Gee, 1997), must actively foster a culture that cultivates practical wisdom (*phronesis*) among their professionals. This means providing ethical education that emphasizes the moral significance of their work and their personal accountability, while explicitly acknowledging that ethical dilemmas are multifaceted and often lack singular, certain solutions. By encouraging improvisation and a willingness to make context-dependent moral choices, even with the risk of occasional mistakes (Schwartz, Sharpe, 2010), organizations can empower developers to take ownership of the societal consequences of their creations. Ultimately, the robust legal frameworks must be seen not as exhaustive ethical manuals, but as foundational layers that enable and necessitate a deeper, institutionally supported commitment to cultivating individual practical wisdom and a shared sense of moral responsibility within the technological community

5. Conclusion

Regulating and implementing the ethical dimensions inherent in artificial intelligence presents a profoundly challenging, yet imperative, task. While the digital landscape has witnessed a proliferation of well-intended ethical guidelines and principles—often termed "soft law"—this analysis has underscored their inherent limitations. As empirical evidence suggests, such codes frequently prove insufficient in fundamentally altering professional conduct, largely due to erroneous assumptions of "ethical intellectualism" and a tendency to externalize individual responsibility onto predefined rules (McNamara, Smith, Murphy-Hill, 2018; Kucz, 2019). Philosophically, this "codex-ridden thinking" overlooks the fundamental complexities of moral choice, where, as Kołakowski (2010) vividly illustrates with the "asymmetry of duties and claims" and the "cogito factor", truly ethical action often transcends universal dictates and involves nuanced resignation (Ovid, n.d.).

Recognizing these shortcomings, the global regulatory environment has begun shifting towards more robust, legally binding "hard law" frameworks, exemplified by the European Union's Digital Services Act (2022) and Artificial Intelligence Act (2024). These legislative instruments aim to establish clear baselines and enforceable obligations, preventing the reckless market behavior that often prioritizes profit over ethical consideration and contributes to

a detachment from broader societal realities (Zuboff, 2019; Frey, Oberholzer-Gee, 1997). However, while crucial for accountability, even the most comprehensive regulations cannot fully account for the multifaceted nature of moral dilemmas, nor can they intrinsically foster genuine ethical motivation. Laws prevent actors from acting recklessly, but they do not, by themselves, cultivate truly responsible behavior (Środa, 1994).

Therefore, the successful and responsible implementation of AI systems hinges upon a synergistic approach that transcends mere legal compliance, drawing upon Ricoeur's (1992) holistic understanding of ethics encompassing individual will, relational responsibility, and institutional support. This requires a concerted effort to cultivate robust moral conduct within organizations, focusing on three crucial elements:

1. **Ethical Education:** This involves fostering moral awareness among AI professionals, genuinely convincing them that their work carries profound moral significance and that they bear personal responsibility for its outcomes. This education must embrace the inherent ambiguity of ethical dilemmas, preparing individuals for complex, multi-faceted decision-making rather than providing simplistic certainties.
2. **Cultivation of Practical Wisdom (Phronesis):** Moving beyond rigid adherence to rules, developing *phronesis* enables professionals to navigate complex moral situations with improvisation and contextual judgment (Schwartz, Sharpe, 2010). This virtue is vital for building trust, assessing risks, and discerning solutions that add value to all stakeholders, thereby serving as a critical bridge between abstract ethical principles and tangible, responsible action.
3. **Supportive Institutional Culture:** Managers and organizational structures play a pivotal role in nurturing ethical attitudes. This involves actively providing opportunities for empathy and engagement with affected stakeholders, fostering intrinsic motivation, and allowing for the necessary degree of ethical improvisation, even with the inherent risk of occasional mistakes. Firms must counteract the tendency for profit motives to suppress righteous conduct, creating environments where ethical leadership is recognized and where professionals can grow into moral role models throughout their careers (Voeneky et al., 2022; Smuha, 2025).

In conclusion, while "hard law" provides an indispensable foundation for governing AI, true ethical responsibility in the digital age demands more. It necessitates a proactive commitment from institutions to move beyond a compliance-only mindset, investing in the continuous ethical education and cultivation of practical wisdom among their professionals. Only by fostering this deeper, integrated approach to moral conduct can we hope to navigate the complex challenges of AI, ensuring that technological progress is guided by genuine responsibility, builds enduring trust, and ultimately serves the well-being of humanity.

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MUNICIPAL DEVELOPMENT STRATEGY AS A PLANNING DOCUMENT THAT SETS THE DIRECTIONS OF LOCAL GOVERNMENT ACTIVITIES

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Purpose: The purpose of the article was to show the importance of the municipal development strategy in the functioning of a local government unit. At the time of publication of the article, it was a programmatic legal act optionally adopted by municipal councils. As of July 1, 2026, it will become mandatory throughout Poland. Using the example of Zabrze, a city with administrative district rights, where three successive strategies have been adopted since 1999, the genesis, assumptions and conditions of their creation, implementation, updating and revision are presented.

Design/methodology/approach: For the purpose of the article, planning documents, legal acts, reports and reports of local government administration and scientific literature on issues related to the realization of development policy were analyzed.

Findings: The analyses conducted confirmed the effectiveness of the municipal development strategy as a planning basis for the implementation of tactical activities by the field administration.

Research limitations/implications: The implementation of the development strategy can apply to all 2479 municipalities in the country, but the study focused on a city with administrative district rights (one of the 66 largest Polish urban centers), which limits the universality of the issues addressed especially in the area of financial management.

Practical implications: The presented experience of preparing, enacting, implementing and reporting the municipal development strategy may prove to be a source of information for use by theoreticians and practitioners of development management.

Originality/Value: This work addresses legal issues that have not yet entered into force in Poland. It presents a new approach to development planning and identifies innovative aspects that may impact the implementation of these regulations.

Keywords: development strategy, spatial planning, sustainability, local government, development policy management.

Category of the paper: research paper. Case study.

1. Introduction

According to the law in force in Poland, development policy is carried out by public administration, specifically by the government and local government. In the case of local government, this refers to the provincial, administrative district and municipal levels, as well as associations of districts and municipalities or metropolitan associations. Each of these entities creates development strategies. When embarking on the development of such a document, it must realize the so-called diagnosis of the social, economic, spatial and climate-environmental situation, taking into account functional areas. The Act of December 6, 2006 *on the principles of development policy* in Article 10a (2) also stipulates that prior evaluation of the relevance, anticipated effectiveness and efficiency of the implementation of the development strategy must be carried out before its adoption.

At the time of the preparation of this article, the elaboration of development strategies by municipalities was still optional. *The Law on Municipal Self-Government*, in Article 10e (1), stipulated that a municipality "may" undertake such a challenge. However, Article 6(1) of *the Law of July 7, 2023, amending the Law on Land Use Planning and Development and certain other laws*, introduced an important innovation. As of July 1, 2026, the task will be mandatory, and exemption from the obligation will only be possible if the municipal area has already been covered by a supra-local development strategy.

2. Municipal development strategy as an obligatory planning document

Regulations aimed at organizing the planning sphere of local government units cover the most important aspects of the functioning of each municipality, namely social and economic development, land use planning or care for nature protection. Of key importance in the construction of the strategy should be to ensure that the municipality is able to develop sustainably, that is, to use resources rationally in a way that will not limit opportunities and possibilities for future generations of residents. It is worth noting that Article 3 point 50 of the Law of April 27, 2001. - *Environmental Protection Law* further specifies that "sustainability" is "such socio-economic development in which there is a process of integrating political, economic and social activities, while maintaining natural balance and sustainability of basic natural processes, in order to ensure the possibility of satisfying the basic needs of individual communities or citizens of both the present and future generations".

Each municipal development strategy must be consistent with the planning document describing the development formula for (1) provincial and (2) supra-local development.

2.1. Principles for creating a municipal development strategy

The amended Law of March 8, 1990 *on Municipal Self-Government*, in Article 10e (3), contains a detailed characterization of the requirements for development scenarios of local government units. Planners must therefore formulate strategic goals for the development of the municipality in social, economic, spatial and climate-environmental terms. The next step is to determine the courses of action to be taken in pursuit of them.

To optimize the implementation of the strategy, the expected results of these activities are to be determined in the previously appointed areas and indicators of their achievement are to be given, which is to ensure the measurability of the developed effects. An important component of the strategy must be a model of the functional and spatial structure of the municipality in accordance with Article 10e paragraph 3 item 4 specifying the target layout of such elements as the structure of the settlement network forming a coherent whole in a given area, the system of natural connections, the main corridors and elements of transport networks (including pedestrian and bicycle), and the main elements of technical and social infrastructure.

A socially important part of the development strategy are recommendations relating to the formation of spatial policy. This includes the principles of environmental protection and respect for resources (the law lists "air, nature and landscape"), as well as cultural heritage and monuments and modern cultural assets. The spatial policy is also concerned with specifying the directions of changes in the structure of land use planning with the determination of the needs for new development, the location of supermarkets and shopping malls (understood as large-format trade facilities, i.e., according to Article 2, paragraph 27 of the Law *on Planning and Spatial Development* of March 27, 2003, with a sales area of more than 2000 m²), the location of energy-generating equipment with installed capacity exceeding 500 kW, and projects that may have a significant environmental impact. The discussed part of the strategy is also to include directions for the development of communication, technical and social infrastructure systems, as well as the location of so-called key public purpose investments. Public purposes may include public roads, bicycle and waterways, rail tracks, airports, public transportation, communications and signaling equipment, infrastructure for the transmission or distribution of liquids, steam, gases and energy, facilities for the supply of water to the public or for the collection, transmission, treatment and disposal of wastewater and the recovery and disposal of waste, as well as premises for offices, courts and prosecutors' offices, public universities or schools or cultural institutions. A detailed list of public purposes is given in Article 6 of the Law of August 21, 1997 *on Real Estate Management*. This part of the strategy should also include the principles of shaping "productive space" for agriculture and forestry, as well as the management of degraded land and land requiring environmental remediation.

Another thematic scope of the municipal development strategy is "areas of strategic intervention defined in the provincial development strategy". *The National Strategy for Regional Development 2030* enumerates that these include sub-regions, urban functional areas,

border areas, post-industrial areas, degraded areas or the so-called inner periphery - as (NSRD, 2019, p. 41), and then defines them as "a response to development problems, as long as this will involve the provision of specific support instruments or agreement mechanisms" (NSRD, 2019, p. 46). The next point of the strategy is a list of areas of strategic intervention, but this time key areas for a specific municipality, if, of course, they are identified and labeled. The authors of the strategy must also state the scope of activities that the municipal government intends to carry out in connection with the establishment of the listed areas.

In addition, the regulations require that part of the municipal development strategy drawn up in textual and graphical form should be a system for its implementation, including, among other things, guidelines for the preparation of implementing documents, as well as the designated funding framework and sources.

2.2. Method of adoption and updating of the municipal development strategy

The cited Law of March 8, 1990 *on Municipal Self-Government* in Article 10f. Sec. 1 states that the municipal council shall adopt a resolution specifying the detailed procedure and schedule for developing the draft municipal development strategy. This also applies to the consultations provided for in Article 6 (3) of the Act of December 6, 2006 *on the principles of development policy*, i.e. primarily with residents and local social partners and economic partners, but also with neighboring municipalities and their associations, as well as with the competent director of the regional water management board of the State Water Management Authority Wody Polskie.

After the draft strategy is drawn up by the single-member executive authority (commune head, mayor or city president), the document is submitted to the provincial board for an opinion on how to take into account the findings and recommendations for the formation and conduct of spatial policy. After 30 days at the latest, the applicable opinion must be issued. Failure to respond results in automatic recognition that the municipal development strategy is consistent with the provincial development strategy. The planning document then goes to the municipal council, which adopts it in the form of a resolution.

When changes occur in the social, economic, spatial or climate-environmental conditions in the area covered by the strategy, the document must undergo a process of updating. As in the case of the need for consistency with higher-level planning documents (supra-local or provincial strategy).

The regulations provide for the possibility of consolidating the efforts of neighboring municipalities, which can jointly develop a development strategy of a supra-local nature, and relating to the area of these localities. The county level government may participate in such activities, or join obligatorily if all the constituent municipalities participate in the work. To facilitate the implementation of such a task, the local government units involved may form a union: inter-municipal or county-municipal (for joint performance of public tasks in

accordance with Article 72a of the Act of June 5, 1998 *on county self-government*), association (to promote the idea of local self-government and defend common interests in accordance with Article 84 of the cited Act *on Municipal Self-Government*) or conclude an inter-municipal agreement (on entrusting one of the municipalities with the performance of public tasks, when it takes over the rights and obligations of the other municipalities in this regard in accordance with Article 74 of the cited Act *on Municipal Self-Government*).

3. Analysis of the formulation and verification of the municipal development strategy on the example of Zabrze

From the work of researchers analyzing the situation in cities with administrative district rights before the aforementioned introduction of the obligation to adopt a strategy for municipal development, the conclusion was that its possession was "clearly correlated with the number of residents and the level of income per capita, i.e. the more both indicators increase, the greater the probability of preparing such a plan" (Sieklucki, 2022, p. 159). Studies of the development strategies of even the largest urban centers in Poland, however, indicated that "models of the functional and spatial structure of cities were most often incomplete, the deficiencies concerned especially elements of infrastructure of various types, land use or natural connections. There was a lack of mapping of many planned strategic goals and activities (Maleszyk, 2024, p. 46). Therefore, for the purpose of this article, the planning documents of Zabrze, a city with administrative district rights in the Silesian province, whose local government not only created three development strategies, but before the expiration of the second one recognized that the established goals had been achieved and implemented a new document specifying further challenges, were reviewed.

3.1. Planning directions for changing the nature of coal and steel monoculture after the liquidation of heavy industry

As Europe's largest village before more than two hundred years ago, Zabrze was the center of coal mining and processing, as well as the center of heavy industry. It was not until 1922 that the municipality of Hindenburg was granted municipal rights, becoming a city (Koman, 2017, p. 154). After World War II, too, employment for residents was provided primarily by coal mines, coking plants, a steel mill, mechanic plants, transportation companies and others affiliated with the mining industry. Economic difficulties after 1989 related to the transition period and subsequent turnaround of the mining industry resulted in the elimination of thousands of jobs, permanent unemployment and the expansion of the poverty zone, and a degraded working environment was left behind after the closed mines and coking plants.

A systemic change in the face of the city required conceptual work involving deputy representatives of all the municipality's stakeholders. First, the "Development Strategy of the City of Zabrze" was created, adopted by Resolution No. XIII/166/99 of the Zabrze City Council on September 13, 1999. The document set six development directions and basic strategic goals: (1) supporting the establishment and development of small and medium-sized enterprises, (2) Zabrze a center for various forms of housing and modern construction technologies, (3) shaping the city's new image, (4) Zabrze as a center for culture, (5) Zabrze as a center for medical care, and (6) Zabrze as a center for science.

A comprehensive report on the implementation of the strategy was drawn up eight years later, when Małgorzata Mańka-Szulik was elected president following the 2006 local elections. The document described as: "Materials collected and compiled by the Department of Strategy, City Development and European Integration - 12.02.2007" has been placed in the Public Information Bulletin. It contains a precise reference to each of the points of the strategy, although some of the findings have a laconic form similar to the description of the effects in item 6 "Zabrze as a city of science": "N.2.4 Promotion at home and abroad of the scientific, research and technological potential of institutions operating in Zabrze. Implementation of the project is not the responsibility of the Education Department" (Report, 2007, p. 58). The report on the implementation of the entire strategy in 2007 was 62 pages long. In comparison, the annual summary of the effects achieved in 2023 alone was 237 pages (Report, 2024, p. 237). The completion of the activities described in the 1999 document was the starting point for the creation of the next strategy. Therefore, with the participation of researchers from the Academy of Economics in Katowice: Małgorzata Czornik, Adam Drobniak, Maciej Baranowski and Piotr Gibas, a planning document "Development Strategy of the City of Zabrze for the years 2008-2020" was created, which was adopted by Resolution No. XXII/284/08 of the Zabrze City Council on March 17, 2008.

The strategy characterized, among other things, external and internal factors of a political-legal, economic, social and infrastructural-environmental nature affecting the situation of the municipality. It also formulated the vision of Zabrze in the adopted time perspective, priorities of development, directions of activities and ways to supervise their implementation. The strategy specified a new vision for the city based on sustainability and revitalization of degraded areas, as well as changing its image. It is worth noting that the concepts analyzed by the researchers "address the idea of urban sustainability to varying degrees. Some of them emphasize the need for more thoughtful urban planning (e.g. compact city, smart growth), while others focus on improving ecological conditions in urban space (e.g. ecocity). Smart cities promote development through technology, while creative cities give preference to the ingenuity of their residents" (Rożałowska, 2016, p. 99). The authors of the document assumed in the formulated vision that Zabrze will be: "a city creating its development based on a balance between history and modernity, Silesian identity and metropolitan context, as well as residential and investment attractiveness" (Strategy, 2008, p. 57).

The development strategy appoints four development priorities: (P1) "Economic Environment", (P2) "Modern Urban Society", (P3) "Attractive Public Spaces", and (P4) "Metropolitan Services".

The researchers evaluating the "Development Strategy of the City of Zabrze for 2008-2020" found that the established development priorities, strategic challenges and strategic and horizontal objectives of the strategy "form a coherent whole - it is no coincidence that the economic environment (P1), modern urban society (P2) and attractive spaces (P3) and metropolitan services (P4) were indicated. All of them are expected to contribute to the effective promotion of Zabrze on the regional, national and international arena (CH1), its revitalization (CH2), better aesthetics of public spaces (CH3), better quality of the environment (CH4) and multi-sector, multi-stakeholder cooperation of city users (CH5). The city's economic competitiveness is strengthened in Zabrze through activities aimed at: improving the city's investment attractiveness and increasing employment potential (C1); stimulating the development of local entrepreneurial spirit (C2); strengthening the city's economic profile (C3); transfer of new technologies and access to economic information (C4). Zabrze should participate more intensively in civilization development through: greater security of living and staying in the city (C5); higher intellectual capital - better trained residents (C6); higher cultural capital of residents (C7); greater sports and recreational activities of residents (C8); higher standard of municipal housing infrastructure (C9); rational social policy (C10); providing conditions for the development of the information society (C11). The city should be "comfortable to live and stay in", so the following challenges were identified in the area of improving functionality: spatial order (C12); higher standard of municipal infrastructure facilities (C13); better transportation accessibility of the city (C14); developed housing (C15)" (Koszembar-Wiklik, Macelko, 2015, pp. 237-238).

After ten years of implementing the assumptions of the strategy envisaged for 2008-2020, Zabrze was already increasingly recognized in the mass media as a city of medicine, science, sports, industrial tourism, new investments and culture. The transformation of the reputation and the creation of a new brand was possible thanks to the skillful use of national and EU funds, which allowed the implementation of many projects important for the development of the city, aimed at improving the living conditions of the residents and the environment (e.g., improving water and sewage management, reducing low pollutant emissions, remediation of degraded post-industrial areas, etc.) and economic reconstruction based on small and medium-sized enterprises and the implementation of modern technologies in their operation. Two years before the expected completion of the activities planned in the "City Development Strategy 2008-2020", due to the fulfillment of most of the goals set therein, the need to update the municipality's main planning document arose.

3.2. Updating the development strategy and adapting to changing conditions

On August 27, 2018, during the session of the City Council, the "Development Strategy of the City of Zabrze 2030" was adopted. The document was prepared by experts from the University of Economics after performing the necessary research and conducting workshops and consultations. The moderators of the work on the preparation of the "Development Strategy of the City of Zabrze 2030" and editors of the document were Adam Drobniak (team leader), Marcin Baron, Małgorzata Czornik and Piotr Gibas.

The strategic document for the municipality defines the directions of the city's development, taking into account the socio-cultural, economic-technological and infrastructural-environmental conditions. It also specifies a modified vision of development - based on improving the broadly understood attractiveness of the city in all areas of its functioning - which reads: "Zabrze is a city creating its development based on the pursuit of: popularize and consolidate active social attitudes and conscious participation in contemporary cultural processes, create competitive specializations of various industries, including an innovative economy, create friendly urban spaces and achieve a significant position in the Metropolis" (Strategy, 2018, p. 27).

The authors of the document adopted four development priorities: "P1. Active urban society" - with the challenge "Actively participate in social development", "P2. Development and innovation of the economy" with the challenge "Strengthen the city's economic competitiveness", "P3. Friendliness of city space" with the challenge "Domesticate space in the city" and "P4. Significant metropolitan position" with the challenge "To stand out in the Upper Silesian and Zagłębie Metropolis". The established priorities "are accompanied by corresponding strategic challenges, understood as a clarification of their leading idea. They indicate the sense of engaging municipal resources and external opportunities in the process of implementing Zabrze's strategic goals, development directions and undertakings" (Strategy, 2018, p. 28).

Strategic goals were appointed, expressed in 20 assumptions about specific priorities. Horizontal goals were also created, relating to all the appointed priorities, namely: "CH1. Creating conditions for the development of the family", "CH2. Shaping conditions for the development of the smart city", "CH3. Revitalization of the city", as well as "CH4. Effective promotion of the city". The next step in the planning cycle was the appointment of selected development directions for the strategic and horizontal goals, and then the assignment to them of thematically selected undertakings (projects, activities, programs, etc.) that organize investment policy and facilitate the management of the city in the period designated by the document. A system was also created for implementing the given recommendations, monitoring their implementation and evaluating the whole process.

In formulating the strategy, the model of integrated planning was taken into account, "in which each of the documents prepared is part of a coordinated and integrated system of planning documents of the city, linked to the national and regional system. At the level of local planning, two elements of this system perform basic coordination functions: the assumptions of city development, linked to spatial management, and an organized system of data collection and analysis, which should also play an important role in integrating local and regional planning" (Korzeniak, 2012, p. 69). Therefore, it is necessary to point out the consistency of the "Development Strategy of the City of Zabrze 2030" prepared in 2018 with the regulations in force at that time at the national and regional level such as the "Long-term Strategy of National Development. Poland 2030", "Concept for Spatial Management of the Country 2030", "National Urban Policy 2023" or "Strategy for the Development of Southern Poland in the area of the Małopolska and Silesian Voivodeships until 2020" and "Strategy for the Development of the Silesian Voivodeship ŚLĄSKIE 2020+".

Among other strategic documents for specific areas of the municipality's functioning, it should be indicated, for example: "Strategy for building an information society" adopted by Resolution No. XXXVII/412/17 of the Zabrze City Council on February 13, 2017 on amending Resolution No. XXI/211/16 of January 18, 2016 on adopting for implementation a document called "E-Zabrze strategy for building an information society of the city of Zabrze until 2020+", "Strategy for solving social problems for the City of Zabrze" adopted by Resolution No. LIX/766/10 of the Zabrze City Council on October 11, 2010. on "Strategy for Solving Social Problems for the City of Zabrze for 2010-2020" or "Local entrepreneurial spirit development plan for the City of Zabrze for 2016-2020" adopted during the session on June 6, 2016 by Resolution No. XXVI/278/16 of the Zabrze City Council.

Thanks to the preparation of the planning instrumentation, it was possible to conduct consistent activities in individual areas of activity of the local government unit in an integrated manner with the overall transformation program. Individual investments, events or undertakings resulted from the adopted assumptions relating to individual stakeholder groups. Thus, taking into account - for example - the issue of support for people with disabilities, researchers studying this issue were able to find that "undoubtedly the city of Zabrze cares about people with disabilities, because both the city development strategy and the strategy for solving social problems take into account the needs of people with a disability, and the actions taken translate into the implementation of the goals formulated in both strategies. In the city, measures are being implemented to facilitate access to information, remove architectural barriers, and projects for the reconstruction and adaptation of individual public buildings are being implemented to adapt these buildings to the needs of persons with a disability. Activities are also implemented in the field of nursing, caring, educational assistance, equalization of opportunities for persons with a disability and counteracting their social exclusion" (Sorychta-Wojczyk, 2011, p. 288).

3.3. Zabrze in the planning perspective - a smart city for sustainability?

In accordance with the current strategy, the local government intends to continue adapting modern and innovative solutions to continue optimizing the city's functioning in a manner consistent with the expectations of stakeholders (e.g. residents, investors, tourists, etc.). A smart city of sustainability, requires combining the requirements of social life, with the challenges of the economy, taking into account respect for the environment. One important aspect, in this regard, is the improvement of ambient air quality. Researchers emphasize that "in the smart city management plan, measures to reduce urban air pollution and environmental prevention can and should place greater emphasis on: projects to raise awareness of environmental activities among residents, reliable monitoring of the city's air, taking into account measurements in individual city districts with information provided to city residents, and enforcement among air polluters (burning garbage). Long-term action accepted by residents in the form of replacing stoves is also of great importance (Ignac-Nowicka, 2019, p. 70). In addition to the state of the environment, important conditions for improving living conditions in the city include providing access to public services, medical and social care, education, culture, sports, recreation, housing or an extensive transportation system (including sidewalks, paths and bike lanes).

It is also important to take into account the assumptions of the 2007 Leipzig Charter and its modified version of the "New Leipzig Charter" adopted in November 2020, which upholds "the ever-present demands of the concept of sustainability strongly emphasizing the need for transformation towards just, green and productive cities" (NLC, 2020, p. 7).

4. Determinants of Zabrze's development - from medicine through innovative economy to post-industrial heritage tourism

The basis for creating the concept of transformation is the proper determination of the actual state of affairs. Therefore, it is necessary to assume that still "Zabrze is a city with a difficult process of economic and social turnaround. The city, where the most coal was mined in Europe, no longer has any large, state-owned mine. Over the past 30 years, tens of thousands of jobs in the mining industry have been eliminated" (2020 Report, 3). The turnaround of the mining industry and the liquidation of many heavy industry plants carried out since the beginning of the transition period have changed the character of the city. The place of the coal and steel monoculture had to be taken by other areas of economic activity. The goal of the transformation was to create a city of medicine, science, culture, sports, innovative economy and industrial heritage tourism, which turned out to be a new urban product, responding to demand at home and abroad.

4.1. Urban tourism product

In 2007, a decision was made to establish an independent cultural institution: Historic Coal Mine "Guido". The process of transformation of an important sphere of the city's activity was then initiated. Over time, Zabrze developed a strong position on the European Route of Industrial Heritage. The facilities of the Coal Mining Museum are now the most recognizable landmarks of the city and the region.

Unique in Europe, places like the "Guido" mine and the "Królowa Luiza Adit" - a combination of the historic "Królowa Luiza" mine and the "Main Key Heritage Adit" - nurture the history and tradition of the region, while showing visitors its uniqueness. Since the establishment of the Coal Mining Museum in 2013, the scope of its activities has increasingly increased and has gained not only national, but also international significance. Every year there are also more and more tourists who want to visit the deepest coal mine tour in Europe. The concerts and artistic performances taking place underground are very popular. Worth noting is the cooperation with European industrial heritage tourism sites. The mine also successfully plays the role of a conference center and an attractive venue for business meetings. A continuation of the "Guido" project is the "Queen Louise Adit", a unique mining and hydrological art object in Europe, which has survived for more than 200 years, and after revitalization, restoration and adaptation to tourism, offers more than a kilometer-long boat ride under the city center. Recognition of Zabrze's programs for preserving, adapting and making post-industrial monuments accessible to tourists was also expressed at the European Union forum, when the city was rewarded with the European Commission's prestigious "EUROPA NOSTRA" award in Paris on October 29, 2019. The Grand Prix of the award went to the Queen Louise Adit, about which the organizers wrote: "it is the largest tourist and cultural complex related to the heritage of hard coal mining in Poland and an absolute rarity throughout Europe" (UNESCO, 2019). Zabrze was awarded for the effective measures implemented by the Coal Mining Museum to preserve post-industrial sites, revitalize them and make them available for tourism. The complex, which consists of, among other things, the underground workings of a former mine, a water tower and an adit offering boat rafting under the city center, was visited by more than 300,000 people in 2023. In 2024, the number of visitors reached half a million, and Zabrze's monuments, as the "Historic Complex of Coal Mining", are applying for entry on the UNESCO World Heritage List.

4.2. Investments improving the attractiveness and functionality of the city

Among the investment projects described in the municipality's development strategy, the thorough replacement of water and sewage systems, the expansion of the transportation system, the spread of post-industrial tourism, the activation of the Special Economic Zone, the commissioning of numerous facilities after modernization (such as the City Hospital), thermal modernization (such as dozens of educational institutions and public facilities) or

thorough renovation (such as the New Theater) were of lasting and significant importance. The creation of new conditions for the city's development includes environmental remediation projects such as "Environmental remediation of land in the area of the Bytomka River", when 183 hectares degraded and devastated by industrial activity were recovered. As reported at the November 18, 2019 City Council session, among other things: "removed 8000 tons of waste, including 500 tons of tar and pitch, remediated 100,000 m³ of land contaminated mainly with aromatic and aliphatic hydrocarbons, planted 1800 trees and 29,000 shrubs". Another project that improves the quality of life in the city is, for example, the Low Emission Reduction Program, which has been consistently implemented since 2009 (residents can obtain funding for up to 80% of the cost of ongoing investments related to replacing heat sources, thermal modernization of buildings and installation of renewable energy sources in single-family homes). In addition to environmental protection, further development impulses for Zabrze are created by housing construction (e.g., housing estates on Trocera and Żywiecka Streets and developer investments) or the formation of a thriving academic center (e.g., the city's creation of a campus for the Silesian University of Technology).

The investment policy of cities would certainly not be possible without effective application, acquisition and settlement of funds from external sources. During the period of validity of the development strategy, Zabrze tried to obtain funding "from the European Union and other external sources for infrastructure, environmental and social projects. As a result, the municipality's assets increased from less than PLN 900 million in 2006 to more than PLN 3.5 billion in 2019" (A Year in Zabrze, 2020).

Zabrze's advantage is its favorable location near the junction of the A1 and A4 highways and access to the Central Highway of the Silesian Metropolitan Area, which is an important argument in assessing the municipality's investment attractiveness. There are 3 international airports within a 100 km radius: Katowice-Pyrzowice (approx. 30 km), Kraków-Balice (approx. 90 km) and Ostrava (approx. 100 km), while "green areas occupy about 62% of the city's area" (Waryś, Hodor, 2015, p. 105). Therefore, the planning documents assumed attracting business activities by "equipping investment areas with technical infrastructure, creating new investment areas and preparing investment offers" (Report, 2017, p. 19). An example of a successful venture is the Zabrze part of the Katowice Special Economic Zone, where all investment areas have been sold.

4.3. Education and raising the functional competencies of residents

The local government, when implementing the assumptions contained in the adopted planning documents that define the directions of development of the municipality, should take into account the situation of the local community in terms of readiness to participate about the projects made available to it. It also matters to strive to improve the level of approval towards innovative solutions, because "without the formation of attitudes of openness and the ability to acquire new competencies, both technological and social, residents will not only be unable to

take full advantage of modern solutions, but will be exposed to the disappearance of social ties and the resulting loss of social capital, which is the basis for the development of any city" (Kuzior, Sobotka, 2019, p. 116).

The issue of education is extremely important in the creation of a smart city, in which the modern formula of public service provision is accompanied by concern for the elimination of areas of digital exclusion. In order to effectively implement innovative developments resulting from technological advances, it is necessary to monitor and then optimize the competence level of the recipients of these projects, reducing the scale of existing or emerging barriers. For this reason, internal training programs involving local government employees were implemented, as well as external courses offered to those with business activities, or by the NGO Center, aimed at associations operating in the city. The local government must therefore ensure the highest quality of personnel involved in serving the city's residents. The researchers note that in Zabrze such measures were undertaken as a pilot nationwide: "despite the fact that in the past human resource management in local government administration was often not an important aspect of its functioning, the Zabrze City Hall was one of the first in Poland to note that there are important arguments for the need to turn to this issue" (Kuzior, Smółka-Franke, Tokar, 2017, p. 235). Not only people employed in the field administration and its subordinate units must meet the criteria of the modern labor market. The higher the competence level of those employed, the more a city's position as a center of highly skilled personnel increases. This also results in increased interest in the city from potential investors. The hallmarks of modernity in economic terms are "computers, automations and robots, complemented by the entire technical infrastructure and extensive IT tools. These tools are necessary to build a new type of organization, highly flexible, intelligent, capable of self-optimization, continuously monitoring its own needs and those of its organizational environment, skillfully communicating with diverse entities" (Kuzior 2017, p. 36). The conditions cited by the researchers confirm the validity of the local authorities' efforts to prioritize the education of children and young people in Zabrze, as well as interaction with higher education institutions. Examples include the creation and successive expansion of the campus of the Silesian University of Technology, the local government's joint ventures with the Silesian Center for Heart Diseases (e.g., the Silesian Medical Technology Park Kardio.Med Silesia), or cooperation with the Silesian Medical University, which has launched a modern Medical Simulation Center at Dworcowa Street.

4.4. Dialogue with the municipality's stakeholders – the importance of social communication

For the effectiveness of the implementation of the municipality's development strategy, the communication activity of the local government to integrate and activate the local community is important, as well as promotional activities that enable the implementation of the assumptions of territorial marketing. "This is because on the effectiveness of the dissemination

of news on matters important to the local community depends the scale of participation of residents in the functioning of the municipality or administrative district. This applies both to knowledge about cultural, sports, recreational, educational or entertainment projects organized for the city's community and individual neighborhoods and settlements that increase the comfort of life, as well as about investment, infrastructural, preventive, medical projects or widely understood development plans addressed to the local government community" (Krawczyk, 2019, p. 107). In Zabrze, there is a Cultural Information Center that publishes the local government periodical "Our Zabrze Local Government", is the broadcaster of the program "Zabrze TVZ Television" and provides profiles of a municipal nature on social media. The institution provides residents with access to up-to-date, reliable and credible information that allows the formation of civic awareness. Of course, as in the case of any medium belonging to a local government unit, it is excluded to perform control functions, which can be performed by commercial editorial offices operating in the city or region.

The implementation of the assumptions of the "Development Strategy of the City of Zabrze 2030" is also aimed at generating the involvement of residents around self-government at all levels, including district and neighborhood councils, and "on the example of the city of Zabrze, we can see that district councilors want to change the perception of their role, as they declare high enough competence to play the role of partners in relations with the city, which would be served by changing the way city employees communicate with councilors, greater cooperation and support for the processes carried out by neighborhood councils, especially in the area of necessary investments" (Pyszka, 2014, p. 104). The influence of residents on the directions of development and decisions made is a key element in the creation of civil society.

5. Summary

In Zabrze, the first strategy was adopted in 1999, when Roman Urbańczyk was president of the city. Work on the next document began in 2007 after the election of President Małgorzata Mańka-Szulik. During her subsequent terms of office, an update was prepared and the next strategy, developed with a 2030 perspective, was implemented. The 2024 local elections were profitably won by Agnieszka Rupniewska, who was recalled by referendum on May 11, 2025, and in the early elections of August 24, 2025, the mandate was given to President Kamil Żbikowski. However, it can be assessed that during the period of validity of the "Development Strategy of the City of Zabrze", a lot of measures were taken for the sustainability of the city. Local authorities took care to remember Silesian traditions (e.g. renovation adaptation of post-industrial buildings for tourism purposes) to create a smart space for economic (e.g. attracting investors) and social development (e.g. providing a rich educational, cultural, sports and recreational offer). Consistent implementation of the assumptions of the planning documents

translated into the implementation of successive investments and programs that improve the quality of life of residents and increase the attractiveness of Zabrze for entrepreneurs and tourists visiting the city in increasing numbers. Applying for funds from the European Union and other external sources for infrastructural projects provided a developmental impulse, the scale and potential of which should also pay off in the future. Modernization projects such as the replacement of water and sewage systems, thermo-renovation of public facilities, environmental remediation of areas degraded by heavy industry have helped build the foundation for further development. Proper communication of the transformations made in the city remains an important challenge, as "the evaluation results show emphatically that the stereotype of a highly industrialized area with the dominance of mining and the nuisances caused by heavy industry, especially the degradation of the natural environment, still strongly affects the image of the conurbation's cities" (Żemła, Szubert, 2019, p. 74). The unfavorable and already outdated conviction of the city's character must be effectively transformed. To this end, it is necessary to implement and communicate measures within the framework of "so-called integrated urban development plans (ger. Integrierte Stadtentwicklungskonzepte), which combine the tasks of urban planning with socio-economic planning" (Billert, 2019, p. 37). With the investment policy carried out in the following years must correspond to attention to social issues in the educational, health, housing, environmental dimensions, etc. In this way, it will be possible to strengthen Zabrze's position as a center of medicine, science, culture, innovative economy and tourism of post-industrial heritage. A position that is defined by the adopted planning documents headed by the "Development Strategy of the City of Zabrze" discussed in this article. A huge challenge in this regard faces the local authorities, as "any goal set by a development policy entity can be achieved by different methods. There is always an alternative way to achieve the goal. It is the task of public authorities to make the optimal choice of goal achievement, that is, the one that will ensure the fastest possible achievement of the goal, the least costly and the most consistent with the values preferred by the local community" (Nowakowska, 2016, p. 49).

Planning documents are intended to help local authorities choose the optimal way to achieve tactical and strategic goals in the process of creating a smart city that is friendly to residents and attractive to the economic and social environment. Starting in the second half of 2026, this will simultaneously be the responsibility of local government units nationwide.

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THE ROLE OF ETHICAL CODES IN BUSINESS MANAGEMENT

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Purpose: The article analyzes the impact of ethical codes on the operations of selected companies. It presents an analysis of ethical codes in selected firms in the mining industry, gastronomy sector, aviation industry and construction sector, with a focus on their role in corporate management, the development of a responsible organizational culture, and the strengthening of market position.

Design/methodology/approach: The article offers a content analysis of the codes and contributes to the discussion on the purpose and effectiveness of implementing ethical principles in the context of long-term business stability and value growth.

Findings: Codes of ethics can play an important role in companies. It is essential that they are implemented jointly with the workforce, which should be supported in adhering to them. New professional roles related to business ethics are emerging in the labor market. Increasing numbers of job postings for ethics specialists, compliance coordinators, etc., on recruitment portals reflect the growing importance of ethics in companies, particularly in large firms operating in international environments.

Practical implications: The findings of this article suggest that organizations adhering to ethical standards enjoy greater trust, which contributes to their success and sustainability in a dynamic market environment. Moreover, these codes are essential tools for protecting companies from the risks associated with legal violations.

Originality/value: The article, on the one hand, presents the approaches of management and ethics theorists regarding ethical codes in enterprises, and on the other hand, provides an overview of specific ethical codes implemented in large and well-known corporations from various sectors of industry and services.

Keywords: ethical codes, ethics, compliance management, codes of conduct.

Category of the paper: general review.

1. Introduction

Professional ethics is part of normative ethics. It is, therefore, inherently linked with norms and codes. On the one hand, it should be disseminated among employees and promote proper attitudes; on the other, it should influence clients and suppliers, thereby increasing the

credibility of the company or the representatives of a given profession. Professional ethics often co-determines workplace relationships, influences interpersonal relations, and should bear witness to the values important to a given profession or company. In this context, it is worth emphasizing that business ethical codes play an essential role in both the professional ethics of various professions and business management. Although their primary goal is to ensure compliance with ethical and legal norms, they differ in scope, function, and practical implementation.

In the 20th century, many professional codes regulated the conduct of journalists, doctors, lawyers, engineers, etc. In recent decades, companies have begun introducing corporate codes. By the late 20th century, almost 90% of companies in the USA had such codes; in other countries, this percentage was lower but still significant—half of British companies and one-third of German and French companies had similar documents (Gasparski, 2000). In the second decade of the 21st century, 95% of major American companies in the Fortune US 100 and Fortune Global 100 rankings had ethical codes (Sharbatoglie et al., 2013), and in 2023, they were in place in 88% of the largest companies (FTSE 100) listed on the London Stock Exchange (Institute of Business Ethics, 2023). In Poland, this trend arrived with the influx of foreign capital after 1989, as well as with Polish companies entering foreign markets. Today, having an ethical code signifies not only an organizational culture but also helps achieve financial success and gain a competitive advantage. However, it is important that an ethical code be created to implement principles, rules, and norms, not merely for image purposes.

2. Ethical Codes in the Context of Enterprises

Literature analysis and recent research lead to the conclusion that ethical codes in companies can have a wide range of applications. These include regulating internal and external relations, ensuring legal compliance, and building an organizational culture based on values. They are a key element of corporate governance, helping to manage risk, increase employee engagement, and shape a positive company image (Babri et al., 2021; Pradesa et al., 2023; Dey et al., 2022, Lach, 2024; Pytlak, 2024). Their main tasks are to:

1. ensure compliance with laws and regulations (helping companies adhere to regulations on, e.g., competition protection, anti-corruption, and avoiding financial and reputational scandals),
2. build organizational culture (shared values create a coherent work atmosphere, a sense of inclusiveness, and employees feel part of a larger whole),
3. minimize the risk of conflicts of interest (large corporations introduce detailed procedures on receiving gifts, relationships with business partners, and transaction

transparency), enabling employees to report abuses without fear of retaliation through "whistleblowing," "speak openly," and whistleblower protection programs,

4. increase the company's attractiveness to investors and customers (companies with high ethical standards are more attractive and credible to investors and contractors),
5. raise awareness of social and environmental responsibility (e.g., companies commit to reducing their environmental impact, supporting local sports, charitable, cultural, or social initiatives).

It is worth noting that the introduction of ethical codes in companies implies the need to employ people responsible for implementing and ensuring compliance with the principles described in the codes. In recent years, Poland has seen a significant increase in job offers related to organizational ethics. The job titles in recruitment advertisements vary: "ethics specialist", "ethics and anti-corruption officer", "ethics advisor". It should be emphasized that in enterprises, these tasks are also performed by compliance managers and officers, increasingly referred to as compliance coordinators. This function is becoming a key element of corporate structures and institutions, especially in regulated sectors such as finance, pharmaceuticals, or energy, but not exclusively. This situation results from increasing legislative and social requirements, which force companies to implement comprehensive compliance and ethics systems. Due to the growing market demand for compliance specialists, both public and private universities in Poland have recently introduced postgraduate programs related to ethics and compliance.

3. Discussion on the Purpose of Introducing Ethical Codes

Anna Lewicka-Strzalecka (2005), analyzing the process of formulating and codifying moral standards, points to both its positive and negative aspects. In her opinion, the "institutionalization of morality" in economic activity is intended, on the one hand, to positively influence the effectiveness of this activity, and on the other, to legitimize it in the eyes of public opinion, which is often shocked by scandals involving unscrupulous entrepreneurs and managers. Introducing ethical codes may be a mere "smokescreen" for actions that deviate from ethical norms or may have no significance beyond image-building purposes. Lewicka-Strzalecka emphasizes that large corporations often have well-crafted ethical codes while outsourcing production to sweatshops in third-world countries, where people earn starvation wages in conditions violating human rights. She describes an example of a large coffee company that used to buy coffee beans from Guatemalan plantations paying workers \$2.50 for a long working day. Under strong public pressure, the company adopted and publicized an ethical code committing to monitoring the working conditions offered by its suppliers. The company received an international human rights award in the spotlight.

The award was given for the promise itself, as its implementation was admitted to be a long process by one of the company's directors. Lewicka-Strzańska also calls for a distinction between a company's ethical code and a professional code of ethics, as they target different audiences. She notes that a professional code of ethics consists of a set of norms applicable to members of a given profession. Sometimes, the norms in a company code may conflict with these professional norms. For example, a doctor working for a company producing a product suspected of harming users' health should inform the public. On the other hand, such information would likely lead to a decline in the company's sales, to which the doctor, as an employee, should remain loyal.

Webley and Werner (2008) pointed out some time ago that ethical codes are often poorly designed—covering only a narrow range of issues or being purely prescriptive, instead of indicating values and ways of dealing with difficult ethical situations. Additionally, codes are sometimes created only to protect a company's reputation, without real management engagement. In their view, even a well-prepared code is ineffective if it is not properly implemented—it is not enough to distribute it to employees without additional training and support. Research shows that the lack of supporting activities (training, counseling, reporting channels) reduces the effectiveness of ethical policies and sometimes worsens the perception of ethics within the organization. Organizational culture is also crucial—even the best-planned ethics program will not work if it is not supported by the company's daily practices. The top management's role is particularly important—its lack of involvement or unethical behavior undermines ethical efforts. Another problem, according to Webley and Werner, is the pressure to achieve results, which may lead to ethical compromises. In many organizations, employees are also afraid to report irregularities for fear of their career and relationships with colleagues. As a result, serious ethical issues often go unreported despite formal reporting procedures. The authors stress that effective business ethics require not only formal tools but also authentic commitment from people at all levels of the organization.

An important issue related to introducing ethical codes is undoubtedly the prior discussion on their content and the purpose of their introduction among staff or in a given community, as emphasized by Sołtysiak (2006). It should not be a document "brought in a briefcase", developed behind closed doors and imposed from the top on all stakeholders. Only then does such a document stand a chance of being respected. Moreover, it is worth noting that the very discussion and identification of conflict areas and unethical actions can significantly help clear the atmosphere, raise ethical awareness, and ultimately change behaviors.

A similar view was recently presented by the Institute of Business Ethics (2023)¹. It also warned that employees need more support in making ethical decisions in their daily work, after its 2023 report showed that only 27 out of 88 companies with an ethical code support ethical

¹ www.ibe.org.uk, *More top firms than ever before have a code of ethics but staff need more support*, 20th March 2023.

decision-making. The Institute called on companies to take action and provide employees with adequate support. These frameworks should help employees make ethical decisions, encouraging them to ask themselves questions such as: "Is this legal?", "Would I feel comfortable explaining my decision to colleagues, family, or friends?" or "What would my mother think of this?".

4. Ethical Codes in Practice

This part of the article presents the ethical codes in force in the following companies: Lufthansa (Germany), KGHM Polska Miedź (Poland), AmRest (Spain), and Skanska (Sweden).

4.1. Lufthansa Group Code of Conduct (Our Ethical Compass)

Founded in Germany in 1953, Lufthansa Group is one of the world's largest airline groups, including both airlines and companies involved in logistics, technical services, and airline catering. It includes Lufthansa, SWISS, Austrian Airlines, Brussels Airlines, and Eurowings. Lufthansa is one of the largest airlines in Europe, operating intercontinental and regional flights. It has a fleet of several hundred aircraft, including modern low-emission models. The Lufthansa Group Code of Conduct² defines the basic ethical principles and standards of conduct for all company employees and business partners. The document emphasizes the importance of integrity, responsibility, and compliance with legal regulations in daily operations. The main values of the Code are:

1. social and environmental responsibility (promoting respect in the workplace and preventing discrimination, ensuring the highest standards of occupational safety and hygiene, commitment to climate and environmental protection, respect for human rights, and ensuring proper working conditions throughout the supply chain),
2. integrity in business conduct (adherence to fair competition rules and prohibition of exchanging strategic information with competitors, zero tolerance for corruption and bribery, avoiding conflicts of interest and ensuring transparency in decision-making processes, compliance with foreign trade regulations, and preventing money laundering),
3. protection of corporate values (ensuring transparency and reliability of accounting, protection of company resources, both material and intangible, e.g., know-how or reputation, responsible communication on social media, and prohibition of using confidential information for private gain).

² Code of Conduct - Lufthansa Group Investor Relations, 14th July 2025.

This Code serves as a comprehensive ethical guide, providing clear principles for Lufthansa Group employees and partners.

4.2. AmRest Code of Ethics and Business Conduct

AmRest Holdings SE is one of the largest restaurant operators in Central and Eastern Europe and also has a significant presence in Western Europe and China. The company manages well-known restaurant brands under franchise agreements as well as its own concepts. Founded in 1993, AmRest is currently headquartered in Spain. The company operates restaurant chains such as KFC, Pizza Hut, Starbucks, and Burger King, along with its proprietary brands: La Tagliatella, Sushi Shop, and Bacoa. AmRest operates in over 20 countries, managing thousands of restaurants, with a strong focus on modern technologies and food delivery services (e.g., through mobile apps and online ordering systems).

The AmRest Code of Ethics and Business Conduct³ outlines the core principles, values, and behavioral guidelines that all employees and business partners must follow. The document emphasizes the importance of integrity, responsibility, and compliance with legal regulations in daily operations. Key areas covered in the code include:

1. Guidelines for ethical conduct, such as respect for the law (compliance with legal and industry regulations), respect for customers (ensuring the highest quality of services and customer comfort), cooperation with public authorities (interactions based on ethics and transparency), fair competition and relations with business partners (adherence to fair competition principles and avoidance of unethical practices), and engagement with local communities (support for social initiatives and sustainable development).
2. Integrity, honesty, and transparency, including conflict of interest prevention, anti-corruption and anti-bribery rules, policies on gifts and hospitality, anti-money laundering (compliance with international financial crime prevention regulations), and accurate financial and tax reporting.
3. Workplace principles, including equal opportunities and diversity, human rights protection, prevention of bullying and harassment, care for employee health and well-being, and promoting work-life balance (e.g., through flexible working arrangements).
4. Environmental protection and sustainability, addressing climate change mitigation, circular economy initiatives, and animal welfare.
5. Protection of company resources and information, such as safeguarding company assets, loss prevention, data confidentiality, protection of business information, and responsible use of the company's digital resources.
6. Reporting mechanisms and consequences for non-compliance, including anonymous whistleblowing channels. Breaches of the code may result in disciplinary actions, including termination of employment.

³ www.amrest.eu, 14th July 2025.

The AmRest Code highlights key ethical values, integrity, and responsibility across all aspects of the company's operations. Its purpose is not only to ensure legal compliance but also to foster an organizational culture based on respect, transparency, and social responsibility.

4.3. KGHM Polska Miedź S.A. Code of Ethics

KGHM Polska Miedź S.A. is a Polish company with a majority stake held by the State Treasury. Founded in 1961, it is one of the world's largest producers of copper and silver. The company is involved in the mining and processing of metal ores, with operations both in Poland and internationally, including in Chile, Canada, and the USA. KGHM owns smelters and mines, providing a full production cycle from extraction to processing. The company emphasizes technological innovation and environmentally friendly mining solutions and operates according to the principles of sustainable development and environmental protection.

The KGHM Polska Miedź S.A. Group Code of Ethics⁴ defines the values and standards to be upheld by employees and partners. The document stresses the importance of responsibility, integrity, and compliance with the law in the company's operations. The key values emphasized in the code include safety (prioritizing the health and lives of employees), collaboration (teamwork based on respect and diversity), results orientation (striving for the company's long-term success), responsibility (transparent actions toward stakeholders), and courage (innovation and taking on new challenges).

The ethical standards described in the code are divided into three main areas: the good of the company, the good of the individual, and the good of stakeholders.

- The good of the company focuses on compliance with national and international laws and regulations, anti-corruption policies (KGHM Group has an extensive ethics and anti-corruption promotion system), information security and personal data protection, responsible management of resources and company assets, product and service quality, and environmental protection.
- The good of the individual emphasizes occupational safety and risk elimination, equal treatment and respect for human rights, prevention of bullying, fostering dialogue in employer-employee relations, and teamwork related to skills development and intergenerational cooperation.
- The good of stakeholders refers to transparent information policies toward shareholders and investors, honest and professional cooperation with business partners, and corporate social responsibility activities supporting local communities. In this regard, the company defines four areas of interest:
 1. Science and education – funding scientific and training programs.
 2. Health and safety – promoting a healthy lifestyle, health prevention, and financing life-saving medical equipment.

⁴ <https://kgbm.com/pl/inwestorzy/esg/kodeksy-i-polityki> , 14th July 2025.

3. Sports and recreation – supporting initiatives for children and adults.
4. Culture and tradition – supporting cultural initiatives and the preservation of traditions and historical monuments.

The code encourages the reporting of any irregularities through confidential channels. All reports are treated seriously, and whistleblowers are protected against retaliation. Reporting channels include contact with the ethics and anti-corruption officer (operating both in KGHM Polska Miedź S.A. and in each Group company), direct contact with the Ethics and Anti-Corruption Department of the parent company, and an anonymous ethics hotline.

The KGHM Code of Ethics is a comprehensive document defining ethical conduct within the company and toward its environment. The company places great emphasis on safety, social responsibility, and high business standards. It is worth noting that, in addition to the Code of Ethics, KGHM Polska Miedź S.A. also has a Code of Conduct, which serves as a guide to the company's values, offering practical advice to employees, managers, clients, and contractors on how to act in ethically ambiguous situations.

4.4. Skanska Code of Conduct

Skanska is one of the world's largest construction groups, specializing in infrastructure projects, commercial and residential construction, and sustainable development projects. The company operates in various markets, including Europe, North America, and Asia. Founded in 1887, its headquarters are in Sweden.

The Skanska Code of Conduct⁵ defines the values and ethical principles applicable to all employees and business partners. The document highlights responsibility, honesty, transparency, and compliance with legal regulations in everyday operations. Among the company's core values, the code identifies: care for life – protecting people and the environment; ethical and transparent actions – maintaining the highest standards of honesty and transparency; collaboration and diversity – promoting an inclusive culture; and client focus – delivering the best solutions for customers.

The code also highlights several important areas:

1. A safe and respectful work environment, including equal treatment and fair employment conditions, prioritizing employee well-being, and zero tolerance for bullying, discrimination, and harassment.
2. Sustainability, including the goal of achieving carbon neutrality by 2045, mitigating the environmental impact of construction activities, respecting human rights, and eliminating forced and child labor.
3. Prevention of corruption and conflicts of interest, with zero tolerance for bribery and financial misconduct, restrictions on gifts and hospitality, transparent sponsorship and

⁵ <https://www.skanska.pl/en-us/about-skanska/sustainability-and-esg/ethics/>, 10th July 2025.

social investment procedures, political neutrality policies, and limits on lobbying activities.

4. Protection of information and resources, including prohibiting insider trading, responsible management of company and partner assets, and adherence to cybersecurity principles.
5. Business ethics and fair competition, preventing unfair market practices and monopolies, combating money laundering and trade sanctions, and ensuring transparent financial reporting.
6. Reporting procedures, fostering a "speak-up" culture, guaranteeing protection from retaliation for whistleblowers, and providing dedicated channels for reporting irregularities.

The Skanska Code of Conduct places a strong emphasis on ethics, sustainability, and transparency. The company promotes a culture of honesty and safety, eliminating all forms of corruption and discrimination. This code is a key document shaping the conduct of Skanska employees and business partners.

4.5. Summary of Corporate Ethical Codes

The above sections present four codes of conduct implemented in companies from the restaurant, mining, construction, and aviation sectors. Despite some minor differences and varying points of emphasis, they share many common features. These include compliance with legal and ethical standards, anti-corruption policies, respect for employees, the creation of inclusive workplaces free from discrimination, bullying, and harassment, workplace safety, social responsibility, environmental protection, and mechanisms for reporting misconduct.

Skanska and Lufthansa place particular emphasis on reducing CO₂ emissions, while KGHM and AmRest highlight their engagement in local social initiatives. Moreover, KGHM stands out among these companies with its extensive system of ethics and anti-corruption officers. As we can see, the codes of conduct in these companies play a significant role. Beyond their image-related function of shaping reputation and ensuring standards (which is the main purpose of professional codes), they help build organizational culture and serve as important components of corporate governance. They have practical applications in business management. Non-compliance by employees, customers, or contractors can have serious consequences, such as warnings, reprimands, financial penalties, loss of contracts, or termination of cooperation.

5. Conclusions

Codes of ethics can play an important role in companies. It is essential that they are implemented jointly with the workforce, which should be supported in adhering to them. New professional roles related to business ethics are emerging in the labor market. Increasing numbers of job postings for ethics specialists, compliance coordinators, etc., on recruitment portals reflect the growing importance of ethics in companies, particularly in large firms operating in international environments.

In the case of companies like KGHM Polska Miedź S.A., AmRest, Lufthansa Group, and Skanska, codes of ethics help shape responsible business practices, strengthen relationships with stakeholders, and serve as tools to minimize reputational risk. The findings of this article suggest that organizations adhering to ethical standards enjoy greater trust, which contributes to their success and sustainability in a dynamic market environment. Moreover, these codes are essential tools for protecting companies from the risks associated with legal violations.

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ENVIRONMENT AND THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE. IS AI HELPING OR HURTING THE PLANET MORE?

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Purpose: The purpose of this article is to provide an overview of the benefits and problems arising from the rapid development of artificial intelligence and its application in environmental protection. The considerations carried out lead to the conclusion that actions using AI, surpassing human capabilities, can be helpful in the realization of the idea of sustainable development and, consequently, in the protection of our planet. However, the environmental costs of developing AI and enjoying its benefits may be higher than the positive results achieved.

Design/methodology/approach: The study is theoretical in nature and is based on a critical analysis of the literature on the subject. The literature has been limited to the part of the literature on the artificial use of artificial intelligence in environmental protection and related environmental costs associated with its development.

Findings: Studies show that the pace of development of modern technology is far ahead of human competence in environmental activities and is a good tool. However, there is insufficient reflection on the environmental costs associated with the development and use of AI.

Originality/value: The technological reality calls for a broader discussion of the environmental costs associated with the development of artificial intelligence and its application, which requires the development of appropriate procedures. The article can serve as a starting point for detailed work on this issue.

Keywords: environment, artificial intelligence, environmental costs.

Category of the paper: Conceptual paper.

1. Introduction

Artificial intelligence in the 21st century has become an indispensable part of human life. It is present in medicine, communications, banking, logistics, science, education, automotive, military, management and marketing, journalism and many other fields. A variety of solutions using AI are also shaping the modern system of culture and technology and are constantly being updated (Zawojski, 2019; Marszałek-Kotzur, 2024). Therefore, the future of humans is

inextricably linked to the development of artificial intelligence (Kuzior et al., 2019; Tomaszewska, 2023). Artificial intelligence has entered the world of man, and in fact man is now living in a world of artificial intelligence. Along with this awareness comes an increasing number of concerns and questions about man's future, his role in the world and his security. The impact of technology on human development, including tremendous advances in artificial intelligence and cognitive technologies, is inspiring representatives from various fields and disciplines. This problem also calls for urgent humanistic analyses, including philosophical ones. After all, the development of artificial intelligence is not without influence on the formulation of predictions about the future of humanity itself. The choice of the topic of this article is dictated by the ambivalence associated with the perception of artificial intelligence. On the one hand, we appreciate its revolutionary role in the modern world. On the other hand, we perceive various dangers arising from its functioning (Marszałek-Kotzur, 2024). Of course, it is difficult to underestimate its analytical and creative potential, but it seems that the dangers threatening from it are too often ignored. This is not just a matter of replacing humans in many activities and the loss of jobs for millions of people around the world (Kuzior, Marszałek-Kotzur, 2022). Nor is it about concerns about AI taking total control over humans, although the above issues are also very important. This article is about environmental issues and climate change problems related to the systematic degradation of our planet. Artificial intelligence, on the one hand, is an invaluable and effective tool used for various activities that exceed the capabilities of humans in the area of implementation of the idea of sustainable development, including environmental protection. On the other hand, however, it negatively affects the environment and exacerbates the climate crisis. In the latter case, there seems to be a lack of sufficiently broad discussion. The fascination with artificial intelligence effectively covers up its dark side, which undoubtedly exists and poses a serious danger to humans. So are the questions resounding enough today: Where does artificial intelligence come from in the physical sense, what “fuel” does it run on, and what are the environmental costs of its widespread use and systematic development? What price will mankind pay for the development of modern technology in terms of protection, or degradation of our planet? In the final analysis, will artificial intelligence help save our planet, or does it contribute more to its destruction?

2. Methodology of research

This study is theoretical in nature and is based on a critical analysis of the literature on the subject. The literature was limited to selected items in the field of the benefits of artificial intelligence as well as the negative effects of its application in terms of environmental impact. The literature study conducted, i.e. the analysis and critique of the literature of the selected publications, made it possible to determine what has been analyzed and how it has been

analyzed in the topic of interest in this paper. It also made it possible to outline the direction of further research. The focus was on issues of explicating examples of positive IS activities in environmental protection. Some selected examples of the benefits of these technologies were cited, and some of their negative effects on humans in selected situations were described. Some probable reasons why artificial intelligence can be destructive to the environment are also described. This article presents only some of the many. Attempts to justify concerns about the future of our planet in the context of further development of artificial intelligence are considered. The research shows that the pace of development of modern technology serves to protect the environment and can help counteract in the face of climate change. At the same time, there is insufficient reflection on the dangers of degradation of natural resources in the area of AI development. The considerations presented here, of course, do not exhaust the whole issue, they are only intended to encourage the reader to do in-depth research in this area.

3. Results of research and discussion

What is artificial intelligence?

AI has the ability to learn, create and memorize huge data sets and communicate between databases. It also has the ability to use the principle of cause and effect (Cymanow-Sosin et al., 2024, p. 59). In the context of discussions on the operation of artificial intelligence, there is talk of so-called machine learning and its subgroup, called deep learning (Kondas, 2022). Deep Learning is the foundation of cognitive computing (Kwilinski, Kuzior, 2020). In this process, a computer learns to perform tasks that are natural to the human brain, such as speech recognition, image identification, natural language processing or a recommendation system. Computers are thus able to learn without directly programming new skills, using neural networks to do so (Gillespie, 2014; Marszałek-Kotzur, 2024). In the process, the algorithms analyze the data provided to them and draw conclusions based on it. They then learn to use the knowledge thus gained in making decisions and solving specific problems. As they process more and more data, they self-improve without reprogramming (Kucinski, 2021). There are many definitions of algorithms. One, describes them as a combination of logical and control processes (Kowalski, 1979), another as procedures for transforming input data into the results we expect by means of mathematical calculations performed by a computer (Neyland, 2018). Algorithms can also be understood as a defining technology, because as such they shape the way we think and perceive the world (Bolter, 1990). They process thousands of complex data in real time, exceeding the capabilities of not just a single person, but entire groups of experts (Kosiński, 2021). Hence they are often used, among other things, to standardize many decision-making processes (Caplan, Boyd, 2018). Therefore, artificial

intelligence appears to be a promising tool in many fields. Including in the fight to protect our planet. Using its capabilities, AI can contribute to the solution of many problems related to ecology and climate change. Its ability to analyze vast amounts of data, identify patterns, and predict outcomes has great potential in understanding and solving problems of environmental degradation.

Use of artificial intelligence for environmental protection

One of the most important problems we face in the modern world is climate change and pollution. Scientists are pinning great hopes in this regard on the use of artificial intelligence. Its virtually unlimited learning capabilities could be key to, among other things, monitoring carbon emissions, predicting climate change, optimizing various processes related to environmental disaster prevention and other activities (Neyland, Möllers, 2017). AI can assist scientists, policymakers or various organizations in making sustainable, ecological decisions. One of the most important applications of AI in the environmental field is the aforementioned monitoring and prediction of climate change. Artificial intelligence can analyze huge amounts of data on temperatures, precipitation, wind and many other atmospheric factors. This allows for a more accurate understanding and more precise prediction of climate change. As a result, it is possible to more effectively plan and adjust measures to protect against the effects of climate change, such as hurricanes, floods, droughts and sea level rise. A serious threat to our environment is the increase in greenhouse gases such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). They trap heat in the atmosphere, causing a gradual increase in the Earth's temperature, thus contributing to global warming. The consequences of this process include the melting of glaciers, rising sea levels and the occurrence of other extreme atmospheric phenomena. Artificial intelligence can play an important role in monitoring and optimizing manufacturing processes, which are a major source of greenhouse gas emissions. By analyzing vast amounts of data, AI has the ability to identify areas where there is any potential to reduce emissions. Through forecasting, trend analysis and mathematical modeling, it can make decisions aimed at more efficient and environmentally friendly production. Using data on energy consumption and other environmental factors, companies will be able to optimize production processes, which will translate into reduced greenhouse gas emissions (Pałasz, 2023). For the realization of sustainable development, the protection of natural resources such as water, soil and energy is a key issue. Artificial intelligence enables more efficient management of these resources. AI systems analyze data from sensors in water supply networks, detecting leaks or predicting failures. This helps reduce water losses and water supply costs. In agriculture, AI-based systems help with precise irrigation, adjusting the amount of water according to the needs of specific crops and local weather conditions. With the development of mankind, the need for natural resources is increasing, leading to their overexploitation and depletion. This phenomenon not only has a negative impact on our environment, but also on the stability of ecosystems and people's quality of life (Nature, 2016).

AI can play a significant role in the conservation of natural resources by monitoring and analyzing environmental data, such as detecting abuses associated with the extraction of coal or other non-renewable energy resources, or tracking illegal fishing activities. In addition, AI can help protect natural habitats by continuously monitoring their condition and identifying potential threats, such as degradation or misuse. With AI-assisted satellite technology, it is possible to monitor oil spills, chemical spills into waterways or illegal logging. AI algorithms analyze images from satellites, detecting anomalies that may indicate pollution or illegal activities (Dydel, 2024). Another important area where artificial intelligence can play an important role is in optimizing energy consumption. The use of algorithms can analyze energy consumption data and predict how it can be optimized. Algorithms can, for example, manage lighting, heating and air conditioning systems in buildings, thereby minimizing energy consumption in cities. Collecting information on work schedules, temperature, traffic volume and many other factors, artificial intelligence can control heating, ventilation and air conditioning systems in buildings, minimizing energy waste and reducing carbon emissions (AI o AI, 2023). Another area where artificial intelligence can help protect the environment is in transportation automation and optimization. Using its autonomous vehicles, it can optimize routes, leading to reduced fuel consumption and harmful emissions. Intelligent systems can also be used to manage traffic, minimizing congestion and regulating the flow of vehicles, thereby reducing road congestion and air pollution. Using sensory technologies, systems equipped with artificial intelligence can analyze the quality of air, water and soil, identifying harmful substances and emitters. When abnormalities are detected, such as exceeding permissible standards, these systems can generate automatic alerts and inform relevant services of the danger. In this way, we effectively control the level of pollution and take appropriate measures to reduce it. Artificial intelligence can also help develop sustainable agriculture. By analyzing data on soil, weather, fertilization and various factors affecting crop yields, algorithmic systems can provide farmers with information and recommendations on optimal farming methods. This makes it possible to reduce chemical abuse, as well as reduce yield losses (ByleEko, 2021). However, the potential of AI in agriculture does not end with plants. There are also opportunities to use it in animal husbandry. With AI's analysis, farmers can make more informed decisions and improve the health of their herd (Palasz, 2023). Artificial intelligence also supports the work of foresters. Combined with remote sensing, it is being used to create digital models of forests. This allows foresters to monitor the condition of trees, assess the biodiversity of forest ecosystems and observe their changes. Experts are also working on methods to accurately measure biometric characteristics of trees and recognize species. The results of the measurements can be useful in many environmental tasks - planting planning, managing alien species, shaping biodiversity. The network of listening posts allows scientists to precisely monitor large areas of forest simultaneously - in the case of traditional methods, this would require the involvement of one and a half hundred qualified experts (Sikorska, 2024; Sozosfera, 2023). There has also even been a conceptual design for an autonomous landscape

infrastructure system, a proposal to integrate artificial intelligence systems into the environmental management process (Cantrell, Martin, Ellis, 2017; Knosala, 2023; Kwiliński, Kuzior, 2020) Another application of artificial intelligence could be in the area of recycling and waste management. Utilizing advanced algorithms and image recognition technology, AI systems can effectively sort waste, allowing for more efficient processing and maximizing recycling. This represents an important step toward the realization of zero waste. One of the key areas where artificial intelligence can help protect the environment is education and environmental awareness building. The use of AI in e-learning systems and educational platforms, allows for the transfer of information and education on sustainability, environmental protection and climate change. Raising public awareness of ecology, can result in the public making more informed choices and taking action to protect the environment (Jaskuła, 2023).

Ecological costs of developing artificial intelligence

Artificial intelligence is one of the most important technologies of the 21st century, driving innovation in almost every field. Generative AI models are transforming the way we work and communicate, offering increasingly sophisticated analysis and content creation capabilities. But behind the technological advances, there are also growing pressures on the environment. Increased demand for computing power, intensive energy consumption, as well as impacts on water resources and the production of electronic equipment are aspects that are often overlooked in the public debate on AI (Kanungo, 2023). It is worth noting their significant impact on the environment and climate. For example, processing texts with these advanced models requires large computational resources and is associated with high energy consumption. It should be noted that both the training of AI language models and the operation of the data centers required to run them require huge amounts of electricity and water resources (Leffer, 2024). Factors such as algorithm complexity, continuous activity, integration with large systems and the need to store large amounts of data can all contribute to increased energy resource consumption. AI chatbots, as well as other AI-based applications, can consume a significant amount of energy, especially if they operate on a large scale or use advanced language models. Some of the chatbots that can consume large amounts of energy are those that handle large user movements or are integrated with systems that require continuous processing, such as chatbots that operate service areas, instant messaging or social media platforms. In addition, chatbots that use advanced technologies such as deep machine learning may also require more computing resources, resulting in higher energy consumption (Halecki, 2024). One of the most serious problems with AI, therefore, is its intense energy requirements. Language and visual models require enormous computing resources (Marszałek-Kotzur, 2022). Training one large AI model can consume as much energy as the average household for decades. Based on studies and reports, including from the Massachusetts Institute of Technology and the UN Environment Program, it is estimated that training the GPT-3 model generated more than 500 tons of carbon dioxide. This used more than 1200 megawatt hours of

energy, enough to power about 120 American households for a year. Also problematic is the fact that many server rooms are powered by fossil fuel energy. Although some technology companies are declaring a shift to renewable energy sources, still much of the global AI infrastructure runs on coal and natural gas. Data centers are likely to account for an increasing percentage of carbon emissions in the coming years. Artificial intelligence also has a huge impact on water consumption. Cooling servers in data centers requires millions of liters of water per year, which in some regions of the world poses a significant threat to local ecosystems. According to a UNEP report, in the near future the equipment used to develop artificial intelligence could use six times more water than the whole of Denmark. Additionally, according to a study conducted at the University of Texas, training large AI models can consume up to several million liters of water per run. The problem becomes even more significant in drought-stricken areas, where any additional use of water resources can lead to serious environmental and social consequences (Azurro, 2024; Ren, Wierman, 2024). Artificial intelligence relies on advanced processors, such as GPUs, which are needed to perform complex calculations. Their production requires the use of rare earth metals. The process of extracting them is extremely energy-intensive and often involves environmental degradation, deforestation and groundwater pollution. In addition, the rapid development of AI is contributing to the growing amount of electronic waste. Processors used in data centers have a limited lifespan and are often replaced every few years, leading to huge amounts of electronic waste. Currently, recycling such components is extremely expensive and complicated, and much of it ends up in landfills or countries with weak environmental regulations (Azurro, 2024). Building the necessary electronic infrastructure requires the consumption of a wide range of critical minerals and rare metals. The very process of extracting them is often carried out in a predatory manner, with no regard for the environment. The result is sometimes soil erosion and the ingress of heavy metals into ecosystems. For example, it takes as much as eight hundred kilograms of raw materials for two kilograms of electronics. In addition, servers and accompanying instrumentation, like all computer equipment in the world, go out of use after a while, creating mountains of electronic garbage. Very often they contain hazardous substances such as lead, cadmium and mercury, which are serious contaminants of water and soil, endangering humans and nature. Unfortunately, the level of e-waste recycling is so far very low. And according to the Global Economic Forum, by 2050 the amount of them on Earth will exceed 120 million tons. Skeptics also point out that it is virtually impossible to estimate all the potential environmental damage associated with artificial intelligence. Examples of AI's controversial impact include the possibility of generating and spreading false information about climate change, which could demotivate some of the public to make green choices. Another threat is the wider use of AI-controlled cars and drones, which could have a negative impact on the animal world (Pavlinec, 2025).

Proposals for regulation of sustainable development of AI

The development of artificial intelligence is not without its impact on drawing down energy resources and generating a carbon footprint. It poses numerous environmental challenges, but there are practical steps that can reduce its negative effects (Marszałek-Kotzur, 2023). The Massachusetts Institute of Technology points to several key strategies that can help reduce the negative impact of artificial intelligence development on the environment. First, technology companies can focus on creating more energy-efficient algorithms. New models can be trained using smaller data sets or in a way that is more optimized for energy consumption. Already, techniques that allow previously trained models to be reused rather than built from scratch are becoming more common. Second, investing in renewable energy sources is a good option. Data centers in the future could be fully carbon-neutral. For such commitments to have a real impact, it is necessary to globally implement green standards in the IT industry. Responsible management of raw materials should be kept in mind in this context. The United Nations Environment Program (UNEP, 2024) recommends developing technologies to recycle and extend the life cycle of IT equipment. It is also crucial to reduce the production of unnecessary AI models, which do not add significant value but generate huge environmental costs. Key in this regard is the use of renewable energy to maintain the company's IT infrastructure. This significantly reduces its carbon footprint. Companies developing artificial intelligence commercially or for their own needs should therefore choose vendors that provide not only adequate infrastructure, specific computing power but also adequate cooling and scalability. It is also extremely important to have metrics that guarantee certain energy and water efficiency and the use of renewable energy to reduce the carbon footprint. Especially since the development of projects based on this technology is expected to be very dynamic (Infor, 2024). Artificial intelligence has many environmental benefits. It is already being used, for example, to map problematic sand mining or analyze emissions of methane, one of the most adverse greenhouse gases. AI is also helping many companies transform to better use resources. The key, then, is to enable its further development in such a way that the costs to the Earth and its inhabitants are not greater than the benefits. Therefore, national standards for monitoring the ecological impact of AI are proposed. Companies are required to disclose information on the environmental costs of products and services created based on AI. AI algorithms and server cooling technology need to be improved to reduce energy and water consumption. E-waste management also needs to be improved and recycling rates increased. It is also important to promote the use of renewable energy to power data centers and raise public awareness of the energy and water losses associated with the use of GPT Chat. There is also a need for greater transparency about the potential impacts of further development and widespread use of AI. The carbon and water footprints of AI need to be known to users, and the goal of the technology should be to reduce them as much as possible. As long as the majority of global energy comes from fossil fuels, AI will be a major ballast for climate change.

Some regions may feel the pressure of water abstraction and mineral and metal extraction more than others. The result of such activities could be local droughts and increasing pollution. This is an example of ecological and climatic injustice, which is yet another challenge for promoters and builders of new technologies. UNESCO openly calls for abandoning the use of artificial intelligence if it leads to disproportionate environmental damage (Azurro, 2024).

4. Summary

Currently, opinions are sharply divided on the degree of existential threat to humanity that may arise from the global development of artificial intelligence. There are extremely optimistic and extremely pessimistic opinions. There seems to be a general consensus that there are risks associated with artificial intelligence, as with most technological advances, but different people perceive these risks in different ways. The specific situations cited in the above reflections, as well as visions for the future of artificial intelligence development in the service of sustainability, open up new horizons for research and the search for answers to the questions raised in the introduction. Perhaps fears about the development of artificial intelligence are exaggerated, but the questions we are concerned about cannot be left unanswered... Contemporary processes of artificial intelligence development should not only be subject to the analysis of current problems, but more broadly should try to identify threats that may escalate in the future (Chomsky, 2023). The purpose of this article is to encourage the reader to reflect on the problem raised and perhaps raise new questions on the issue. Artificial intelligence has become the foundation of modern technologies, and its application is invaluable, also in terms of solving various problems related to the exploitation of our planet, consequently leading to pollution and climate change. The benefits of utilizing its capabilities, among others in the field of environmental protection and pursuing the idea of sustainable development, are obvious. However, it seems that the negative aspects of its development and application are not discussed as widely as the benefits. Therefore, this article more clearly explains the environmental costs. A definitive statement on whether AI brings more benefits or more harm to the environment would require detailed and in-depth research. High energy consumption, exploitation of water resources and increasing electronic waste are just some of the challenges that the AI industry is facing. While some companies are taking steps toward greener AI, real change requires global regulation and informed decisions by both consumers and businesses. The future of AI should not only be smarter, but also more sustainable - so that the technology can serve humanity without destructive consequences for the planet.

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COACHING AS A PROFESSIONAL TOOL FOR PERSONAL AND CAREER SUPPORT (TAKING INTO ACCOUNT THE HUMANISTIC FORM OF MANAGEMENT)

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Purpose: The purpose of this article is to frame coaching as an effective tool to support the complex process of pursuing professional and personal life goals. This article is a concise description of the various components of professional coaching. The analysis also takes into account the importance of the humanities and the humanistic form of management in modern business organizations.

Design/methodology/approach: Due to the complexity of the issue addressed, the article uses a comparative-descriptive analysis method.

Findings: The conducted analyses made it possible to verify the thesis according to which coaching is a conversational method of support, the essence of which is, based on the majeutic method, a Socratic dialogue, conducted from the level of the heart/feeling. Coaching is based on the ability to listen at a level appropriate for coaching, also on the ability to ask questions characteristic of coaching, and the ability to identify areas in which coaching is currently most often worked on.

Research limitations/implications: The subject of coaching as a helping profession is multifaceted, so the author of the article, acting selectively and deliberately, considers only the key elements of the professional coaching process.

Social implications: The scientific basis of coaching is the humanities and social sciences, especially philosophy and psychology. Coaching is the practical application of humanistic and social knowledge. Humanistic knowledge focuses on human beings and the multidimensionality of their lives. This multidimensionality can be successfully applied to the need to lead a satisfying professional life, as well as a sense of fulfillment in private life. Coaching as a helping profession is an effective tool for supporting psycho-physical health and shaping well-being.

Originality/value: Coaching still belongs to rachitic phenomena with not fully developed formal and legal imperatives; a profession whose formal principles need to be refined. For this reason, it is worth taking up the subject of coaching as a helping profession, showing its professional-therapeutic dimension.

Keywords: Coaching, Socratic dialogue from the level of the heart/feeling, humanistic management, corporatism, concern for quality of life and building well-being.

Category of the paper: Review paper.

1. Introduction

In the article, using the method of comparative-descriptive analysis, I make an effort to characterize the issue of coaching, which nowadays, along with many other pro-social professions based on the humanities and social sciences, especially psychology, co-members the subcategory of helping professions. I present coaching as an effective tool for professional personal and professional support. I recognize that coaching serves its purpose in terms of both personal and professional support. Any criticism of coaching as an obscure and layman's, because not fully formed method of helping, or a tool for forcing continuous development, is most often related to a lack of professional, substantive knowledge of coaching and an incorrect understanding of the concept/profession.

The answer to the question of what coaching is ambiguous. Currently, there are many definitions of coaching. These definitions are recognized by both international and Polish institutions for professional coaches. One such institution is the International Coaching Federation (ICF Poland) – the oldest international coaching organization, established in 1995, which recognizes coaching as „a form of accompanying the client in a creative process that makes them think and inspires them to maximize both their professional and personal potential” (icf.org.pl).

Specialists in the fields of self-development, counseling and coaching explain in different ways what coaching is. It can certainly be admitted that coaching is interdisciplinary in nature, and the cited classical definitions of coaching most often call coaching a professional support tool based on psychological, philosophical, sociological and management-counseling knowledge. It is not uncommon for coaching to be captured simply in the form of an ongoing, processual method of providing assistance in the mentee/coachee's self-directed pursuit of a self-determined goal. According to Robert Kozłowski, a practicing coach and coaching teacher, „coaching is about supporting people to travel the path to achieve a goal. Although the coach accompanies the client/mentee on the journey as a journey of life leading to a goal clearly defined by the client, the coach does not direct the client and does not suggest to the client what to do to achieve that goal. The coach's task is to support the client in making the intended change on his/her own” (Kozłowski, 2016, p. 12).

In Poland, the professional principles of coaching, were first described by Małgorzata Sidor-Rządkowska, putting coaching imperatives into a system of 14 ethical principles of coaching. These principles have not lost their relevance even today, constituting a kind of coaching precodex rooted in humanities (Sidor-Rządkowska, 2022). According to these principles/rules, a professional coach is bound by strict ethical and humanistic orders of action and behavior. Among the professional principles of a coach's work, the principle of systematic improvement of competence and the principle of concern for one's own development as a professional coach deserve special mention. Of equal importance is also the principle of increasing trust in the

process of building relationships, the principle of truthfulness and the principle of loyalty, the principle of respect for the client's autonomy; also the principle of being the ultimate judge of one's own professional decisions, the principle of keeping commitments and skillfully questioning one's own decisions, the principle of taking care of one's own psychophysical condition, also Kant's principle of the difference between the end and the means to the end related to the postulate of non-instrumental treatment of the other person. To the aforementioned principles should be added the principle of cordiality based on friendly cooperation with other coaches and the principle of maintaining professional self-respect (Sidor-Rządkowska, 2022, pp. 53-54).

Nowadays, the coaching form of employee support finds application in those organizations that place special emphasis on human/employee empowerment and introduce a humanistic management culture. Humanistic management is a form of management through values. The humanistic form of management through values seeks to link moral postulates with the business world, while treating human beings as a special value, since they are autotelic (Szulczewski, 2011, pp. 143-159).

2. Humanistic form of management in the face of corporatism. Coaching as a remedy for dehumanized management styles

Humanistic management was born, as it were, in the form of a reaction to our times, a notable feature of which is the ubiquity of business organizations and the corporatization that prevails in them. This corporatism manifests itself in patterns of extremely hierarchical management based on instrumental coercion of efficiency, productivity and performance (Smelka-Leszczynska, 2024, pp. 151-153), also the constant, permanent need to control the employee as a result of the lack of direct trust in that employee. This corporatization is also externalized in the willing and increasingly intense seizure of power and available resources of the company, while shifting responsibility to the employee and his team/environment (Kostera 2015, p. 53).

It has been noted that - in the hitherto inhumane atmosphere of corporatism – the humanities and the humanistic form of management can become „a possible inspiration for individuals and groups seeking renewal and change (...). Humanistic management can be defined in three ways. First, it is management whose goal is the human being, his well-being, emancipation and development. Humanistic management adopts Immanuel Kant's categorical imperative as a principle, postulating that man should never become a means to an end, including such ends as profit, economic growth or efficiency (...). Second, humanistic management draws on the contributions of the humanities in the broadest sense, seen as a body of knowledge and culture offering contextual knowledge and sensitivity to political, historical and ethical traditions (...).

Third, humanistic management focuses on the human perspective, is interested in the human condition, the human experience, it is, as it were, management from the human level” (Kostera, 2015, pp. 53-54; Taylor, 2020, pp. 384-385).

Humanistic management unites around an ethos of shared values, such as responsibility, loyalty, dignity and respect, and common goals binding together leading principals of moral conduct, plans and actions. For this reason, „a morally intelligent organization is an organization whose principles are based on important values and whose members act in accordance with them. The main characteristic of a morally intelligent organization is that it is formed by morally intelligent people” (Szulczewski, 2011, p. 158; Lennick, 2007, p. 172). For this reason, the awareness and axiological sensitivity of the employee plays an extremely important role today. The axiological sensitivity of the employee is greatly enhanced by the adaptation of a coaching work culture in the organization. Awareness and axiological sensitivity of a person/employee are most often developed with the help of professional coaching as an effective, albeit non-invasive tool for creative development, which finds its application both in work on areas of professional and private-personal life. The skillful use of coaching as a support tool requires knowledge of the professional principles of its application.

3. Principles of professional coaching

Professional coaching enhances „individual, continuous and comprehensive development of a person’s competencies, inspires and helps build valuable attitudes, supports the development of new strategies, behaviors and facilitates the achievement of desired goals and results” (Wilczynska, 2023, p. 19). It is worth adding that coaching increases the client’s self-awareness, improves self-cognitive processes, influencing the reduction of stress levels, allowing to lead a more balanced life, positively influencing the quality of communication, with a clear reference to humanistic values.

Among the most frequently mentioned types of professional coaching, the following deserve mention: first, executive coaching dedicated to executives and senior managers. This type of coaching focuses on working in the area of intensely changing forms of management and business development strategies of the organization; and after second, close to executive coaching, business coaching, whose main goal is to optimize „management processes and work on business goals and results” (Wilczynska, 2023, p. 21). Business coaching strengthens the effectiveness of managerial activities in the business sphere and effectively supports the implementation of business projects. The third type of coaching is career coaching, dedicated to people focused on professional development. This development may involve the need to acquire new competencies/skills, or to make changes that will improve professional work and contribute to the client’s desired career goal. Another, fourth type of

coaching is life coaching identified with personal coaching or personal life coaching (Ramirez-Cyzio, 2010). This type of coaching deals with personal life and most often involves the issue of changes carried out within it. These changes may involve the need to develop a balance between the private and professional spheres of life. They also not infrequently involve the need for self-discovery and gaining insight into oneself. This need requires working through, as part of the coaching process, the area of (limiting as well as reinforcing) beliefs, including the client's values, taking into account the client's preferred gradation of values/hierarchy of values (Wilczyńska, 2023, pp. 20-21).

The mentioned types of coaching refer to individual coaching. However, it is worth mentioning that today team and group forms of coaching have also developed. These forms, although similar, are not the same (GROWTH ADVISORS). Most often, clients of team coaching (team coaching) know each other, form one team, and during the coaching process pursue one common goal. In contrast, in the case of group coaching, clients do not know each other and, although they form a group, they do not constitute a team. In this situation, the goals of the group members may differ, may be different, formulated differently. The group is united only by dedicated group coaching. An example of dedicated group coaching, can be coaching directed to people after a breakup, after the trauma of divorce, coaching dedicated to women after the loss of a child, parenting coaching directed to parents of children with disabilities, also to parents of children with mental development disorders, neurodevelopmental disorders (for example, to parents of autistic children, etc.). In contrast, in the case of team coaching, nowadays in business, consider, for example, the special role of agile coaches, who help team members reduce redundant/bureaucratic tasks and consolidate the resources inherent in the team, i.e. the potential that team members probably do not see in themselves (Adkins, 2020, p. 54). Regardless of the type of coaching, the coaching method of support involves working in accordance with the rules described in the codes of international, and nowadays also Polish, professional coaching organizations (Chamber of Coaching)¹.

4. Coaching process as an empowering maieutic dialogue from the level of the heart

The traditional coaching process, regardless of the type/type of coaching, consists of a series of one-and-a-half or two-hour meetings. These meetings are held systematically over several months, usually at regular biweekly intervals. Of course, the described model of meetings is not the rule. The most common model involves „six two-hour sessions over four months”

¹ Professional coaching organizations include the International Coaching Federation (ICF), the International Coaching Community (ICC), the Chamber of Coaching - an independent coaching organization representing the interests of the professional coaching community in Poland. www.izbacoachingu.com.

(Rogers, 2010, p. 18). The actual coaching process is preceded by a pre-coaching session, during which the coach „prepares the client for the first session by requiring the client to do some paperwork, sometimes including certain exercises” (Rogers, 2010, p. 18). The pre-coaching meeting ends with the signing of a (individual or managerial) contract and the official conclusion of the agreement.

The task of the client is to set a list of proposed topics, and therefore the goals that the client wishes to achieve using the coaching form of support. The positively formulated goals most often take the form of dilemmas (e.g., the dilemma of which career path to take) or puzzles (e.g., the disjunction of considering the topic of what to change in order to work better while maintaining as a constant the principle of work-life balance) (Rogers, 2010, p. 18). During a coaching conversation, the client discusses the proposed topic with the coach. The conversation follows a specific pattern, that is, a selected coaching structure appropriate to the situation. During the session, the coach adapts/adapts the structure to the topic of conversation. At the end of the session, the client and the coach carry out an evaluation (follow up) of the conducted session. This evaluation involves obtaining feedback on the quality of the conducted session. The feedback is referred to as constructive feedback.

The client leaves the session with a clearly defined, precisely developed plan of action by him regarding the topic and purpose of the conversation held with the coach. The professional coaching relationship: coach – client, is a parallel relationship. The parallel relationship means that the coach does not step into the role of a teacher, mentor, tutor or psychotherapist. In a parallel relationship, the coach also steps out of the role of an expert and is not an expert on the subject. The coach becomes merely a conversational companion working with the dialogical method of asking questions.

The source of the dialogical, philosophical-therapeutic method of coaching is the *majeutic* method, called *midwifery*, used by Socrates, the ancient philosopher (Negri, 2016, pp. 65-75). Socratic dialogue has contemporarily become the basis for building a coaching relationship based on the value of interpersonal trust. Socrates' *majeutic* dialogue, as a supportive, therapeutic conversation, is a leading tool of coaching. Coaching dialogue is an empowering encounter, an empathic relationship of „deep contact between individuals” (Czarkowska, 2016, p. 151). For this reason, it is not uncommon to associate coaching practice with dialogue conducted from the level of the heart.

Dialogue from the level of the heart is marked by full commitment, empathy, inner openness, courage to be authentic, sincerity, and at the same time dialogic presence and attentiveness of the coach during the conversation with the client. This attitude strengthens the coaching relationship. A valuable aspect of the coaching relationship is also the increase in the level of trust between the coach and the client as equal actors in the relationship. The coach conducts this type of dialogue from an open, pure and strong heart level (Czarkowska, 2016, p. 145). The subjects of the relationship: the coach and the client, are able to „express their opinion, respectfully but consistently defend what is important to them, honestly and in

agreement with each other agree or disagree with the other's proposals, and the interlocutors' declarations are consistent with their actual intentions" (Czarkowska, 2016, p. 150). The issue of conducting conversation from the level of the heart prompts one to ask about another important substantive issue of coaching. This issue is the problem of attentive listening during a coaching session.

5. Levels of listening in coaching

The gift of listening is a special competency that fosters openness to those around you and promotes a sense of belief, appreciation and understanding. Listening is also a key skill of a professional coach. A good coach „is able to listen in a special way, so that he or she is also able to see what remains unspoken" (Starr, 2015, p. 71). There are many different forms of listening. In professional coaching, there are several levels of listening – those levels of listening that are most valuable in coaching require a focus on what is deeply human, humanistic, presence-based, and allows one to look at the client holistically. „The level of listening changes with the effort put into understanding the person and the topic of conversation" (Starr, 2015, pp. 71-72). Among the various classifications of listening levels, the one proposed by thought leader and career counselor Julie Starr is particularly noteworthy.

Julie Starr distinguishes the level of cursory listening. Cursory listening is the lowest level of listening, at which the listener usually pretends to listen by wandering his or her thoughts elsewhere, ignores parts of the conversation, and loses the meaning by running his or her thoughts beyond the subject matter taken up by the client (coachee). Superficial listening is a form of superficial listening that does not work in coaching. A cursory listener forgoes engagement in listening and attentiveness, which is a particularly important skill in the coaching process. A slightly higher level of listening is that of conversational listening. This type of listening is most often wrapped up in conversations that follow a triadic pattern: listening – speaking – thinking. According to Starr, at the level of conversational listening, „we focus not only on the other person and what they are saying, but also on ourselves and what we are saying, what we are planning to say" (Starr, 2015, p. 73). In coaching, this level of listening is also insufficient. In a coaching conversation, we enter an even higher, and thus deeper, level of listening. This higher/deeper level of listening is sometimes referred to as the level of active listening. Active listening, is the leading competence of a professional coach. In active listening, the listening coach focuses on the client's statements and recording facts and filling in gaps, prioritizing listening and processing information over speaking. A coach at the active level of listening focuses attention on the client while trying to „understand what the interviewee is saying by asking clarifying questions, repeating parts of the client's statement or summarizing the information heard" (Starr, 2015, p. 74). The active level of listening takes into account

paraphrasing and mirroring the words/sentences spoken by the customer during the process. The last and highest level of listening is the intensive listening level. At this level of listening, the coach demonstrates a high level of perception and perspicacity.

As a listener, the coach calms and quiets his mind, is fully focused on the client of the coaching process, and focuses his full attention and awareness on the client. The intense level of listening is sometimes referred to as the higher/deeper level, as it is directly associated with mindfulness as presence, focus and engagement close to meditation. This level of listening as information retrieval, Starr describes with the following sentences: „In my experience, it is a service-focused attitude – a desire to understand, to help, or to provide support; in any case, it is an intention for the benefit of the speaker and his or her development” (Starr, 2015, p. 76).

With such an understanding of service, Julie Starr also links the concept of intuition. Starr believes, among other things, that intuition is a valuable cognitive tool successfully used also by a professional coach. Intuition as a tool of cognition refers to those specific forms of communication that occur in places inaccessible to our consciousness, in other words, in areas not registered by consciousness (Starr, 2015, p. 80). „Intuition is the brain’s ability to understand the message of situations or people by going beyond the signals to which we normally respond (...). Intuition makes use of knowledge we already have and that is communicated to us through thoughts, feelings, images and sounds” (Starr, 2015, p. 80). Intuition, as a function of the mind and body, does not require the use of language. The form of intuitive cognition is facilitated by experience and the stock of skills one possesses (Starr, 2015, p. 82).

6. Formulation of questions in coaching

As demonstrated earlier, the foundation of coaching is dialogue based on building an empathetic relationship. It is worth adding that the essence of this relationship is professional coaching questions. Among the leading coaching questions are open-ended questions. The use of such questions not infrequently involves the ability to transform closed questions. These usually begin with the participle „if”. Skillful posing of open-ended questions involves avoiding this participle, as well as the important competence of shying away from/avoiding suggestive, homing, rhetorical or interpretive questions, and abandoning the analytical search for the perfect question.

Tony Stoltzfus, an American coaching instructor, argues that „a derivative of the problem of finding the perfect question is intricate questions” (Stoltzfus 2012, p. 13), which should also be avoided. The key to success is simplicity, or more precisely, simplicity in the style of asking questions. When posing a question, one should keep in mind the not-so-easy skill of interrupting the client at the right moment. It is a disadvantage, especially for novice coaches, both to

interrupt the client too seldom and to interrupt the client too often, even habitually. An undesirable form of questioning in the classic coaching process is also the case beginning with the pronoun why. This pronoun introduces a question that hides, according to some coaching practitioners, a blameworthy request for an explanation or an obligation to offer an exculpatory explanation (Stoltzfus, 2012, pp. 12-16).

7. Coaching as a competency-based tool for support in various aspects of life

According to Ewa Mukoid master certified coach, coach mentor and supervisor, coaching competencies are excellent, distinctive tools used in working with people, through which people enhance the level of life satisfaction, also life harmony, especially emotional balance. During an empowering coaching conversation, the level of proactive behavior of the client also increases, exerting a positive influence on his psycho-physical well-being in various aspects of life (Mukoid, 2017, pp. 437-438).

Coaching support also strengthens the mental resilience of the mentee/coachee. Strengthening mental resilience can equally apply to personal/private life, social life and professional life. „Mental resilience is a personality trait that largely determines how an individual responds to challenge, stress and pressure, regardless of the prevailing circumstances” (Clough, 2016, p. 157; Strycharczyk, 2012). The topic of mental resilience is related to the issue of resilience and hardiness. Working on resilience as commitment, calm flexible control response, correct and skillful evaluation of the stressful event, and working on hardiness as an active response to the stress-generating difficulty, is a very common theme in coaching processes (Clough, 2016, p.158; Kellerman, Warsaw, 2023, p. 25).

However, coaching is used not only to cope with challenges, but also to improve talents and social competencies, point out ways to support people in their development and struggle with the disadvantages of life. As a helping profession (helping professions), coaching is an excellent tool for expanding consciousness, transforming identity (Mukoid, 2017). As is already known, coaching teaches the ability to ask the right questions (some of which fall into the category of difficult questions), reinforces the habit of active listening, teaches the skill of sincere appreciation, as well as taking care of one's own natural abilities (mukoid.com).

The ability to sincerely appreciate the client is done at several levels: the level of enjoying the progress that the client has made in the process of pursuing his or her goal as a result of working with the coach; the level of expressing faith in the other person/client reinforced by the effects of the client's work to date. At this level, the coach appreciates the client by emphasizing the importance of the client's resources. The client's resources are the skills, competencies, positive habits and abilities possessed by the client, which can become the seeds

of the client's future success. Client appreciation is also done at the level of appreciation as defining identity, or „expressing in a positive way who a person is” (Kozłowski, 2016, p. 32).

8. Conclusions

The purpose of the article was to present coaching as a tool for professional personal and professional support. Conducted in a succinct outline, the analysis focuses exclusively on the descriptive principles of professional coaching, that is, coaching as a dialogical relationship with a parallel position of the subjects of the relationship. Also coaching as a conversational method of support, the essence of which is the Socratic maieutic dialogue, conducted from the level of empathy, emotion and heart/feeling. Reflection on the present issues was also accompanied by a description of the levels of listening in coaching, a characterization of the leading questions for coaching by type, and an indication of the areas in which coaching support method is most often worked on today.

Such a special area today is business organizations, which are replacing the instrumental-corporate style of management with a new, humanistic – focused on the human being and his values – form of leadership/leadership. The humanistic management style thus focuses on the employee as a human being and awareness of the multidimensionality of his life. This multidimensionality can be successfully applied to both the need to maintain satisfaction in one's professional life and a sense of fulfillment in one's private life. Coaching as a helping profession can be considered an effective tool for supporting psycho-physical health, a tool for growth and compensation of quality of life, and a reliable accessory for building well-being.

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THE USE OF NEW TECHNOLOGIES AVAILABLE IN POLISH HEALTHCARE SYSTEM BY INHABITANTS OF SILESIA

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Purpose: This research aims to analyze the awareness of the inhabitants of Silesia regarding the use of the selected new technologies in the Polish healthcare system, as, according to Polish law, all Polish citizens are entitled to equal access to healthcare services regardless of their financial situation and information about the scope and type of health services provided by various healthcare institutions.

Design/methodology/approach: Online survey, 20 questions, focuses on the inhabitants of Silesia, a southern Polish voivodeship, with Katowice as its capital, covering an area of 12,334 km² and home to approximately 4.4 million people, based on the results of the National Population and Housing Census conducted in 2021 by the Central Statistical Office of Poland.

Findings: The work presented a general overview of the selected new technologies utilized in Polish healthcare, providing information on their purpose, a general idea of how they work, the benefits of their use, and possible challenges or disadvantages of their implementation. The conducted research points out that the Silesia inhabitants do not have a high level of awareness regarding the use of new healthcare technologies in Poland, which means that appropriate actions should be taken by local authorities and medical institutions to promote information and educate Silesia inhabitants on the use and implementation of the new healthcare technologies in Poland.

Research limitations/implications: To gather the relevant data, an online survey was conducted using Google Forms to provide a numerical overview of the characteristics of a sample of the Silesia inhabitants population. The survey consisted of 20 questions, 5 on demographics and 15 questions focused on assessing respondents' awareness of new healthcare technologies.

Practical implications: The research results can help to understand how new technologies are used in the Polish healthcare system and what is the awareness of use new technologies in Silesia.

Originality/value: The work shows a general overview of the selected new technologies in patient healthcare, paper presents new attitude. It is addressed to healthcare organization, doctors, researchers and public institutions.

Keywords: new technologies, Polish healthcare system, new technological solutions in medicine.

Category of the paper: research paper.

1. Introduction

Poland's healthcare system has undergone dynamic changes in recent years, with some of its aspects particularly due to the impact of the COVID-19 pandemic. One of the key factors of this progress is the implementation of various new technologies, regarded as innovative methods that outperform the existing ones, enhancing patient care, improving access to medical care, and efficiency in the provision of medical care.

This research aims to analyze the awareness of the inhabitants of Silesia regarding the use of the selected new technologies in the Polish healthcare system, as, according to Polish law, all Polish citizens are entitled to equal access to healthcare services regardless of their financial situation and information about the scope and type of health services provided by various healthcare institutions (Kancelaria Sejmu RP, 1997, 2020). The study focuses on the inhabitants of Silesia, a southern Polish voivodeship, with Katowice as its capital, covering an area of 12,334 km² and home to approximately 4.4 million people, based on the results of the National Population and Housing Census conducted in 2021 by the Central Statistical Office of Poland (Główny Urząd Statystyczny, 2022).

To gain insight into the awareness of Silesia inhabitants regarding the use of new technologies in Poland's healthcare system, the following hypotheses were formulated:

The Silesia inhabitants have a high level of awareness of the new technologies used in Poland's healthcare system. The Internet Patient Account services are the most commonly used new technological solutions in Polish healthcare. The prior positive experience using one of the new healthcare technologies implemented in Poland makes individuals more likely to trust them and more willing to try those they are not familiar with. The primary means of accessing information among Silesian inhabitants regarding the use of new technologies in Poland's healthcare are internet sources, which are also the preferred tool for raising public awareness. Silesia inhabitants prefer to use new healthcare technologies more in comparison to traditional methods, and they support their widespread implementation in Poland. A patient using medical services expects a product, i.e. a service that conforms to the parameters about which he or she has been previously informed and a reproducible level of quality of these services (Nadziakiewicz, 2018) Both quality and marketing are directed in their activities and goals towards the recipient, the user (Nadziakiewicz, Mikołajczyk, 2019).

2. New technologies used in Poland's healthcare system

2.1. E-health

The incorporation of digital technologies into healthcare has strengthened patient understanding of medical advice and empowered individuals to manage their health more actively. One of the new healthcare technologies utilized in Poland, leveraging digital technologies, are e-health services, defined by the WHO as the safe and efficient application of communication and information technologies, which serve to improve various areas in relation to healthcare, such as medical care, health monitoring, medical research, patient education, and information sharing (World Health Organization Eastern Mediterranean Region, 2025). In Poland, the Ministry of Health is responsible for overseeing the development of e-health services, including solutions such as Internet Patient Account (IKP), telemedicine, and mobile health solutions (mHealth) (Babraj, 2018).

Launched in 2018, IKP serves to consolidate patients' medical information, offering digital access to services, such as:

- E-prescriptions (electronic replacements for traditional paper prescriptions).
- E-referrals (digital referrals generally issued for specialized medical care).
- Electronic sick leaves (automatically delivered to appropriate recipients, that is, employers and insurers).
- Electronic health records (patients' centralized medical documentation) (Centrum e-Zdrowia, 2023; Łuszczynska, 2018).

Telemedicine allows the provision of remote medical services, such as doctor's appointments, with the utilization of telecommunication technologies, like audio and video devices (Kirch, 2008). The most common form of telemedicine service in Poland is teleconsultation, a medical consultation between a patient and a doctor, nurse, or midwife, usually carried out via phone calls, video calls, or e-mail (Ministerstwo Zdrowia, 2020). The healthcare facilities providing primary health services in Poland had the obligation to enable patients to utilize teleconsultations since January 2020; the process of which was significantly sped up in March 2020 during the COVID-19 pandemic to reduce in-person visits and limit infection risk (Narodowy Fundusz Zdrowia, 2020).

Mobile health is a branch of e-health that utilizes mobile devices and wearable technology to monitor and transfer patients' health-related data, including blood pressure, heart rate, and blood glucose levels (Adibi, 2015). The mHealth solutions help maintain a healthy lifestyle or manage pre-existing health conditions. In Poland, mHealth solutions include applications certified as medical devices by the Ministry of Health and wearable devices possessing the ability to identify, analyze, and transfer the user's health-related data that work together with mHealth applications (Ministerstwo Zdrowia, 2022; Moorthy et al., 2024).

2.2. Medical robots

Medical robots are reprogrammable and versatile manipulators of various structures, sizes, and autonomy of operation, used in healthcare to carry out various tasks, primarily in surgery or rehabilitation (Beasley, 2012). They can be divided into two categories based on their purpose: robots that assist medical personnel, as they can automate repetitive tasks and perform highly accurate and precise movements (e.g., surgical, laboratory, and pharmacotherapy robots), and robots that assist patients in improving their quality of life (e.g., rehabilitation robots, exoskeletons, and robotic prostheses).

In Poland, the utilization of surgical robots first started in 2010 with a surgery conducted with the use of the da Vinci surgical robot, in a Wrocław hospital, a city located in Dolnośląskie voivodeship (Izba POLMED, 2025). Initially, the use of medical robots was limited to the private sector; however, it expanded significantly after the public healthcare system introduced, in 2022, dedicated funding for robot-assisted surgeries by public payers (Izba POLMED, 2025). As a result, the number of hospitals offering robotic surgeries continuously rose, marking a significant improvement in recent years from 40 hospitals in 2022 to 58 in 2023, with performed procedures increasing from 4844 to 10,110 (Jakubiak, Sujecki, 2024). In Poland, common applications of robot-assisted surgeries include urology (primarily prostatectomy), gynecology (mainly gynecologic oncology), and gastroenterology (mainly colorectal cancer). In Poland, medical facilities use many types of medical robots. When it comes to surgical robots, there are two most commonly utilized: the da Vinci (in 45 hospitals) and Versius (in 13 hospitals) (Jakubiak, Sujecki, 2024). In addition to imported surgical robot systems, Polish institutions are developing their own solutions, such as the Robin Heart system created by the Biocybernetics Laboratory and the Foundation of Cardiac Surgery Development, located in Zabrze, which aims to support cardiac surgery, though it still requires funding to reach the production stage (Zdrojewicz et al., 2014). However, there are medical robots made by Polish companies that are already available on the market, for example, medical robots of EGZOTech, a Polish company, which develops and manufactures rehabilitation robots to strengthen muscles, improve patients' motor functions, or restore range of motions (EGZOTech, 2025).

Apart from the increasing number of medical institutions that perform robot-assisted surgeries, there are also efforts to advance the field, including the establishment of the Polish Group of Robotic Surgery, Artificial Intelligence, and Telemedicine, which promotes research, maintains a national robot surgery registry, and offers education on the use of robotics in medicine (Ministerstwo Nauki i Szkolnictwa Wyższego, 2025).

2.3. Immersive Technologies

Immersive technologies, that is, the use of technologies, such as virtual reality (VR) augmented reality (AR), and mixed reality (MR) that serve to create an immersive and interactive, three-dimensional user experience or incorporate the digital information into the

real world, enhancing rather than replacing an individual's perception of their surroundings, are increasingly impacting Polish healthcare; however, their widespread implementation is in its early stages (Lowood, 2025; Hayes, Downie, 2024). Immersive technologies in Poland are especially used for:

- Surgical planning, through VR simulations or AR goggles that project 3D holograms onto the patient's body, helping visualize internal structures and plan access routes to the operated area.
- Rehabilitation, by engaging patients in interactive VR exercises, which are especially useful for those facing long wait times for traditional therapy in medical institutions.
- Psychological therapy, by exposing patients to controlled virtual environments that help manage anxiety, trauma, and mood disorders, reducing stress and boosting the resilience of patients.
- Pain and stress relief, especially for diverting children's attention during medical procedures.
- In education, to allow Polish healthcare students and medical professionals to practice their skills in realistic, risk-free virtual environments, improving learning, critical thinking, and teamwork.

Though still in the beginning phase, immersive technology in Polish healthcare shows strong potential to transform patient care and medical education.

2.4. Laser technology

Laser technology plays an important role in Polish healthcare, together with ongoing efforts to increase the number of medical lasers in medical facilities and integrate them with other technologies, such as artificial intelligence, to make them more efficient.

Medical lasers are devices that produce a thin and coherent beam of light in a very controlled way and at a specific wavelength, used in place of traditional surgical tools (Hecht, 2025). The medical lasers' interaction with tissue, depending on the laser and tissue characteristics, allows the performance of various functions during surgery, like tissue coagulation or ablation, offering minimally invasive procedures. In Poland, lasers are used across various medical fields, including:

- Dermatology – for removing lesions, tattoos, scars, wrinkles, etc.
- Ophthalmology – for vision correction, corneal transplants, glaucoma and cataracts treatment, etc.
- Neurology – for treating brain tumors and epilepsy, etc.
- Urology – for fragmentation of kidney, ureter, and bladder stones, etc.
- Dentistry – for soft and hard tissue surgeries, reducing swelling, etc.

The implementation of lasers in a larger number of medical facilities, their increased application in various medical procedures, and new advancements such as the procurement of the first of its kind in Poland AI-assisted laser for glaucoma treatment, continue to contribute to the increase in the importance of medical lasers in Polish healthcare.

3. Research

To gather the relevant data, an online survey was conducted using Google Forms to provide a numerical overview of the characteristics of a sample of the Silesia inhabitants population. The survey consisted of 20 questions, 5 on demographics and 15 questions focused on assessing respondents' awareness of new healthcare technologies. For this research, first, a convenience sampling technique was utilized, as the author distributed online surveys to acquaintances of various ages and educational backgrounds. At the same time, the initial online survey participants were asked to send the survey to other individuals, thereby utilizing the snowball sampling technique. This process continued until the appropriate number of answers was obtained.

A total of 127 responses were collected, all from Silesia inhabitants:

- Gender: 49.6% female, 49.6% male, 0.8% undisclosed.
- Age: Most respondents were aged 45-54 (26%), followed by 35-44 (25.2%), and 18-24 (19.7%). There was also a significant number of respondents above 65 years old (10.2%), the 25-34 year olds (8.7%), the 55-64 year olds (8.7%), and under 18 years of age (1.6%).
- Location: 38.6% lived in cities under 50,000 inhabitants, 27.6% in villages, 19.7% in cities of 100,000-200,000 inhabitants, 12.6% lived in cities between 50,000 and 100,000 inhabitants, and 1.6% lived in cities over 200,000 inhabitants.
- Education: 49.6% had secondary education, 46.5% higher education, and 3.9% primary education.

The Silesia inhabitants have not a high level of awareness of new technologies used in Poland's healthcare system, only 38.5% of respondents felt well-informed about new technologies used in the Polish healthcare system, while 41.7% disagreed with this statement, and 19.7% of respondents remained undecided. Moreover, 54% indicated that they do not understand how new healthcare technologies work, with only 30% feeling confident in their understanding, and 16% remaining undecided. In addition, while awareness of more commonly used new healthcare technologies in Poland, such as various e-health services, is relatively widespread, awareness of emerging or specialized advanced technologies, such as virtual and augmented reality or medical robots, is considerably lower. This indicated inconsistent and

generally low awareness among Silesia inhabitants, highlighting the need for targeted education and improved communication strategies.

The Internet Patient Account services are the most commonly used new technological solutions in Polish healthcare. 91.3% of respondents have used Internet Patient Account services at least once, making it the most commonly used new healthcare technology among the surveyed, with only a few reporting no use at all (8.7%). This significantly exceeds the reported usage of the second most utilized technology, according to the survey, which is telemedicine (77.2%), and other technologies (mHealth devices – 36.2%, VR and AR solutions – 1.6%, medical lasers – 8.7%, medical robots – 3.1%), which showed an even more drastic decline in use among survey participants. The prior positive experience using one of the new healthcare technologies implemented in Poland makes individuals more likely to trust them and more willing to try those they are not familiar with, 70% of respondents had a generally positive experience with new healthcare technologies, only 5.5% reported negative experiences, and the remaining were neutral. The vast majority (70.1%) indicated that their prior experience made them more open to using unfamiliar technologies, while 7.1% reported that their experience did not increase their willingness to try other new healthcare technologies, and 22.8% were neutral. Moreover, 75.6% of respondents expressed trust in new healthcare technologies implemented in Poland, only 6.2% reported a lack of trust, and the remaining were neutral. Positive experience strongly correlated with increased trust and willingness to adopt innovations. In contrast, negative or neutral experiences were linked to lower trust and openness.

The primary means of accessing information among Silesian inhabitants regarding the use of new technologies in Poland's healthcare are not internet source. Online news (50.4%), social media (42.5%), and personal networks (43.3%) were indicated as the most commonly used sources for information about new healthcare technologies, they are not seen as the most effective for raising public awareness. Respondents favored local media campaigns (69.3%) and the implementation of educational materials in public spaces (50.4%). Digital sources like medical institution websites, webinars, or podcasts, and local educational programs received comparatively less support. Thus, although internet sources are widely used to look for relevant information, they are not preferred for raising public awareness.

Silesia inhabitants prefer to use new healthcare technologies more in comparison to traditional methods, and they support their widespread implementation in Poland.

Most respondents (62.2%) prefer to use new healthcare technologies over traditional methods, while only 20.4% favor traditional methods, and the remaining were undecided. Additionally, 76.4% support wider use of those innovations in Poland, with only 4.7% expressing opposite views, and 18.9% not having an opinion. This overwhelming support further affirms the Silesia inhabitants' readiness to embrace technological advancements in healthcare and their willingness to see such innovations implemented on a broader scale.

4. Recommendation

The findings of this study pointed out a limited and uneven level of awareness among Silesia inhabitants regarding new healthcare technologies implemented in Poland, several actions are recommended to address the identified knowledge gaps, foster public engagement, and enhance public awareness through strategic information dissemination. The recommendations on the information dissemination regarding the use of new technologies in the Polish healthcare system are based on the findings of this study regarding the most effective way of raising the awareness of Silesia inhabitants regarding the new healthcare technologies (see Table 1).

Table 1.

Actions most likely to improve the awareness of Silesia inhabitants regarding the use of new technologies in Polish healthcare

Action	Respondent's approval (in percentage)
Information campaigns in local media	69.3%
Promotion of new technologies on the health institutions' websites	41.7%
Free webinars and podcasts on new technologies	20.5%
Provision of educational materials in the form of leaflets, posters, or infographics in public places	50.4%
Implementation of local educational programs	27.6%
Other	3.9%

4.1. Local Media Information Campaigns

Given the trust and familiarity with local media outlets, such as television, radio stations, and newspapers, they can serve as a crucial tool for the dissemination of accurate and accessible information about healthcare innovations in Poland. Regional and national health authorities should design and implement comprehensive information campaigns in local media aimed at increasing awareness and understanding of both established and emerging healthcare technologies. These campaigns should employ easy-to-understand explanations and put particular emphasis on technologies that are less familiar to the public. The information campaigns in local media regarding the implementation and use of new healthcare technologies in Poland can be disseminated, e.g., with the use of public service announcements, expert interviews, or short documentary segments.

4.2. Public Educational Materials

Government agencies and healthcare providers should also develop targeted, user-friendly educational materials in the form of leaflets, posters, or infographics implemented in public places, aiming to clarify the purpose, advantages, and usage of various healthcare technologies. The deployment of visually engaging educational materials, especially across high-traffic public areas, such as public transportation hubs, libraries, pharmacies, medical institutions, libraries, or city halls, offers a passive yet effective method of knowledge dissemination.

4.3. Information Dissemination via Healthcare Institutions' Websites

Healthcare professionals should be encouraged and trained to act as intermediaries in informing patients about new healthcare technologies. However, as not to overwhelm them, such information could be distributed by the provision of leaflets during medical check-ups or through healthcare institutions' medical websites. The healthcare institutions, as an authoritative source of medical information, can offer reliable, up-to-date information on their official websites. It can be done by, e.g., creating dedicated sections that explain current and upcoming new technological implementations, in addition, allowing the institutions to directly address public uncertainties through interactive FAQs, explanatory videos, or guides.

Together, local media, public spaces, and digital platforms can offer a proactive and inclusive form of information dissemination regarding the use of new healthcare technologies in Poland. These strategic methods can meaningfully contribute to closing the knowledge gap identified among Silesia inhabitants and prepare them for engagement with technological innovations in Polish healthcare. However, it is immensely important that all the facilitated information is credible, helps normalize the discourse around healthcare innovations, and stimulates public interest and trust in these developments. Moreover, regular assessments of public awareness should be conducted to monitor the effectiveness of the educational initiatives, allowing for adjustments to ensure that the undertaken efforts remain effective and align with the public's needs.

5. Conclusion

The work presented a general overview of the selected new technologies utilized in Polish healthcare, providing information on their purpose, a general idea of how they work, the benefits of their use, and possible challenges or disadvantages of their implementation. The conducted research points out that the Silesia inhabitants do not have a high level of awareness regarding the use of new healthcare technologies in Poland, which means that appropriate actions should be taken by local authorities and medical institutions to promote information and educate Silesia inhabitants on the use and implementation of the new healthcare technologies in Poland. It was established that the Internet Patient Account is the most commonly utilized new technological solution by Silesia inhabitants. It was also confirmed that the prior positive experience with one of the new healthcare technologies implemented in Poland makes individuals more likely to trust them and be more willing to utilize those they are not well aware of. This leads to the conclusion that for the Silesia inhabitants to keep trust in the new healthcare technologies and be open to trying those they are not familiar with, the medical institutions need to ensure that the patients have a positive

experience with the new healthcare technologies. It was estimated that Silesia inhabitants primarily access information regarding the use of new technologies in Poland's healthcare through internet sources; however, they prefer more traditional methods of sharing such information to raise public awareness, indicating that the best way of educating Silesia inhabitants is through information campaigns in local media, with the use of public educational materials, or by disseminating information via healthcare institutions' websites. Lastly, it was confirmed that the Silesia inhabitants prefer to use new healthcare technologies over traditional methods, and they support further implementation of those technologies in the Polish healthcare system, positively influencing the overall development of the Polish healthcare system. In conclusion, this study highlights the growing presence and potential of new healthcare technologies in Poland, despite the significant gap in Silesia inhabitants' awareness and understanding, those individuals show a strong preference for new healthcare technologies and support their broader implementation, signaling a favorable outlook for the continued advancement of healthcare system in Poland.

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SPATIAL CONCENTRATION OF OLDER PEOPLE – SOME REMARKS ON THE ISSUE

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Purpose: The main reasons for writing this paper was to present and discuss some views on spatial concentration of older people as a consequences of demographic aging, so that the complexity of this issue would be clear. The other equally important purposes were drawing attention to the significance of relations of older people to other age groups in their residential environment. Another reason for writing this article was showing that abovementioned relations in different aspects should be studied for a proper shaping of the habitat according to the needs of both younger and the older residents.

Design/methodology/approach: The approach to the issue of the article includes the discussion on both potentially positive and negative consequences of the spatial concentration of older persons. Scientific perspective of the text involved theories, concepts or views emphasizing the importance of social ties of people aged over 60 and the cumulation of the issues of that stage of life for their situation in given area/territory.

Findings: The consequences of spatial concentration of older people are not just obviously negative or positive. It more complex issue and its complexity should be analyzed regarding the individual combination of features of residential environment of older persons in each case.

Originality/value: The article shows that demographic aging and spatial concentration of older people is an important phenomenon as it occurs not only nowadays, but also occurred in history of Europe. The paper discusses both negative and positive consequences of this phenomenon as well as its complexity. It is addressed to sociologists, social workers, specialists in social policy.

Keywords: older people, demographic aging, social ties.

Category of the paper: Viewpoint, Conceptual paper.

1. Introduction

Demographic aging is a phenomenon which results in the creation of special places in which the percentage of inhabitants aged over 60 is enormously high. This in turn may have both positive and negative consequences for older people themselves and the rest of society.

One of historical cases of that kind was the plague in 14-th century Europe. At that time statistically plenty of children and young people died, and as a result proportionally many older people stayed alive in rural areas, small towns and cities. That process affected populations in few European countries like: England, Germany, Spain, France, Italy (Minois, 1995). It occurred quite often that these older persons didn't have any support as their younger relatives passed away. So (as a result) in many households there were mostly old people unable to work in their farms. It was a real cumulation of problems connected with old age (Minois, 1995). Many frail old men and women formed big households. Also in numerous cities people in their late years, left without support of the younger, became a real burden. As the same occurred in rural areas spatial concentration of older people emerged as an issue of this period of European history. Two opposite schemes (patterns) of consequences were observed: rather dependency of older people in villages (as they were left without support) or the increased power of senior citizens from higher social classes in Italian cities (Minois, 1995).

Demographic ageing is a process which, according to studies by demographers, has been manifesting itself quite clearly in Poland since at least 2000 (Stańczak, Szałtys, 2016), and what is particularly important, this process concerns not only the whole country and some of its regions, but also cities (Janiszewska, 2019). This means that the proportions of the population of post-productive age in the total population of many cities in our country are increasing. Demographic ageing affects not only the cities themselves, but also districts or housing estates, yet the spatial structure of cities can differ in terms of the percentage of people aged 60 and over - some neighborhoods are rather young demographically, while others are definitely older.

Within social sciences there are some theoretical views on both negative and positive consequences of demographic aging of different habitats. As this phenomenon nowadays also occurs in many postindustrial societies these views are worth discussing.

2. Social ties as an aspect of spatial concentration of older persons

One of the reasons why spatial concentration of older persons becomes a complex issue is the fact that people in their late years differ a lot within their age group as it comes to social characteristics. Spatial concentration of older adults itself does not imply their social activity in local community. As famous sociologist Mark Granovetter (1973) stated in one of his articles if social group has too strong social ties it usually means that this group exactly does not have enough information and has no connection with other groups, even those living relatively close. If the group doesn't have contact with other groups they lack precious support in different forms. It practically means that this group is weaker when facing its problems. It could be stronger when having access to the potential solutions and help coming from other groups.

This regularity refers to older people as many of them need support (Krause, 2006). Moreover no matter how much and what kind of support they need they have right to be included in the society or local community, not excluded from it. In case of older adults as a special social category two kinds of isolation has to be considered:

1. Isolation from (and within) their own group.
2. Isolation from the rest of society or local community.

The first type of isolation refers to the cases when elderly people are cut off from their peers due to different reasons. It can be because of belonging to different social groups or social classes, and then it is a product of just social stratification (Harris, 2007) or/and prejudices or just differences. This may mean that older people living in different parts of the same city do not want to have a contact with each other, so there is no cooperation or exchange of experiences. The isolation can also be the result of other differences between older persons, like e.g. in the degree of physical fitness, autonomy and independence if everyday life. Race and ethnicity can also be the reason for no connection or difficulties in connecting older adults of different background. The practical examples of this issue is lack of cooperation between different districts of the town or metropolis when they organize activities or activities are organized for them by services or authorities. Even within the same district or smaller local community of parish or street it is not easy to organize support and help for older residents in neighborhood if necessary.

Additionally some research conducted in 1980-s shown that in specially designed institutions and housing projects for older persons social interactions between them are rare. Moreover less self-efficient older adults and those coming from minority ethnic groups are out of social networks created among their peers in such places (Sheehan, 1986; cf. Rubinstein, Parmelee, 1992, p. 150).

Both types of isolation of older people shown above are negative and can be dangerous for them as they are observed in different social circumstances and spatial conditions. When analyzing different forms of living of older residents in various spaces and places (in urban or rural areas), these two kinds of isolation has to be included as a potential threat in SWOT analysis of a given area.

So trying to answer the question if the spatial concentration of elderly people in given place is positive or negative from the perspective of social interactions and ties, it is worth taking into account a set of arguments which come from theory, research and practice.

If a spatial concentration of older people in urban or rural areas is viewed from the angle of the subculture created by them, two points of view should be included in potential studies. These are the views of Arnold M. Rose and Arlie R. Hochschild. The first of the aforementioned scientists, as recalled previously, is the author of special theory dedicated to subculture of older persons (Rose, 1965), the second, in compliance with this perspective, was conducting qualitative research in a community of older adults living in a specially designed housing project in Merrill Court in USA (Hochschild, 1978). As regards to the concentration of elderly

people in American metropolises Arnold Rose (1965) stated that this process/phenomenon leads to the creation of the aforementioned subculture as people belonging to the same cohort live close to each other, so may have opportunities to get in touch. Moreover, as it was mentioned earlier, according to Granovetter (1973), too strong social ties within given group can lead to the isolation from other groups in its social surroundings. No matter how controversial is the issue, if older adults are concentrated in space, thus relatively close to each other, it means that they have more opportunities to build social networks, moreover their social life has (potential) advantages such as for example:

- more regular pleasurable interactions between peers,
- potentially wide, dense, strong and effective support networks,
- if their social capital is high, they can have an influence on local authorities when struggling for the improvement of their quality of life,
- their peer groups can be created by themselves which implies not only support, but also defines and strengthens social identity, and that practically means belonging to the same age group and generation of a very specific culture with its distinct values, norms, rituals, symbols etc.

The qualities essential for social integration of older adults in the milieu in which they live mostly among their peers are institutionally regulated interactions between senior citizens through special social channels, practices, customs, organizations and facilities. Therefore it is crucial if these structural mechanisms work or not in given space or place in which older adults live very close to each other. If such structures and institutions, like day care facilities, senior clubs, or special organizations for pensioners do not exist in given place, they have to be built by people who belong to this category of inhabitants. If not created by older residents themselves they have to evolve as a result of professional activities of e.g. social workers or other professionals who can stimulate and organize social actions. The abovementioned mechanisms and actions can turn an aggregation of older people into a community or at least effective group with its own goals.

The formation of an effective peer group or community of older adults is an interesting process which occurs differently in various social circumstances. If it starts from scratch in a social milieu which does not have any institutions for people aged 60 and over, it becomes really great challenge. Probably such a rise of a group of older adults who even do not know each other occurs easily when happening in specially designed social situation like living in the same special housing estate or a nursing home.

Such processes in a small scale in special circumstances were revealed by aforementioned Arlie R. Hochschild (1978) in her study of a community of residents of a special housing project. She described these phenomenon after two-year observation of the people who created this community when living together in one place only among their peers. After many years of researching social interactions and practices of older adults she summarized her own and other scientists' studies. As a result of this she concluded that older persons have much more

opportunities to have interactions with their peers when they live in a residential environment in which they are only or mostly among inhabitants of the same age group as theirs. According to Hochschild, living together with their contemporaries turns out to be the best option for older people as regards to their self-integrity and maintaining their social identity.

3. Cumulation of problems of old age in town districts

The aforementioned social identity is bolstered if we consider for example the lives of older adults who spend their late years in old districts of towns. Nonetheless there are also the disadvantages of such a situation. In this case the spatial concentration of people 60 years of age and older may imply cumulation of different problems of that stage of life in the area/residential environment. This issue was described really well by Frąckiewicz (1972). As a result of her wide-ranging studies she concluded that:

The lower standard of flats' furnishings and equipment the higher percentage of older people in the population of residents. This regularity can be observed within a region, towns and districts of towns and cities (Frąckiewicz, 1972, p. 168). This thesis had been proven by the researches described in Polish and foreign literature in 1960-s and 1970-s.

This accumulation contains:

1. Low or even substandard quality of housing environment.
2. Overpopulation in researched housing environment.
3. Low health and physical efficiency of the residents after many years of hard work.
4. Poor condition of health care and nursing.

In spite of these problems older people are attached to their residential environment of a district or housing estate. It is attachment to a social milieu as well as to a place itself. So when Frąckiewicz emphasizes that continuous living in the same "historical district" is crucial for a good quality of life of older inhabitants, two categories well known in environmental psychology become very important:

1. Place attachment (Rowles, 1983, 1984; Rubinstein, Parmelee, 1992).
2. Sense of place (Hummon, 1992).

"Historical" here means district which people memorize and recall with a sentiment. Living in a given place for many years also implies strong social identification with local community. So according to Frąckiewicz's study when relocating older residents of given districts, it is very important to relocate them with other peers from the same district. It is crucial for the remaining still the same sense of place – the feeling that we are in the same place as previously/always, place we accept.

Notwithstanding the great significance of the above mentioned sense of belonging, the potential process regarding such housing environments is degradation which progresses with the individual and demographic aging of residents. The possible solutions to this problem worth considering may be:

1. modernization of flats,
2. the creation of special 24-hour units – nursing homes within the same district,
3. day care centers also within the residential environment of older adults,
4. prevention of becoming of “ghettos” of older people in deteriorated urban spaces.

The accumulation of issues of individuals aged 60 years and older in space of a city discussed above has also been proven in subsequent studies conducted by other Polish investigators (Błędowski, 2003; Szweda-Lewandowska, 2021).

In a similar way the problem has been analyzed by Canadian researchers (Després, Lord, 2005). Here the research team was studying that complex issue in widely interdisciplinary manner. The analyses included perspectives of few types of specialists like: architects, urban planning experts etc. This study was focused on senior residents of post-war suburbs of Quebec. Their life situation included living in the old decaying buildings and flats requiring repairs and renovations as well as their own individual aging and gradual losing physical fitness. As regards to solution to the problem of increasing dependency on the care of others, relocating of the above mentioned older adults to a nursing home had been considered as too expensive. Moreover, similarly to senior residents of Polish old town districts, these older adults were emotionally attached to their place to live. So after the complex analysis the research team proposed strategy to let these residents live in the habitat they got accustomed to through the years. That idea included improvements and adjustments of the residential environment which could help discussed older adults in reaching out to the places in which the services and institutions essential for their life-quality are located. The very important part of this scenario were the enhancements in transportation system so that it would be more accessible for senior residents and readable for them as regards to information how to get to given points or/and board preferred means of transport. Such proposals were the added value of the interdisciplinary cooperation of the specialists in fields like: urban planning, architecture or widely residential environment (Després, Lord, 2005). They were based on thorough SWOT analysis of the area and the multidimensional situation of its older residents.

4. Summary

Demographic aging may have both positive and negative consequences. In case of local communities it usually means a spatial concentration of olde people. As it was mentioned earlier when this concentration is concerned it may lead to the flowering of social capital of older

persons in given area or the cumulation of problems of their last stage of live. This two scenarios are of course the extreme ones. There can be potentially whole spectrum of other possibilities. In coping with potentially positive and negative consequences of demographic aging different scenarios may be considered and launched. As regards to social capital, which means effective support networks a good strategy is to create them within the community organization method. One of the types of it is that one which is done as an action research intervention in the collectivity of older people in given area. At the very early stage of such interventions older persons are gathered in one place for discussion about their needs and possible actions concerning these needs. Their preferences are searched through surveys. In the next stage actions derived from these preferences are put into practice. Then, in the end, the impact of these actions organized for senior citizens is studied or even measured by research again. In Poland there are good traditions of such participatory research regarding the needs of older generation (Czekanowski, 2000; Halicka, Pędich, 1997).

Considering the emigration of younger dwellers to other places for different reasons, which is the case e.g. in some towns of Silesian voivodship (GUS, 2025), the risk of development of “ghettos” of older people mostly in old and neglected districts of cities should be addressed. That is important practical issue for the managers of the municipalities. The solution of this problem requires launching some strategies aimed at drawing young people to rural areas, districts, housing estates and towns prone to demographic aging. Such strategies have to be connected with the creation of residential environment friendly for all groups of inhabitants according to the idea of universal design (Goldsmith, 2000; Preiser, Smith, 2011). As the combination of positive and negative characteristics in each case of residential environment is different, in each case the SWOT analysis seems to be suitable research strategy for complex diagnosis of the situation of older inhabitants.

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VIEWS OF OLDER ADULTS ON THEIR HABITAT IN THE LIGHT OF CHOSEN RESEARCH PROJECTS

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Purpose: The aim of this article is to present the qualities which are significant for positive and negative assessment of residential environment by older adults.

Design/methodology/approach: The above mentioned purpose were achieved due to three research projects conducted among older adults living in housing estates in few cities in Upper Silesia. Within these researches quantitative (survey) and qualitative (in-depth interview) techniques were applied. Some concepts and terms coming from environmental psychology like e.g. place attachment have been used.

Findings: As a result of the research presented a set of several element essential for positive and negative assessment of habitat by older residents have been revealed and illustrated. Even if the environment does not fulfil all expectations some qualities like: location or good neighbors seems to outbalance in the estimation of a habitat.

Research limitations/implications: As each housing estate is different and living conditions of older adults change the continuation and repetition of that kind of the research in other residential environments is advisable. One of the reasons for such a continuation is concern about available support and services for that age group in local communities.

Practical implications: As some needs and problems of older residents have been revealed proportion of age groups within housing estates should be monitored.

Originality/value: While some researches on housing of older people are conducted rarely, in limited thematic scope and huge statistical scale, the study presented in this article shows the wider range of issues concerning habitat from the perspective of the experiences of the residents in their late years. The text may be interesting for sociologists, geriatricians, social workers, social politicians and managers of housing estates.

Keywords: older adults, residential environment, place attachment.

Category of the paper: Research paper.

1. Introduction

Residential environment has always been significant for well-being of older persons. It was addressed as a very crucial issue within some scientifically and practically oriented actions, endeavors and ideas. To give a very short overview of the latest, it is worth mentioning e.g.:

1. Nationwide large-scale gerontological research carried out so far in our country, including those under the aegis of the Polish Gerontological Society. I am thinking of research from 1967-1968 (Piotrowski, 1973) under the guidance of prof. Jerzy Piotrowski, research from 1999-2001 (Synak, 2003) under the guidance of prof. Brunon Synak, PolSenior 1 research from 2007-2011 (Mossakowska, Więcek, Błędowski, 2012) under the guidance of prof. Piotr Błędowski and PolSenior 2 from 2018-2020 (Błędowski, Grodzicki, Mossakowska, Zdrojewski, 2021; Szweda-Lewandowska, 2021) under the guidance of prof. Tomasz Zdrojewski.
2. Madrid International Plan of Action on Aging (United Nations, 2002) which links closely the quality of life of older people to their residential environment, as it exposes housing environment and habitat as one of the themes/issues under the priority: creating a favorable and supportive environment (Szatur-Jaworska, 2012).
3. Certain social policy solutions and EU programs implemented in different countries meeting the abovementioned priority as they are focused on the best adaptation of the architecture, infrastructure and services to the needs and limitations of older adults. Good examples are two strategies of the British government: "Lifetime homes, lifetime neighborhoods", or housing strategy "Laying the foundations. A housing strategy for England" (Stula, 2012), as well as French project entitled "Vivre chez soy" (to live in the house for as long as possible) focused on the use of intelligent devices supporting independent life of older persons (Stula, 2012). The other example of that kind is the project entitled „Adapting European cities to population ageing: policy challenges and best practices” (<https://www.espon.eu/ACPA>) realized by ESPON (European Observation Network for Territorial Development and Cohesion) aimed at researching the quality of life of different categories of older residents of the cities (ESPON, 2022).
4. The idea of Universal Design (Goldsmith, 2004; Preiser, Smith, 2011) which emphasizes that the needs, perspectives, preferences, as well as limitations of each group of inhabitants should be included when planning, building and managing given habitat.

Furthermore, additional circumstance signaling the importance of the issues of widely understood residential environment for older adults is the processes of demographic aging of many territorial communities (rural areas, towns, cities and their districts), which according to demographers occurs in Poland since the year 2000 with continuous noticeable dynamics (Stańczak, Szałtys 2016; Janiszewska 2019).

To show the qualities of the residential environment essential for well-being of older people the material coming from three research projects will be presented in this article. These are first of all PolSenior¹ research, Polish-German project² and the research conducted on „Zandka” estate in Zabrze (Poland)³.

As part of the nationwide PolSenior research sub-project, the research team conducted 166 questionnaire and 31 free interviews with older residents of three housing estates in Upper Silesia (the ‘Superjednostka’ housing estate in Katowice, the ‘Zatorze’ railway workers’ housing estate in Gliwice and the post-state farm housing estate in Poniszowice outside Gliwice). In the case of the Polish-German project, on the other hand, the empirical material consists of 589 questionnaire interviews and 100 free interviews, including 22 with older residents (aged 60 and over) of three housing estates in Katowice (Tysiąclecia housing estate, Paderewskiego housing estate and Zgrzebnioka housing estate). The implementation of both projects was aimed at determining how the older residents of the above estates perceive their living environment, mainly in terms of neighbourhood ties, social support, forms of activity and architectural barriers experienced. It should be added, however, that in the case of the PolSenior project, the residential environment of the elderly was included both in the aforementioned research in Upper Silesia and in the nationwide questionnaire of the project.

¹ This research work was financed from the funds for science in the years 2007-2011 as a commissioned research project PBZ-MEiN-9/2/2006, carried out under the supervision of Prof. DSc. Piotr Błędowski from the Warsaw School of Economics. The project resulted in the monograph: Mossakowska, M., Więcek, A., Błędowski, P. (Eds.) (2012). *Aspekty medyczne, psychologiczne, socjologiczne i ekonomiczne starzenia się ludzi w Polsce*. Poznań: Termedia Wydawnictwa Medyczne. The manager of the sub-project entitled: Social capital of seniors in different urban environments and the requirements of their adaptation to life activation and quality assurance of the needs of the elderly was prof. Adam Bartoszek, DSc., Professor at the Institute of Sociology of the University of Silesia, and the executors were Prof. Elżbieta Niezabitowska, dr Eng. Beata Kucharczyk-Brus and Dr. Marek Niezabitowski from the Silesian University of Technology. The research (as part of this sub-project) resulted in the monograph: Niezabitowska, E., Bartoszek, A., Kucharczyk-Brus, B., Niezabitowski, M. (2013). *Środowisko zamieszkania polskich seniorów w badaniach interdyscyplinarnych: studia przypadków na wybranych przykładach*. Katowice: Wydawnictwo Naukowe „Śląsk”.

² Polish-German project with the symbol UE7/Rar-3/2011 entitled “Yesterday, today and tomorrow of Polish and German large housing estates. A comparative study of urban development models and their acceptance on the example of Katowice and Leipzig” (2011-2012), funded by the Polish-German Foundation for Science. Project leader: Prof. Elżbieta Niezabitowska. Participants in the project from the Polish side: prof. Adam Bartoszek, DSc., dr Eng. Beata Kucharczyk-Brus, Dr Eng. Beata Komar, Dr Marek Niezabitowski. Participants from the German side were Prof. DSc. Sigrun Kabisch, Dr. Katrin Grossman, Dr. Annegret Hasse from the Helmholtz Zentrum für Umweltforschung (UFZ) in Leipzig.

³ Research entitled “People and institutions in the process of transformation of urban local community. A sociological study on the example of the Zandka residential area in Zabrze” (scientific-research work with the symbol NB-207/ROZ-2/2009, realised in the years 2009-2010). The research was conducted by a team from the Department of Applied Social Sciences, Silesian University of Technology, consisting of: dr Marek Niezabitowski (project manager), dr Barbara Rożałowska, dr Brygida Smółka-Franke, dr Jarosław Mikołajec. The research resulted in the monograph: Niezabitowski, M., Rożałowska, B. (Ed.) (2010). *Ludzie i instytucje w procesie przemian miejskiej społeczności lokalnej. Studium socjologiczne na przykładzie osiedla Zandka w Zabrzu*. Gliwice: Wydawnictwo Politechniki Śląskiej.

As regards to the research concerning “Zandka” housing estate in Zabrze the survey was carried out among 112 inhabitants and 11 in-depth interviews was conducted with the residents age 60 years and over. This study was focused on the issues analogous to these two aforementioned projects.

To illustrate/render the significance of some features of residential environment for the quality of life of older adults both quantitative (survey results) and qualitative (quotes from interviews) data coming from the abovementioned projects will be presented in this article.

2. Elements significant for positive estimation of residential environment (accentuated by older adults during interviews)

2.1. Attachment to the place of living

According to the researched older inhabitants attachment to their place of living is the reason why they highly estimate their milieu. This is consistent with the Rowles concept of social insideness, which means attachment to given place based on recollections of meaningful people connected with this place (Rowles, 1983, 1984). The very good illustration of this is the below respondents' answers to the question: Is the place where you live, here on the estate, special to you? *We have lived here for 40 years and this place is above all a place of memories from the times when we were young - a place of our fun* (76 years old, woman, ‘Superjednostka’ estate, Katowice), and *Sure, this is where my children grew up, I grew up here ... I know everyone here ... they are all dying out, who have lived here so long, and I laugh because I think that I will outlive the young ones ... I know everyone here; so many years since I was little girl ... and with my husband we still lived here as long as he was alive* (76 years old, woman, Zatorze, Gliwice). Further in the interview when asked: Have you ever thought that you would live here in your old age? she replied: *Yes, because my husband and I stayed here, then, after my husband died, I wanted to stay here. I know the area and the people around me, so I didn't want to move away.*

The expression of the same attitude is also the statement of the resident of “Zandka” housing estate in Zabrze: *[...] I won't move out of Zandka, I grew up here. I will never move out!* (65 years old, male, ‘Zandka’ housing estate, Zabrze). In very explicit way the attachment to place was expressed by 60-year-old woman living in the same settlement when she answered to the question: Is this place of residence special to you, does it evoke any emotions? ‘I have a kind of affection for it, we all live here, we have become attached to this environment’ (60 years old, female, ‘Zandka’ housing estate, Zabrze).

2.2. Habituation

Another meaningful reason for will to stay in present home for the rest of someone's life is just habituation as a second nature of human being. This attitude is clearly rendered in the quotes below: At this age, you don't replant old trees, you get used to it (woman, 67 years old, Tysiąclecia housing estate, Katowice) or [...] I felt lack of this one additional room a little bit, but then we got used to it and I am happy with my flat. I am comfortable here (woman, 62 years old, Paderewski housing estate, Katowice), and "When I renovated it, I really liked my flat and for this reason I wouldn't like to give it back" (woman, 66 years old, Paderewski housing estate, Katowice).

The essence of the attitude described above is also well-illustrated this statement: "I could move around my house even blindfolded" (woman, 75 years old, Philadelphia; from interview, quoted in: Rubinstein, Parmelee, 1992, pp. 147). This quote shows that well-known residential environment gives the sense of security to an older inhabitant.

2.3. Positive neighbourly relations

Good neighbor relations are another basis to assess positively the residential environment by older adults. It is visible in both quantitative and qualitative data from the discussed researches.

As regards to survey's results of Polish-German project conducted in Katowice, it's worth noting that for noticeable percentages of the residents age 65 years and over nice and helpful neighbors are priority in their assessment of housing estate (42,4% - Tysiąclecie housing estate, 57,8% - Paderewski housing estate, 80,0% - Zgrzebnioka housing estate).

Due to qualitative data from the interviews it becomes clear what constitutes a good neighbor for the researched older adults. The respondents appreciate helpful and sociable neighbor very much, thus consider him or her a really good one. It is well-illustrated in the quotes below: "Here we all know each other, we help each other as much as we can. And nice neighbours" (Female, 65 years old, 'Superjednostka' estate, Katowice), and 'We have close friends - quite a lot, if we need something, for example we go somewhere, there is no problem to take care of flowers, to watch the flat, we trust each other. [...] with a neighbour every day, when she goes out somewhere she lets us know, when we go out we also let her know, social visits - like name days or birthdays - we ask each other for coffee' (Woman, 72 years old, 'Superjednostka' estate, Katowice) or "Well normally as everyone knows each other here from the beginning. Nothing special, yes, if someone has a problem, we talk" (Male, 52 years old, Poniszowice).

The summation of an idea of a good neighbor we can find in below shorter statements: "As I mentioned we have a very good relationship. Sometimes we keep an eye on each other's flats, pick up each other's mail, etc." (Male, 64 years old, Paderewski housing estate, Katowice),

and [...] I say, we have good neighbors; all in all, it's family-like here [...] as they say "a neighbor is closer than family" (62 years old, female, interview 2, Zandka estate, Zabrze).

2.4. Convenient location

Especially important element of positive assessment of residential environment by older inhabitants is good location of their house. This quality is well reflected in the term place dependence (Stokols, Shumaker, 1981) which exactly means the awareness of the fact that our milieu facilitates the satisfaction of our needs and preferred forms of activity.

As regards to survey's results of Polish-German project conducted in Katowice, it's worth noting that for visible percentages of the residents age 65 years satisfaction from location is the reason for will to stay in present housing environment even if it does not fulfil all expectations (28,4% - Tysiąclecie housing estate, 47,3% - Paderewski housing estate, 60,0% - Zgrzebnicka housing estate).

Moreover, according to the same survey, also for noticeable percentages of the residents age 65 convenient location is priority (26,4% - Tysiąclecie housing estate, 21,0% - Paderewski housing estate, 60,0% - Zgrzebnicka housing estate).

What constitutes this convenient location is reflected in the typical quotes from interviews below: "In general, I am satisfied with the flat because I have everywhere close by" (Woman, 71 years old, 'Superjednostka' housing estate, Katowice), and "[...] Everything I need is close at hand. Hairdresser, clinic, pharmacy, grocery shops, bakery, butcher shop. Everything is there" (Male, 64 years old, Paderewski housing estate, Katowice) or "[...] somehow it is nice here, it is nice to live here. Everywhere is close. We have doctors close by [...] There is no problem to get to shops [...]" (woman, 67 years old, retired teacher, Tysiąclecie estate, Katowice).

Convenient location may remain very important in old age even if the overall assessment of the housing environment is ambivalent. It is visible particularly in the below answer to the question: Would you like to move somewhere else?

"Oh, how I would love to. Very much. Somewhere on the outskirts of town where there's lots of greenery, where a person can breathe a bit. My rehabilitation therapist told me: [...] in your old age you don't move out of the city centre. It's close to me everywhere, to the clinic, anywhere. I said: [...] I would like to breathe a little. And she says: Oh well, just go out on the balcony and breathe. And how will you get here to the city centre if you mover? And it's true. You don't replant old trees. But I would like to" (woman, 76 years old, Superjednostka estate, Katowice).

2.5. Independence and privacy

The very important aspect of positive estimation of home environment is independence, privacy and intimacy, connected with the uniqueness of the place which is ours. The significance of these qualities are well-illustrated by the below statements of the

respondents of discussed researches: "[...] if I couldn't cope on my own, I would have to think of something. Although I would be reluctant to go there [to a retirement home - M.N.], for sure. It's always in one's own. It's completely different. I'm not dependent on anyone. I get up when I want, and I do what and when I want. And there, in a nursing home? There is rigor there. The time for breakfast and other things are strictly set" (Woman, 77 years old, Tysiąclecia housing estate, Katowice) and "Why do I need two rooms with a kitchen, because that's what I had in Helenka [a district of Zabrze], and my daughter didn't want to come to the block. My son-in-law tells me "come to our house", but I prefer a cramped but my own one (laughs). I can't sleep, so I would like to just play the radio or TV late in the evening, but I wouldn't be able to, because my son-in-law still works, and when he goes on shifts or has to work nights, he has to be asleep. I used to work myself, so I know how it is. It is better to have a cramped, but own corner" (Woman, 81 years old, "Zandka" housing estate, Zabrze).

The aforementioned uniqueness of home is also perfectly rendered by this quote: [...] There's nothing like home (Woman, 79 years old, nursing home, Zabrze).

2.6. Nice view from window

A visual aspect of residential environment is viewed by older adults as a very significant element of their well-being. This very often refers to what they see from their windows. The importance of such an outlook is accentuated in the below statement of woman who lives in post-state owned farm in Poniszowice: "I would never change my flat for a retirement home. This is my nest. I like to look at the views and the animals from the window here" (Woman, 61 years old, Poniszowice).

2.7. Lift which stops on each floor

Talk about the abovementioned view from a window reveals also another quality which is particularly important for positive evaluation of housing environment by older residents – it is the accessibility of a lift on given floor of the inhabited building. Although nice view on higher floors is appreciated, if lift does not stop on there, this is perceived as a huge disadvantage. This point of view is reflected perfectly in the quotes below: "In principle, there are no disadvantages because there is a lift, so there are no problems with mobility. On the other hand, the advantages certainly include a beautiful view from the window" (Man, 64 years old, Paderewski housing estate, Katowice), and "Disadvantages - lift between floors. Advantages - view from the window - great because I have a view of the park" (Woman, 67 years old, Tysiąclecia housing estate, Katowice).

3. What kind of shortcomings older adults notice in their residential environment?

3.1. Architectural barriers

There are some disadvantages of housing environment which causes older adults to experience the deterioration of their well-being. One of them is lack of shower in bathroom as one of the researched older persons stated below: "I could do with a change in the bathroom or a lowered bathtub to make it easier to enter, but I haven't even seen such bathtubs in the markets. A shower would be a good option, one with a shower tray, but that would involve a bathroom renovation, which I don't want to do any more as I'm 83 years old (woman, 83 years old, Superjednostka housing estate, Katowice).

Another architectural barrier, noticed and experienced by respondents of discussed researches is too small amount of benches in the surroundings of their houses: "[...] I have such a shaky balance and need to rest every now and then. More benches would be useful for old people around" (woman, 83 years old, Superjednostka, Katowice).

It is also emphasized by the respondents that the buildings are not adjusted to their disabilities. One of such maladjustments are: are to heavy doors for older person and lack of handrails in a corridor. The experiences connected with this are expressed in quotes below: "It's all because of the new porter's lodge, unfortunately the doors are heavy and I can't open them myself, so the doormen are always there to help" (woman, 76 years old, Superjednostka housing estate, Katowice) and "It would be useful to have railings in the corridor so that I can catch myself" (woman, 59 years old, Superjednostka housing estate, Katowice).

As it has been mentioned earlier, the fact that lifts do not stop on each floor constitutes a big problem for older inhabitants of housing estates studied in relevant research projects. It is well-reflected in the statements below: "In my opinion they should make other lifts for us, outside, like the ones in Skarbek [a department store in Katowice - note M.N.]. So that this lift would go outside and go all the way down and up to the floor as if you were getting off. That would have been ideal for us older people. Well, but I don't think we'll get that. [...] How can you have a lift on the mezzanine floor and a staircase one up and one down, well... after all, how? And those with small children and prams have problems, and the disabled with prams can't get out at all, how?" (woman, 77 years old, Tysiąclecia housing estate, Katowice).

3.2. Lack of infrastructure used for social integration

Researched older adults accentuate the importance of places in which they can meet other people, so they notice and express lack of the places to meet: "It would be good if this activity was enabled by the city, the estate, there is nowhere to meet. Older people have nowhere to meet, nowhere to go out. There's nowhere for old people to meet, there's nowhere to go out.

The pensioners' club is not for everyone, it's so far away, you have to go by tram to Guido [another district of Zabrze - note by M.N.], they meet there, and here, on the housing estate, if you want to meet, there's nowhere to go, you have to be invited straight home for a coffee or a vodka. There should be a café or a club, so we could meet and talk. There is no such place, no café. There should be such a senior citizens' club" (man, 69, Zandka settlement, Zabrze).

The abovementioned view is also reflected in the answer to the question: Should and if yes, what kind of new services be developed in the housing estate? – "A place to meet, that kind only" (woman, 82 years old, Zgrzebniok estate, Katowice).

3.3. Lack of catering services

One of the shortcomings of residential environment noticed by researched older persons is lack of the places in which they may buy and eat meals. It is rendered by these statements: „[...] But it would help if there could be a point where older people could use, for example, some kind of... not everyone can cook, and if families have some such things, such a point would always be useful. Such a point if someone cooked lunches of some cheaper, adapted to this. Yes, it could be, because we are getting older as a housing estate, at the same time some people die and young people come in, but there are a lot of older people here, but, you know, we would have to interview how many such people there are, whether it would be worth it for anyone, because today the economic conditions decide whether it is worth it or not" (woman, 82 years old, Zgrzebnioka housing estate, Katowice) or "If, sir, they were to build this pavilion, [...] we have people who would be happy to run workshops in German, English, etc. for free, for elderly men, tables for bridge, for canasta, etc., not to mention the fact that some kind of a catering room would be useful here, where you could, for example, have a nice dinner, cheap dishes, tasty. That would definitely be useful" (woman, 74 years old, Zgrzebnioka housing estate, Katowice).

3.4. Lack of support

Limited access to support can be a real issue for some of older residents of studied housing estates. It is reflected in the results of the survey of Polish-German project conducted in Katowice. According to this survey noticeable percentages of the residents age 65 years and over have to count only on themselves in at least 2 out of 5 life situations like: 1) illness, 2) financial problems, 3) problems with shopping and cleaning house regularly, 4) problems with going about something in institutions, 5) loneliness and seeking contacts with other people. These visible percentages are respectively: 31,2% for Tysiąclecie housing estate, 34,2% for Paderewski housing estate, 10,0% for Zgrzebnioka housing estate.

As support is so important for the sense of security researched older adults accentuated that they want young people to live close to them in the same estate. The very good illustration of this view are the below answers to the question: Should older people be separated from the younger? - "No, because no matter where these older people live, if they live with younger

people, that's what the younger people are meant for, to help them if something happens. And if they are locked in some ghetto of old people, then what? (woman, 64 years old, Superjednostka housing estate, Katowice).

Another evidence of the significance of support coming from young residents we find in this additional statement: “[...] Young people are needed, well sure they are. There are children and these children make a bit of noise. They run around and it's different. I like young people very much, and I would even like such a young person to live here. Bringing shopping or something also helps. The old can't always manage. Young people are needed. Always” (woman, 77 years old, Tysiąclecia housing estate, Katowice).

4. Summary

Basing on the research presented above, some conclusions or recommendations can be drawn. As noticeable percentages of older residents of studied housing estates are left without support in some areas of everyday life (shopping, loneliness etc.) one of the challenges in cities should be monitoring the quality of their social networks. In case of poor quality resulting in lack or insufficient assistance some measures have to be taken, like e.g. social work in community oriented towards the creation of self-help groups.

As demographic aging of population of cities is in progress the age structure of residents of housing estates should be monitored and the infrastructure of neighborhoods ought to be planned accordingly. Considering that estates are inhabited by people aged 60 years and over among residents from different age groups the needs and preferences of all these groups have to be studied. For each of the group SWOT analysis of essential aspects of given estate will be invaluable source of knowledge for managers of residential environment (e.g. housing cooperative bosses).

If the state of social networks, particularly support networks of older adults in their habitat is well-cared-for and managers make housing estates attractive for all the age groups these places to live will not become a “ghetto of the elderly”. That is clue of the strategy to avoid the spatial concentration and cumulation of the issues of old age.

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ARTIFICIAL INTELLIGENCE AND ITS ROLE IN THE DEVELOPMENT OF SOCIAL SCIENCES AND HUMANITIES

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Purpose: The purpose of this article is to demonstrate the importance of AI-based tools for advancing research in the social sciences and humanities. The author focuses primarily on how AI can enhance research in these disciplines.

Design/methodology/approach: This article analyses selected available literature on the use of AI-based tools in research conducted in the social sciences and humanities. In addition to a literature review, the author employs the method of analysis and logical construction.

Findings: Artificial intelligence is a tool that representatives of social sciences and humanities have great hopes for. AI raises many important issues for the humanities and social sciences. The emergence of AI technology has changed not only research conducted in the social sciences and humanities but also the paradigm regarding various aspects of practicing the humanities, such as academic writing, learning and intellectual property.

Research limitations/implications: The article refers to a limited number of studies. It discusses the current state of AI's impact on the social sciences and humanities, both in terms of ongoing research and emerging ethical issues.

Originality/value: The article addresses the relatively rarely analysed issue of the impact of AI-based tools on research in the social sciences and humanities. The incredibly dynamic development of AI creates new, previously unknown possibilities, but also raises a number of new problems and challenges.

Keywords: AI, humanities, social sciences.

Category of the paper: Conceptual paper.

1. Introduction

Artificial Intelligence (AI) is rapidly moving beyond speculation to practice across academic disciplines, including the social sciences and humanities. AI's integration into these fields is shifting not only how research is being done but also how knowledge is being constructed and advanced (Hutson, 2024). To understand the impact of AI technologies on methodologies, data analysis, and theory in the social sciences and humanities, this paper

specifically addresses the following research question: How does the incorporation of AI technologies influence the methodologies, data analysis processes, and theoretical developments within the social sciences and humanities?

The social sciences and humanities are based on the study of human societies, behaviours, and cultures, with qualitative and interpretative research techniques dominating these fields. AI has automated traditional methods such as transcription and coding, made large-scale textual and visual data analysis possible, and supported the study of ancient manuscripts and global literature using NLP and machine learning. It allows for the identification of societal patterns and simulation of alternative historical scenarios, thus expanding the capacity for both analysis and hypothesis testing. Therefore, the relevance of this topic is due to the possibility of increasing the efficiency of the research process, but also for providing tools to question and/or deepen our knowledge about human societies.

The aims of this scientific article are threefold: (1) to show how AI is being implemented into methodological development for data processing and analytic techniques, as well as for the automation of traditional research activities, within the social sciences and humanities; (2) to explore the impact of AI technologies on theoretical development within the social sciences and humanities, from hypothesis development to theory generation and interpretation of results; and (3) to identify key ethical and epistemological issues regarding the utilization of AI technologies for social sciences and humanities research, in the form of risks or challenges such as bias, transparency, and accountability.

This paper is based on a thorough review of literature on artificial intelligence, digital humanities, and AI in social sciences research. I consulted empirical studies on AI and AI ethics, analyses of how digital humanities use AI technologies in social science and humanities disciplines, and practical or theoretical frameworks regarding responsible AI for its developers and organizations implementing AI.

AI research is developing rapidly, especially in the social sciences and humanities fields. This field is starting to create practical applications by automating tasks, enabling digital preservation, or fostering collaboration between areas. Meanwhile, several studies showed that AI technology has many potential issues such as bias, data privacy concerns, accountability, fairness, and transparency.

The structure of this scientific paper is as follows: Chapter 2 examines the role of AI in social sciences and humanities research, focusing on applications, methods, and theoretical developments. Chapter 3 addresses the most relevant challenges of AI in the social sciences and humanities research, such as algorithmic bias and data privacy. The last chapter synthesizes and offers reflections regarding this topic.

2. Methods

The article uses a research technique such as literature review to collect, analyze, and synthesize relevant information from a wide range of sources. A literature review is a fully-fledged research method. A well-conducted literature review allows you to get acquainted with the current state of knowledge in a given field and provide reliable answers to research questions (Snyder, 2019). This is an excellent method for analysing interdisciplinary research. It also allows for the synthesis of research results and the discovery of areas where further research is necessary. The literature review was conducted on the Google Scholar and Science Direct platforms. The databases were searched based on the following keywords: sustainable development, progress, environmental ethics, sustainability.

The table 1 below summarizes the different types of literature review.

Table 1.
Types of Literature Review

Type	Systematic	Semi-systematic	Integrative
Typical purpose	Synthesize and compare evidence	Overview research area and track development over time	Critique and synthesize
Search strategy	Systematic	May or may not be systematic	Usually not systematic
Research questions	Specific	Broad	Narrow or broad
Analysis and evaluation	Quantitative	Qualitative/quantitative	Qualitative
Sample characteristics	Quantitative articles	Quantitative articles	Research articles, books, and other published texts
Examples of contribution	Evidence of effect. Inform policy and practice	State of knowledge. Themes in literature. Historical overview. Research agenda. Theoretical model.	Taxonomy or classification

Source: own elaboration based on: Snyder, 2019.

The considerations presented in the article also use the method of logical analysis. The essence of this method is the use of logical tools to distinguish correct arguments, i.e. those that are consistent with the laws of logic, from those that violate the rules. Logic and its methods allow us to discover the most general structural aspects of our thinking and actions (Peregrin, Svoboda, 2017). The application of the tools of logical analysis to propositions expressed in natural language is justified by the fact that the rules of such a language are also subject to the laws of logic.

Logical analysis is helpful in research conducted in social and management sciences. It enables better understanding of their theoretical and conceptual framework (Ngulube et al., 2015). Management sciences, like any other scientific discipline, have their own research methods and are characterized by interdisciplinarity. For this reason, some kind of methodological eclecticism can be attributed to these sciences. It allows to combine methods from various disciplines, paradigms and approaches, ensuring their cognitive and pragmatic

efficiency. These are both quantitative and qualitative methods. The research process in management sciences is often accompanied by various types of models, including: theoretical and conceptual, research or statistical. The model, in general, means a hypothetical thought structure, i.e. the arrangement of assumptions, concepts and relationships between them, allowing you to describe some aspect of reality. The role of logic in research is crucial because it allows to draw correct conclusions and avoid errors in reasoning.

Logic is a formal science. Both formal and informal principles of logic can be applied to the analysis of a text in natural language most often used in social sciences and humanities (Ngalande, 2011). The author of this article does not use formalisms. In the social sciences, universal logical principles are used to determine the correctness of statements and theories formulated within these disciplines (Mahoney, 2021).

3. The Role of AI in Social Sciences and Humanities Research

Artificial intelligence is changing research methods in the social sciences and humanities, providing new options for data analysis, visualization, and the development of theories. In this context, new opportunities and dangers emerge. These include the potential for research bias, ethical challenges, and a need for transparency.

3.1. Current Applications and Methods

AI tools have become increasingly significant in social science and humanities research methods by innovating qualitative and quantitative data collection, processing, and interpretation techniques. AI-based transcription and coding solutions have improved data management by removing human error, thereby facilitating researchers to focus more on analysis. This has aided social science research in terms of efficiency and analysis (Christou, 2023). While the use of these AI tools helps social sciences research by saving time and minimizing mistakes, researchers need to be mindful of the risk of oversimplifying complex social scenarios with these technologies.

Advances in pattern-recognition with the aid of AI tools have helped social science researchers in identifying themes and patterns in qualitative datasets. These AI tools can discover insights beyond human ability in a rapid way (Unke et al., 2021). While this has opened new avenues for analyzing research datasets, researchers need to be aware of the effects of algorithmic processes on interpretations of cultural and contextual issues.

Transcription AI, particularly through speech-recognition technologies, has greatly helped researchers in saving time on data preparation tasks, such as transcriptions of interview or focus group discussions. This allows the fast and reliable generation of transcripts at low cost (Mojadeddi, Rosenberg, 2024). This can allow researchers to conduct research projects by

themselves and as a group. Despite its strengths, this also has challenges in transcribing poor-quality audios and in cross-language transcriptions and needs to be done in a manner that maintains reliability.

AI-based data visualization has helped researchers convey complex qualitative data through techniques such as word clouds or thematic maps. These are very useful in collaborative projects and across different social sciences fields (Arulselvi, 2024). As this method of analysis is emerging, it is important that researchers balance the use of AI in explaining complicated topics with the potential risk of oversimplification or distortion.

LLMs, such as ChatGPT, have been used to generate high-variance survey responses to help social scientists in testing out survey tools without having to depend on real-world respondents and being affected by biases. This approach allows the evaluation of survey reliability and validity (Grossmann et al., 2023). As such, the challenge for this method is finding ways to verify that the answers generated are genuine. Moreover, these can be used to analyze historical data and answer “what-if” questions about alternative historic narratives. By using LLMs, researchers can study social phenomena or test theoretical relationships previously not explored (Grossmann et al., 2023). Thus, one needs to analyze whether the use of these LLMs has an effect on the theoretical frameworks used.

Text analytics and natural language processing have opened pathways for the study of press material, historical literature, and other text datasets that would have taken researchers long periods of time to analyze and search patterns (Chapinal-Heras, Díaz-Sánchez, 2023). This has enabled scholars in the humanities and social sciences to identify concepts within large texts to look for patterns and make comparisons between different texts from different periods. For instance, this has been used to investigate conceptualizations used by ancient Greek philosophers in old literature (Köntges, 2020). These kinds of AI tools have allowed for exploring patterns that, prior to the development of these, were simply beyond the capabilities of researchers to do so. While the application of text analysis has helped the humanities in a multitude of ways, it is important to ensure that there is limited oversight and that these tools are not relied on as a definitive arbiter of textual meaning.

By identifying concepts, themes, and sociological constructs, AI allows researchers in the humanities to make comparative analyses to look for patterns. This helps researchers to understand culture in different scenarios (Ho, Vu, 2025). When used in these circumstances, it assists researchers in the humanities to contextualize multilingual and multi-sourced data, supporting diversity and pluralism in this sector (Chapinal-Heras, Díaz-Sánchez, 2023). Thus, there needs to be a constant check on these AI techniques to see if they are doing accurate comparative assessments to see if various factors influence it.

These AI tools have enabled pattern identification in historical imagery and object databases, which leads to the advancement of conservation analysis in the cultural heritage sector. With AI analysis, cultural heritage researchers can identify and prioritize preservation activities. Examples are restoration work done in Notre Dame Cathedral and analysis done on

the Terracotta Army (Ghaith, 2024). Moreover, by making use of AI tools in cultural preservation, future preservational needs can be identified and be planned for. Cultural heritage researchers have been using AI to aid cultural heritage preservation efforts. With AI applications, it has helped with identifying cultural heritage needs.

AI and machine learning systems have been used by cultural heritage researchers to decipher old scripts from Mayan ruins. With the use of deep learning technology, researchers can determine structural and grammatical rules for the system to transcribe and analyze the script (Ghaith, 2024). This brings light to previously inaccessible historical accounts for both academia and the general public. Furthermore, there have been developments by scholars to create digital and interactive interfaces with museums and cultural heritage sites. While it can facilitate access, it is important that researchers take into account data and privacy rights when it comes to intellectual property.

With the introduction of these AI systems in the humanities, it has created collaborative research opportunities among various social sciences fields. It is able to connect individuals from various fields of social sciences together. Some of these disciplines include linguistics, history, and computer science (Srivastava et al., 2025). With that being said, these advanced systems also come at a large price, and not all higher education institutions can afford them. This can cause issues with accessibility among institutions and create a potential for an AI-based digital divide. These challenges need to be considered so that there is proper oversight and equality across research universities.

AI sentiment and fact-checking tools are implemented within different fields of study across the humanities, from mental health research to research analyzing disinformation in the context of disease and cancer (Xu et al., 2024). Results from these AI models often correlate with data and events that are not AI-generated. It has been shown that AI sentiment analysis has been able to mimic the rises and falls of stock prices and consumer sentiment (Xu et al., 2024). While these sentiment and fact-checking AI tools are helpful, it is important to address issues to guarantee their validity in research and to avoid AI bias.

AI-powered and data-driven applications are widely used within digital humanities education, allowing students to receive personalized learning experiences. An area of study that heavily utilizes such systems is medical humanities. These technologies and educational methods show a high educational impact on a variety of specialized topics and across a variety of different students with different learning needs (Cahayani et al., 2024). It is important for stakeholders in education to address this digital divide because some teachers may lack the basic skills to operate these AI systems.

AI-implemented methods have had an impact on traditional interview practices. The integration of AI-led techniques, in combination with traditional approaches to interviewing in the humanities and social sciences, has helped researchers examine issues on a broader, more interconnected scale, enabling them to make generalizations to an array of groups and nations (Rezaev, Tregubova, 2018). This ability to increase the range of qualitative

investigation in the humanities helps to bring depth to the research conducted. However, care should be taken not to ignore the subtleties and specific contexts that could be revealed by a qualitative analysis (Rezaev, Tregubova, 2018).

AI has aided social sciences research in utilizing unstructured data. By using text and data analysis, it is helping to unveil new insights in fields such as behavioral research, public opinions, and trends in culture (Rolnik, 2024). It helps researchers to improve their analysis by making these large datasets smaller. AI has shown itself to be beneficial for social scientists. However, these benefits and the acceleration of studies using AI-based analyses must be examined in terms of ethical use and how to ensure that the tools do not distort human behavior.

AI is also transforming fields within the humanities by allowing for multilingual research through data processing of numerous languages using machine translations and AI-generative neural networks that create artworks from various data (Nanda et al., 2024). These AI applications are revolutionizing research methods within the humanities (Saddhono et al., 2024). They provide a different way for scholars to understand human behavior, which poses a number of theoretical implications within the field that will need to be examined by humanities researchers and scholars.

3.2. Theoretical Developments

The integration of AI into research has altered the construction of theoretical frameworks by discovering previously undetected patterns within qualitative data. The automation of the discovery of thematic clusters, latent variables, and patterns is making theory construction easier, providing chances to uncover latent associations and relationships between events or objects to reveal trends and relationships (Raj et al., 2023).

AI systems are capable of hypothesis generation and theory refinement, but these systems' scope of impact to construct complex constructs for sophisticated aspects of human behavior remains limited, and their ability to extrapolate theoretical concepts from data or analyze data in context also poses a question. By detecting empirical regularities, AI systems produce thematic clusters and latent variables, thereby serving as building blocks for data-informed theoretical frameworks that may lead to innovations or refinements in hypotheses (Christou, 2023). However, the overwhelming amount of computational findings may challenge researchers to find theoretical patterns of significance. As such tools for theory construction begin to garner popularity, it is imperative to question their validity and translatability, in diverse cultural or disciplinary circumstances, through reflective theorizing.

AI algorithms can be used for coding, which reduces the dependence on one researcher's ability to draw meaning out of textual data (Poldrack et al., 2023). The potential to produce standardized and replicable coding schemes has created a shift toward increased objectivity in the theoretical domain, but at the risk of inadvertently introducing biases into the theoretical development of phenomena of interest. As such, researchers must be cautious when applying algorithms that include data and programming biases that could affect or misrepresent

interpretation. For a theoretical framework to be built using data analytics, critical theorizing regarding the use of algorithms must be addressed. Theory-building in the social sciences requires situational context and the acknowledgement of variability, which may fall into the blind spots of algorithms.

AI-based visualization tools such as network graphs and word clouds show great potential to bring theoretical relationships in large datasets into more interpretable formations. Through visualization, AI systems open channels to discover new theories (Kovalerchuk et al., 2022). Theories, even those based on large amounts of quantitative data, are not inherently interpretive, and it is difficult to translate results into theoretical insights. Visualization methods are changing data-driven theories to become more interpretable and accessible across disciplines, which may oversimplify underlying theoretical nuances in order to clarify and convey relationships.

Computational methods and data-intensive approaches have changed traditional theory-driven methods through pattern discovery and uncovering correlations that might not be evident within pre-existing theoretical frameworks (Bircan, Salah, 2022). While these methods have brought new advancements, they also present a challenge to epistemology and have been labeled anti-theoretical since they prioritize uncovering patterns over causal interpretation. The inability to incorporate nuance, human agency, and context poses serious concerns regarding the development and relevance of theories. Critical theorizing in this respect requires reflective practices in how computational methods reframe or miss significant theoretical advances.

AI systems show promise in unveiling phenomena that are under-investigated or invisible within qualitative or small-sample-size research by uncovering patterns previously unseen (Qin, Zhang, 2025). Critical theorists must therefore reflect on the implications of how such pattern discoveries can extend or modify existing theories, as well as the necessity to reflect on theoretical concepts and generalizations. By being aware of how algorithms shape theoretical contributions, AI can reveal novel explanations, but theorists must be cautious to avoid overlooking important contextual or individual dynamics to ensure the proper adaptation and interpretation of new theoretical developments in order to capture the complexities of human behavior.

The ability of large language models (LLMs) to respond to questions with a human-like response allows for the generation of counterfactuals in order to explore theoretical possibilities, such as alternative outcomes to historical events or alternative responses among different demographics (Grossmann et al., 2023; Bail, 2024). By critically theorizing about how counterfactual analysis has the potential to shape theory development and the potential to ask "what-if" questions, the impact of AI systems can be maximized to inform theories for all dimensions of the social sciences (Xi et al., 2025). However, critical theorizing must reflect on how LLMs generate these models and if these models simply reconfigure biases embedded in the datasets used to train these AI tools. Theorizing must also be reflexive, reflecting on the

potential role of AI-generated content as evidence and whether theoretical concepts and analyses constructed using such evidence can lead to new and reliable theoretical generalizations.

LLMs show potential to uncover previously hidden sociocultural biases in theory generation, to theorize simulations that include more complex and complete situations, and to generate simulations more efficiently and at higher scale than with previous technologies, which can be used to examine diverse theoretical questions across the social sciences, expanding the horizons for research in areas such as small-group dynamics, public policy responses, or political attitudes (Yang et al., 2025). LLMs can simulate broad theoretical constructs across social groups, which are frequently limited in qualitative or small-sample studies. This shows the vast potential for LLMs to influence theoretical research. However, researchers must acknowledge the potential limitations and biases that AI tools can introduce, and consider how such limitations affect the interpretation of the data and the construction of theoretical generalizations, which is not addressed by the current research. Critical theorizing may reduce and control for the biases of the LLMs by critically examining the models they produce and using human interpretation to reflect the subtleties of complex human experiences in these simulations. Researchers must also reflect on the transparency and validity of LLMs, and consider ways to promote transparency and validity by considering the ethical challenges of LLMs in theory construction.

The development of data-based and theory-informed research methods has been further enhanced by the development of automated computer-based tools to evaluate large-scale cultural records, such as literary, historical, or archival records. Computer-based techniques are being applied to address research issues that are traditionally conceptualized, which leads to new connections between themes, interpretive frameworks, and aesthetic styles. The utilization of such large databases has also facilitated more comprehensive and empirically grounded reflections and debates about theories, and it can lead to new theoretical explanations within the social sciences and the humanities (Islam et al., 2024; McGillivray et al., 2022). A simple example of these methods being used in theory construction can be demonstrated with the patterns and trends detected in large datasets, which provide insights that shed new light on long-lasting interpretive issues. The availability of algorithms for theme or pattern extraction has provided unprecedented access to textual meaning, thereby adding an extra dimension to qualitative analysis (Gefen et al., 2020). While algorithm extraction of data enhances the accessibility of meaningful patterns, care must be taken to ensure that there is not an over-reliance on quantitative and empirical trends or patterns.

Theoretical concepts within the humanities are being constructed and utilized through pattern discovery of motifs, themes, and shifts in public debate within such cultural records as newspapers, literary works, and digitized artwork (Pawlowski, 2012; Smits, Wevers, 2023; Wijfjes, 2017). The use of computational tools provides the ability to investigate new or overlooked topics that would be impossible using manual data-mining techniques and to

examine these topics in tandem across multiple disciplines or genres. This calls for a model that reflects and addresses both digital humanities and social science domains, as both rely on human and computer interaction for successful theory-building. For these advancements in theory-building in the humanities to continue, critical theorizing on all levels is imperative. Theorizing must be both reflexive and critical of human interpretation in order to capture patterns that are of importance, so that theoretical research will not be overly focused or influenced by computer-extracted themes that overlook nuanced human experiences or interactions.

The ability of humans to produce explanations has led to the development of the subfield of AI called explainable AI (XAI) to explore meaningful explanations that go beyond mechanistic concepts (Xu et al., 2019). The development of XAI has been informed by philosophy and social psychology, which reflect on how to measure the qualities of a good explanation (Balog, Radlinski, 2020; Miller, 2019). Since XAI is human-centered, it is important to critical and reflective theorizing. Critical theorizing concerning theories of human understanding calls for reflexivity because human explanations are not isolated to algorithms, but are shaped by cognitive, behavioral, social, and cultural considerations. These elements, in combination with the impact of such forces on the production of algorithms and theories, impact the appropriateness and validity of new theories and how they are understood by human subjects.

The development of XAI has integrated human-centered models of explanation with algorithms, which have advanced and improved the performance and trustworthiness of algorithms (Miller, 2019). As a result, theorists must engage in reflective practice to consider the strengths and limitations of theoretical models, and they must evaluate and utilize AI tools critically and cautiously (Dwivedi et al., 2023). The advancements of XAI show the reciprocal relationship between AI and human understanding of theoretical explanation, in that AI methods can be enhanced using social science principles, and the use of AI methods and tools requires the reformulation of human theory explanation.

The use of AI in science has also led to the science of science, a field that leverages algorithms, machine learning, and AI to explore interconnected science networks with a view toward theoretical development on a meta level (Fortunato et al., 2018; Hou et al., 2025). Using large-scale and diverse datasets to conduct meta-analyses to understand, explain, and predict processes such as knowledge creation, diffusion, innovation, and impact calls for reflective theorizing on AI itself in order to prevent AI systems from replicating and reinforcing inequities, thereby reducing the system's validity and reliability. Data mining and mapping of millions of citations have discovered scientific macro-level trends of shifts in paradigms or the rate of diffusion of scientific knowledge (Han et al., 2022). Therefore, more complex and sophisticated theories must be conceptualized to account for these emergent trends, though theories must also consider the complexity and uniqueness of scientific behavior across disciplines.

Platforms such as SciScinet utilize machine learning techniques, computational algorithms, and visualization methods to provide comprehensive data-intensive methods to examine the co-evolution of science across the world and to identify and conceptualize new theories (Lin et al., 2023; Hou et al., 2025). The theoretical constructs conceptualized in the SciScinet project utilize the identification of quantitative shifts in the composition of scholarly communications and the integration of qualitative shifts in underlying knowledge as a foundation for assessing and forecasting paradigms. By incorporating computerization and automation to analyze knowledge, its creation, and scientific practices, scientists have contributed to advances in the theoretical development of science. However, the co-evolution of human behavior and AI in this realm must be further investigated and considered for the evolution of theory itself to be understood and predicted. Thus, theories of knowledge evolution should include the human-computer interaction as a necessary variable to understanding the dynamic influence of data and machines on how science changes.

The development of the content studies and content science fields has led to new theoretical concepts and frameworks regarding human activity and content activity in digital environments that go beyond and combine elements of established fields (Floridi, 2025; Lee et al., 2020). The field of content studies concerns itself with understanding the users, designers, developers, and consumers of content and how the environment impacts interaction, design, and navigation to provide meaningful immersive experiences for its users. Such a novel construction demands theories that account for the role of computational content and the dynamics of user-content interplay, and in doing so, theorists are addressing the lack of research and literature regarding user activity. By theorizing the user, content, and interactional phenomena and activities as well as how they co-evolve, research can provide a theoretical conceptualization for how content works in computational or non-computational spaces and how the user interacts with content to obtain meaningful information or immersion. However, critical theorizing remains absent in how theorizing and reflecting on the user-content dynamic or the co-evolution of user and content informs how content studies as a discipline has the responsibility to consider how the human-computer co-evolution also necessitates new ethical theories.

Critical theorizing in this endeavor remains untouched, even in a discipline that investigates human activity in such interactive mediums. In anthropological research, the examination of expert systems shows that theories are not only constructed but are embedded in the construction and utilization of AI systems (Bell, 2021). Anthropologists who have analyzed expert systems have emphasized the choices that programmers make while coding, and the limitations that such coding requires in order to make computer programs functional (Forsythe, 1993). Critical and reflective theorizing is necessary because while programmers may not be theorists by training or nature, their interpretation and categorization of human activity in theoretical fields as machine-readable is itself an act of theorizing and has theoretical implications. Researchers must be aware and cautious that while building computational tools,

they are contributing to how human knowledge is translated and utilized in systems that may or may not be able to capture human agency in an ethically just way.

AI holds promise in supporting critical theorizing by revealing unseen or unexplored areas of thought. Reflective theorizing and self-critique must, however, remain at the forefront of the practice and be utilized with AI, as the potential of AI as a method for aiding in the development of theory is both immense and has yet to be fully realized. The successful deployment of AI requires a comprehensive understanding of its capabilities and limitations, particularly in distinguishing between theoretical promise and practical implementation.

4. Ethical Considerations and Challenges

As AI technologies are gaining traction and impacting research practices in the social sciences and humanities, it is crucial to discuss the ethical considerations of data privacy, bias, and accountability in AI in order to ensure its responsible and transparent governance in the digital transformation of scholarship.

4.1. Data Privacy and Protection

The use of AI in the social sciences and humanities has undeniably increased the efficiency of research, but it also raised valid concerns in the protection of privacy. Automated systems, such as transcription or image processing software, have made it possible to process large amounts of data more accurately and quickly than before. However, these systems also increase the possibility of revealing sensitive participant information. For example, storing and processing interviews, surveys, and images on computers or cloud platforms makes data more accessible to unauthorized users (D'aquin et al., 2018; Pansoni et al., 2023). In the case of digitized and AI-analyzed manuscripts or artifacts, contextual clues linked to certain people or communities can be exposed, highlighting the need for the implementation of proper data governance (Neudecker, 2022). Moreover, the fact that AI technology is mainly automated increases the risks of data leakage, as large amounts of data are aggregated.

The algorithmic text processing and the use of AI models for cultural heritage have shown the importance of ethical and “privacy by design” practices (Birhane, 2021). AI tools that can conduct automated coding, entity recognition, and data enrichment often reveal information extracted from data that may have been supposedly anonymized beforehand (Tang, Su, 2024; D'aquin et al., 2018). For this reason, appropriate privacy controls and data audits should be regularly conducted to maintain appropriate data protection. However, ethical “privacy by design” processes are far from the status quo as institutions have not yet had the capacity, competence, and organizational will to put the framework to practice. In this respect, regular ethical updates and the institutional support of educational resources about ethical methodologies in these systems should be adopted (Runcan et al., 2025).

Digitalization processes in AI technology for cultural heritage have allowed the possibility of 3D scanning, mural restoration, and the construction of virtual museums, opening several questions about data privacy (Gervasi et al., 2022). The collection and use of high-resolution images and metadata can be potentially misused by indirectly providing information such as the identity of the artists or the community membership beyond what is initially required for the research (Ye, 2022; Pansoni et al., 2023). These issues are especially problematic when such cultural heritage can be related to social sensitivities. For that reason, beyond the legal compliance of these data, informed consent from members, cultural groups, and communities should be obtained to protect against a multitude of risks that could affect them, their dignity, privacy, and rights. As a result, ethical data guidelines in these cases are necessary for the interests and purposes of research.

While text and data recognition and enrichment techniques have helped in the information retrieval from library and cultural archives, they can sometimes lead to an ethical concern when personal historical data are unintentionally extracted or revealed. For example, the automated process of handwritten letters and historical documents can reveal insights about individuals, families, or communities without obtaining consent or any kind of partnership with stakeholders (Neudecker, 2022; Gonzalez, Rodrigues, 2022). These cases need to be addressed by creating transparent and comprehensive data curation policies, including the data selection, the data process, and the data usage for the purposes of the research. These policies should outline strategies for including communities in decisions about the curation of their own data, maintaining ethical data privacy.

Generative AI models, such as ChatGPT, may compromise data privacy, data protection, and intellectual property. With the utilization of personal and sensitive data by systems, data privacy is becoming a bigger issue within the research and educational fields. For example, an AI-driven system offering educational content or writing analysis could use personal data in its training process, consequently decreasing users' privacy (Nam, Bai, 2023; Farooq et al., 2023). Because of that, access controls and anonymization policies, among others, should be adopted in research and education to minimize ethical concerns by protecting individual and organizational interests.

Data-informed, ethical, and sustainable AI governance in research should implement cross-organizational initiatives and have a responsible leader. Ongoing concerns about accidental exposure, algorithmic opacity, and different privacy perceptions among researchers, communities, and organizations call for the evolution of these governance policies (Runcan et al., 2025). Reporting transparency, the implementation of continuous training, and the development of organizational cultures for AI-aided data privacy are necessary to ensure more ethical and equitable uses of these technologies. Also, integrating community perspectives into the creation of research guidelines can increase policy uptake and accountability.

In conclusion, as AI is becoming more prevalent in the social sciences and the humanities, researchers, organizations, and stakeholders should make more efforts in the implementation of ethical policies regarding data privacy and protection.

4.2. Bias and Accountability

AI tools have brought in innovative approaches for social sciences and humanities research (Frontoni et al., 2024; Balburin et al., 2024). However, their potential to exacerbate bias, undermine accountability, and lack transparency remain prominent concerns that require deliberate mitigation. The replication and reinforcement of societal biases by AI-driven models remain a critical issue (Khan, 2023). These models are trained on historical data, which inevitably mirrors the structural inequalities that exist within societies (Ho et al., 2025). As a result, these models often perpetuate or even exacerbate the replication of biases such as race, gender, and class, leading to discrimination in research outcomes and social policies (Lindgren, Holmström, 2020; Tang, Su, 2024). Active counterbalancing, starting with bias mitigation through diversified and ethical training datasets, is crucial.

When AI outputs in research are biased, it impacts decision-making in policy and the way marginalized groups are depicted and described. For instance, sentiment analysis, based on biased data, can distort public opinion and cultural representations (Celi et al., 2022). This negatively impacts not only the integrity of research but also the quality of policy recommendations that emerge. To combat this, implementing robust auditing tools, as well as the investigation and implementation of fairness-aware algorithms to balance outcomes between groups, are deemed effective interventions to deal with bias in AI applications.

Minimizing bias necessitates increasing demographic diversity of researchers and decision-makers, given that heterogeneity has shown to promote equity in the distribution of outcomes (Messerli, Crockett, 2024). Such diversity encourages a wide range of perspectives on how AI systems can be developed and used in diverse contexts, ensuring that such systems do not solely perpetuate traditional norms. To build an inclusive research workforce, universities and research institutions must make recruitment, training, and collaboration strategies more inclusive to ensure that the diversity of the communities they serve is represented in AI research and decision-making. Additionally, the involvement of underrepresented groups in this process helps promote accountability and can ensure the creation and use of AI systems for socially and economically relevant purposes.

The insufficient AI training of social science and humanities researchers puts the validity and credibility of AI application at risk, due to the researchers' low technical competence in AI methods, making them adopt and reproduce AI outputs more uncritically (Lavidas et al., 2024; Chakravorti et al., 2024). For this, researchers need targeted training in AI literacy, which could be facilitated via focused workshops or interdisciplinary educational approaches, where these scholars are offered adequate critical techniques to evaluate and contextualize AI output, thus ensuring more reliable and socially responsive research findings.

The opacity of AI systems further hinders accountability, as the models often have internal functioning that is opaque and unintelligible for researchers and end-users to understand. Such opacity of algorithms in the AI domain, especially for machine learning methods, undermines trust in AI-driven results, as users cannot be aware of whether such results reflect methodological issues or reflect a lack of transparency (Tang, Su, 2024). Disclosure of all used algorithms and AI tools, datasets, and parameters is necessary so as to improve transparency and enables comprehensive evaluation and auditing of AI systems (Runcan et al., 2025).

Explainable AI (XAI) allows end-users to see the reasoning behind AI predictions, which is particularly helpful in explaining how AI systems arrive at certain conclusions. This bridges the gap between human and technological interpretation (Miller, 2019), therefore addressing AI opacity. The interpretability in XAI is ensured if explanations are produced for humans (Tull et al., 2024). This demands interdisciplinary cooperation and collaborative work between software and AI engineers and the community and stakeholders, to provide qualitative interpretations of XAI's results (Miller, 2019).

Interpretive misrepresentation occurs when analyzing humanities and cultural datasets and archives, which have been digitized by algorithms. In humanities research, context, meaning, and interpretation depend heavily on a human researcher's subjective and historical perception. Thus, there is a risk of losing sight of the subjectiveness of humanities and cultural studies as research becomes increasingly dependent on algorithms. Algorithmic-based humanities research can potentially overlook or misinterpret the meanings and subjective elements embedded in sources and archives, as AI focuses on patterns and trends in historical text that often lack cultural relevance. Therefore, the deployment of interdisciplinary ethics committees in AI research is required, which, alongside participatory governance and institutional codes, can oversee accountability and decision-making for AI use (Runcan et al., 2025).

The overuse of algorithmization could risk deprioritizing human interpretation, which is at the core of humanities research, which can diminish the values of context-dependent interpretations and evaluations of datasets (Leeuw, 2025). Research can become largely focused on computational efficiency without adequately exploring the contextual and qualitative nuances of the datasets, for example (Frontoni et al., 2024). Algorithmization has become the dominant form of data analysis because of the increased computing power (Frontoni et al., 2024), therefore undermining the human interpretative role, as research now is focused on quantitative analyses. This phenomenon is particularly detrimental for those disciplines or types of research that are reliant on non-algorithmic qualitative analyses.

The dominance of a mainstream cultural dataset risks neglecting marginalized groups, thus replicating power imbalances within the academic field. A lack of critical awareness of which datasets are used to train algorithmic models may promote the dominance of those with more mainstream representation and historically powerful or dominant voices (Lindgren, Holmström, 2020). For this reason, the integration of human expertise at all steps of algorithmic research is vital to ensure inclusivity in knowledge generation and model design (Frontoni et al., 2024).

Some of the studies in our sample debate whether to automate all the research phases, including data interpretation, or if AI algorithms are suitable for data processing, but interpretation needs to be done by the researcher or by an AI program adapted for the humanities or social sciences field (Chun, Elkins, 2023). Therefore, research needs to establish clear boundaries in which it is specified whether algorithms should aid or substitute interpretive work and how research can incorporate humans in all the research phases (Frontoni et al., 2024).

Although some researchers show concerns that algorithmic approaches will diminish the interpretative capacity of scholars or over-rely on mathematical analyses, other studies in our sample propose the possibility of hybrid interpretations to mediate this tendency in which the results are produced by the computer, and interpreted by the researcher or a computer program, allowing for the simultaneous application of interpretative analysis and algorithmic modeling in a way that does not interfere with one another.

Familiarity levels with AI differed between younger (doctoral candidates) and older (established academics) researchers. Doctoral candidates tend to embrace and display confidence with new AI technologies, while senior academic staff were less AI literate and skilled, and thus could not oversee and supervise doctoral research to the degree required. To improve transparency and interpretability, it is important to have more training workshops for researchers so they will have AI literacy across disciplines, as well as that universities have to develop long-term, continuing-capacity learning programs to cater for both senior academic staff, junior researchers, and doctoral students (Lavidas et al., 2024).

The rapid evolution of AI technologies necessitates the development of comprehensive educational frameworks that prepare future scholars and practitioners for the ethical and effective application of these tools (Messerli, Crockett, 2024). Furthermore, future research must proactively address the inherent biases within AI training data, considering how these biases can be leveraged not as flaws, but as crucial insights into historical interpretation and socio-political forces (Baunvig et al., 2025). This includes actively working towards the democratization of data and ensuring human accountability in AI decision-making processes to mitigate potential discrimination and uphold individual autonomy.

The ethics governance in our sample frames the role of researchers as "stewards of AI" by establishing AI ethics protocols, which are built on institutional codes and community narratives of appropriate use (Jeon et al., 2025). These ethics frameworks provide transparency of procedures and can encourage accountability among AI creators and researchers to minimize AI bias, which creates trust and confidence among the public, to further reduce miscommunication and fear caused by uncertainty (Jeon et al., 2025; Runcan et al., 2025).

AI governance has to consider institutional resources and external resources available and be adapted to specific needs, values, and contexts. Governance through multi-stakeholder involvement requires that institutions incorporate societal, cultural, and ethical values into all steps of the development and use of AI for social sciences and humanities research (Cai et al., 2019). Effective governance frameworks are essential to navigate these complexities, ensuring that AI development and deployment align with ethical principles and societal well-being.

5. Summary

This paper has explored the multifaceted integration of AI within the social sciences and humanities, highlighting both its transformative potential as a research tool and its complex implications for ethical considerations and societal impact. The study aimed to critically assess how artificial intelligence is changing research in the social sciences and humanities. It sought to evaluate opportunities, challenges, and innovations in methods, theories, and ethics brought by AI integration. The literature review and synthesis of case studies have accomplished the objective, showing the many ways AI is impacting the social sciences and humanities, in both research and ethical considerations.

AI technologies are transforming research methodology in many disciplines in the social sciences and humanities. Automated data processing has facilitated quantitative and qualitative data analysis in ways never before possible. Pattern recognition and natural language processing are examples of how AI tools can advance thematic analysis and make sense of vast amounts of complex and unstructured information.

Ethical considerations are vital when discussing the implementation of AI into research. AI technologies offer new possibilities for research methods and theory development; however, they have increased ethical concerns around privacy, data security, algorithmic bias, and accountability. The potential for AI to perpetuate or even amplify existing societal biases, particularly through the data used for training machine learning algorithms, represents a critical ethical challenge that demands rigorous attention (Leavy et al., 2020). This includes addressing biases inherent in AI algorithms and ensuring the responsible use of AI to protect privacy and promote fairness in research (Markowitz et al., 2024). This requires rigorous evaluation of AI systems to mitigate risks such as algorithmic opacity, which can limit accountability and contestability, and the potential for perpetuating inequalities through automated decision-making (Radavoi, 2025). Moreover, the social alienation generated by AI, stemming from job displacement and reduced human interaction, also warrants careful consideration within social research.

When situating the findings of this study in the larger context of existing literature, it appears that AI technologies are creating an impact by altering traditional social science and humanities methods. While there is limited available data on how AI-based methodologies may be implemented and how social science and humanities scholars can benefit from automated technologies, AI has greatly increased the possibilities of interdisciplinary work. AI offers more efficient data analysis and the capability of testing complex hypotheses, enabling new interdisciplinary and cross-disciplinary exploration and theory development.

Some limits to this study were considered throughout the research, as it is impossible to create a study that perfectly captures the complexity of the interaction of humans and AI in a research setting. Some considerations and limitations are summarized below:

- Some information and data may become outdated. The speed at which AI technologies are emerging makes any research project on this topic dynamic.
- The data from this study came exclusively from secondary sources. Though many different sources were consulted, there was no empirical data collection as a part of this study. This may be an important limitation.

Despite the possible limitations, this study has been important in assessing how AI technology is altering methods in the social sciences and humanities as well as ethical concerns in this realm. Some directions for future research on AI in the social sciences and humanities may be explored in the following section.

Future research is critical to provide more detailed understanding on the incorporation of AI technologies into social sciences and humanities scholarship. Three key areas for future research are outlined below:

- Empirical research on methods. This research would assess how AI has changed theoretical assumptions and how it is being applied to practical methods. It would be valuable for this study to analyze both quantitative and qualitative findings on various AI methodologies in order to assess how scholars are developing new strategies for implementing AI into both methodological and theoretical research.
- Future research on ethics of AI in social sciences and humanities research. This is an underrepresented area in the literature. To maintain accountability, ethical considerations need to be addressed to ensure that scholars are being responsible and respectful with both data and humans as AI-based methodologies are implemented.
- More complex empirical research of AI methodology in the social sciences and humanities will also be needed to address gaps in understanding of various types of methods and how they can work together. For example, how AI-based pattern recognition can be implemented into a study that is employing methods related to ethnographic inquiry.

Though the future of research and literature is speculative and unconfirmed, the directions above are some of the most helpful and worthwhile paths toward deeper comprehension of these technologies. Two recommendations emerge from the above section. These are:

- Further encourage discussion and research on ethical standards that need to be put in place to ensure responsible use of AI technologies.
- Continued discussions on how to incorporate and integrate various techniques from AI-based research into traditional social science and humanities-based methods.

AI significantly enhances the study of digital humanities by enabling advanced computational analyses of extensive cultural datasets, offering unprecedented insights into linguistic patterns, historical narratives, and artistic expressions. For instance, AI-powered tools can meticulously analyse vast textual corpora to identify thematic trends and stylistic nuances that might be imperceptible through traditional human-centric methods. This analytical

capability extends to the preservation of cultural heritage, where AI can aid in the digital reconstruction of damaged artifacts and the cataloging of extensive archives.

The fields of social sciences and humanities, traditionally centered on human experience, culture, and societal structures, are now poised to leverage AI's analytical capabilities to explore complex human and social problems, offering new avenues for research into subjective experiences and interactive activities (Huang, 2022). AI, a technology capable of reproducing human-like reasoning, learning, planning, and creativity through data processing and algorithmic responses, provides a powerful tool for empirical research, particularly for prediction and recognition tasks involving vast datasets (Rascão, 2024). This integration marks a transition towards a "digital empirical approach", where research models and analyses are increasingly data-driven, representing a significant evolution from traditional qualitative and quantitative methodologies.

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ANTHROPOMORPHIC DESIGN: ETHICAL DILEMMAS

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Purpose: The main objective of this article is to describe the ethical aspects of anthropomorphic design in terms of the possibility of excluding unethical practices.

Design/methodology/approach: A number of psychological mechanisms are used in the design of UX/UI for digital solutions, one of which is anthropomorphism, i.e., an automated cognitive response; this fact can raise ethical questions related to the loss of autonomy by users. Hence, there is a need for analyses dedicated to the ethics of the scope of their influence. Two research methods were used in the deliberations, a bibliometric study and a conceptual analysis. The bibliometric analysis helped to establish the importance of this issue of design anthropomorphism, while the conceptual analysis helped to develop a quasi-model for the ethical assessment of its impact.

Findings: This paper first establishes the growing body of research dedicated to the use of the anthropomorphisation mechanism in design activities. Second, due to the automatic nature of the cognitive response that is anthropomorphism, attention was drawn to the possibility of ethical dilemmas related to design. Thirdly, within the framework of applied ethics, a quasi-model of moral assessment of design impact has been developed, which may be helpful in identifying so-called dark design patterns. The research work undertaken may be helpful in eliminating unethical forms of design.

Research limitations/implications: These considerations are only a conceptual sketch and, as such, require in-depth theoretical analyses, which will then be subjected to empirical verification, e.g. piloting, e.g. how often the anthropomorphisation mechanism is used in design or what user awareness is related to the use of this mechanism, whether they accept the use of automated responses in UX/UI design, etc.

Practical implications: The research conducted in this article has a very practical dimension, as the theoretical analysis undertaken was aimed at creating tools to identify cases of unethical use of the anthropomorphism mechanism, ultimately this can be used to identify so-called dark design patterns and eliminate their negative impact on society.

Social implications: The article is conceptual in nature, which, in line with the research method used, allows the development of a theoretical reflection (primary research), in this case concerning the use of an automatic cognitive mechanism for design activities, This analysis can be useful to identify unethical uses of this mechanism and contribute to building autonomy towards its impact.

Originality/value: The most significant achievement of the present reflections is to develop a quasi-model to subject UX/UI projects that use the mechanism of anthropomorphism in their design activities to an ethical evaluation.

Keywords: anthropomorphism, design, anthropomorphic design, applied ethics, ethics of influence; 'dark patterns'.

Category of the paper: Conceptual paper.

1. Introduction

Joseph Wiezenbaum, creator of the first chatbot, ELIZA, in *Computer Power and Human Reason. For Judgment to Calculation*, published in 1976, cites as one of the main motives for writing this book very simple recognitions that require understanding: "I was startled to see how quickly and how very deeply people converging with DOCTOR became emotionally involved with the computer and how unequivocally they anthropomorphized it. Once my secretary, who had watched me work on the program for many months and therefore surely knew it to be merely a computer program, started conversing with it. After only a few interchange with it, she asked me to leave the room. [...] I was promptly bombarded with accusation that what I proposed amounted to spying on people's most intimate thoughts: clear evidence that people were conversing with the computer as if it were a person who could appropriately and usefully addressed in intimate terms" (1976, pp. 6-7).

Similar comments were made by Sherry Turkle, who was among those who had the opportunity to test the first chatbot and watch how students, knowing that the programme knew nothing and understood nothing, wanted to talk to it and be alone with it, implicitly entrusting it with their secrets. In her research work, S. Turkle pointed out the tendency to see machines as "human" agents, "if they can, for example, make eye contact, track our movements and make friendly gestures" (2013, p. 29). In her view, we must have programmed some evolutionary 'buttons' activated during contact with robots that caused us to think and behave towards them as if we were another human being. We now know that anthropomorphisation is a cognitive predisposition involving the attribution of human nature to non-human objects including technological ones; it concerns the processes of perception and meaning-making at the most basic level, so related phenomena remain outside human consciousness.

This tendency was already recognised in antiquity, one of its motivations being related to the situation of reducing uncertainty, helping to cope with its effects. But while for J. Wiezenbaum this fact was a human concern, over time, this mechanism began to be used in design processes to guide human reactions and behaviour, this applies to the UX/UI (User Experience/User Interface) of digital solutions. It seems that this situation is not ethically neutral, as symptoms of a loss of decision-making autonomy can be recognised in the technologically biased behaviour of users, hence the need to problematise these issues.

From this point of view, it is crucial to understand the mechanism of anthropomorphisation and its principles of operation, i.e., to find the evolutionary 'button' mentioned by Turkle, as well as to identify the design areas that make use of this mechanism. The research work

undertaken will provide a closer look at the specifics of this cognitive predisposition, so that it can then be analysed from an ethical point of view. In this section, the perspective of applied ethics will be used, thanks to which it will become possible to isolate possible ethical dilemmas. The paper assumes that an awareness of the ethical dilemmas involved in the use of anthropomorphisation mechanisms in the design of digital technology will ensure a more balanced impact of these dilemmas and thus contribute to maintaining a sense of autonomy towards technology. We need to know the pitfalls so that, as users, we can consciously build mental models of adequate responses to the suggestive potential of digital instrumentation.

2. Methods

The paper will use two research methods: a bibliometric method and a conceptual analysis. Bibliometric analysis is a quantitative and statistical method of examining the literature; it involves the use of a variety of data on scientific publications and citations to assess the performance of scientific activity, monitor the development of science, identify trends and impact in a field (OECD Glossary of Statistical Terms). It includes a quantitative assessment of scientific output (e.g. number of articles, books, chapters); a citation study, an indicator of the impact and importance of a given work is studied; a study of the impact of citations of a given scientist or scientific unit; a study of the average number of citations of articles published in a given journal over a given period; a study of networks between scientists and institutions; identification of key topics and their links in a given field; visualisation of links between publications, authors, institutions, or keywords, helping to uncover trends and research gaps; measures scientific activity in the digital world (e.g. mentions in social media, blogs, scientific websites), complementing traditional indicators. It is used to assess the scientific output of individual researchers, research units, institutions, and even entire countries. It is used for evaluation, recruitment, or awarding of prizes and grants; identification of research trends, helping to track the development of scientific fields, the emergence of new research areas, and the disappearance of others; identification of the most influential researchers in a given field; and is particularly useful for the creation of systematic reviews and meta-analyses, as it allows a quantitative approach to the analysis of large amounts of data. In the present discussion, the number of publications with the two key words "anthropomorphism" and "design" will be analysed, helping to identify the number of publications dedicated to the issue of design anthropomorphism, the type of publications describing the phenomenon, and the research area. This will allow us to trace the development of the research with an indication of the main threads of the analysis.

The second method used for consideration will be one of the oldest scientific methods, i.e. conceptual analysis (Furner, 2004; Gilson, Goldberg, 2015; Stuart, 2015; Dickson et al., 2018), whereby further theoretical analyses are conducted on the basis of already existing knowledge. In this method, using the most classical research methods, such as deductive reasoning, initial assumptions, well-grounded in theory, are made, and from these initial assumptions, conclusions are formulated that extend knowledge in the field or allow new hypotheses to be put forward, which are then subjected to verification in empirical research. This type of research is typical of so-called basic research. Conceptual analysis is used to combine theories, adapt theories to new developments, categorise, establish logical relationships between phenomena, and build theoretical models (Jakkolla, 2020). Given the theoretical sophistication of the issues discussed in the considerations, this method seems appropriate. According to the conceptual analytical steps adopted, the study will carry out the following tasks:

- Defining basic concepts, describing the initial theoretical assumptions, in this case, defining terms such as ‘anthropomorphism’, ‘anthropomorphic design’, ‘applied ethics’, ‘ethics of influence’.
- Establishing the relationships between the different concepts, in this study, the authors answer the question: In which areas of design is the mechanism of anthropomorphism used?
- Conclusions – in this study, an answer to the question: What ethical dilemmas might be generated by the use of the mechanism of anthropomorphisation in design?

The theoretical knowledge obtained in this way can form the basis for empirical research, as hypotheses developed that should be verified in the course of further research work (Osika, 2024, pp. 457-458).

3. Results

3.1. Bibliometrics

According to the methodological assumptions described above, it is initially necessary to establish to what extent the proposed topic is currently a relevant research topic. Below are the results of a search in the SCOPUS database from the Science Direct website, covering terms such as: "anthropomorphism", "design". Data were collected on 30.06.2025. The number of publications by year, type of publication, and scientific discipline was taken into account. The results obtained are presented sequentially in Figure 1 (by years), Figure 2 (by type of publication), Figure 3 (by scientific field).

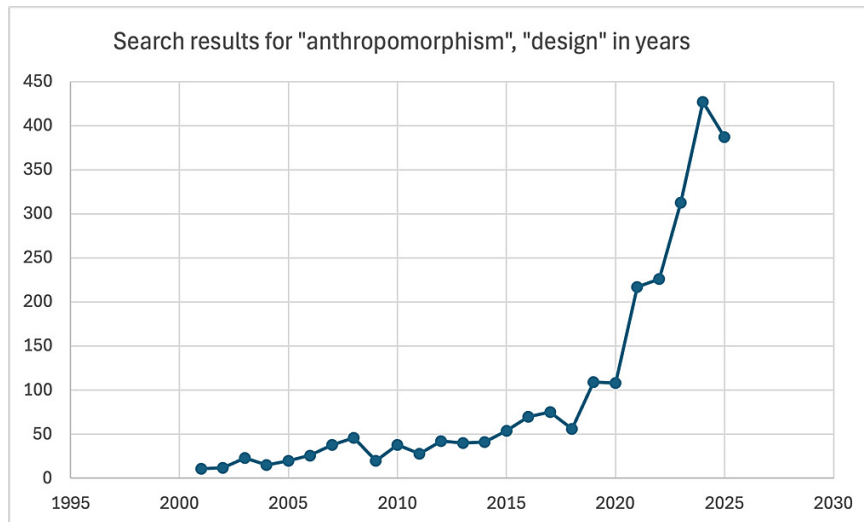


Figure 1. SCOPUS-based Science Direct – number of published articles search for "anthropomorphism" and "design" in years.

Source: Own elaboration.

Considering the number of publications appearing in a given year for searches of the terms "anthropomorphism" and "design", it can be seen that since 2020 their number has been steadily increasing. This may indicate a constant demand for knowledge in this area motivated by design considerations, i.e. that anthropomorphism as a cognitive tendency is used in UI/UX.

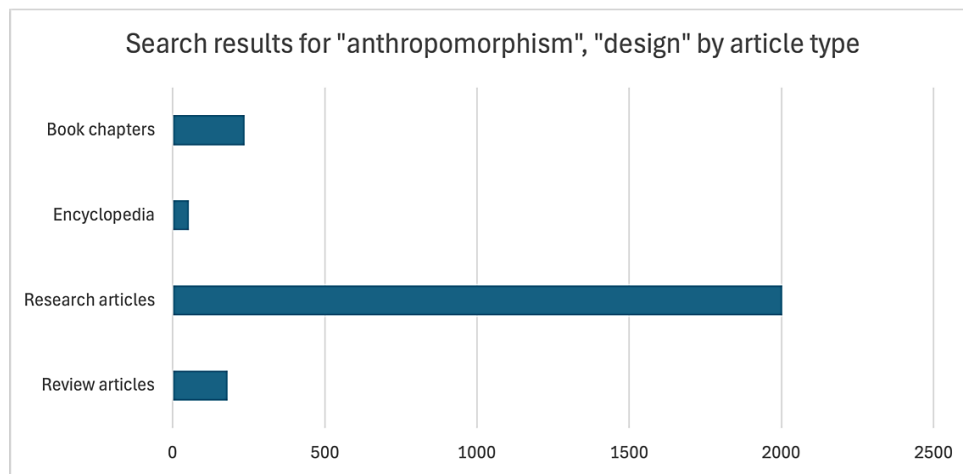


Figure 2. SCOPUS-based Science Direct – number of published articles search for "anthropomorphism" and "design" by article type.

Source: Own elaboration.

The above-mentioned trend can also be seen in the type of research conducted. As shown in the chart above, research publications are the most numerous, which means that we are currently at the stage of gathering knowledge.

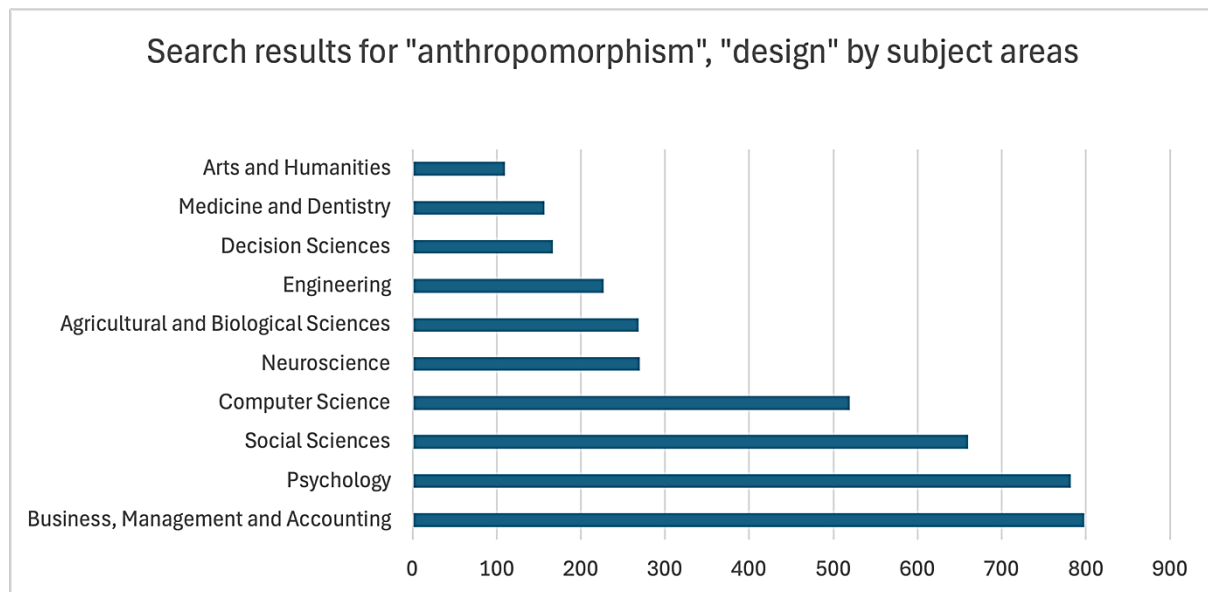


Figure 3. SCOPUS-based Science Direct – number of published articles search for "anthropomorphism" and "design" by subject areas.

Source: Own elaboration.

Similar conclusions can be drawn with regard to the identified research areas, i.e. psychology, computer science, business, management and accounting, social science – psychology and social sciences concern research into the phenomenon of anthropomorphism itself, while the other two are likely to be related to the use of findings.

The data obtained from the bibliometric study allow several conclusions to be drawn, indicating the existence of certain trends related to scientific analyses of issues concerning anthropomorphism in design. First, an increase in interest in this issue has clearly been discernible in the past five years. The decrease in the number of publications in 2025 is the result of a lack of complete data; there are still a few months to go before the end of the year, and the current number of publications rather indicates a continuation of the trend. The increasing interest of researchers usually indicates that the subject matter is problematised, i.e. that it is becoming the focus of attention, as an issue of importance, and this in turn is the result of increasingly perceived gaps in current knowledge. Secondly, the type of publications that predominate are research articles, which may indicate a pragmatic tendency in the approach to results, i.e. the use of research results in project activities. This may also be evidenced by the research areas within which the publications are produced mentioning business, management and accounting, psychology, social science, and computer science.

The bibliometric analyses obtained in the course of the research indicate that the scientific work carried out is intended to serve design activities enabling greater use of knowledge about this largely automated cognitive tendency, bypassing conscious responses, from an ethical point of view this trend may be questionable.

3.2. Conceptual analysis

3.2.1. *Definition of anthropomorphism and anthropomorphic design*

Anthropomorphism, a concept derived from the Greek words *anthropos* meaning "human" and *morphe* referring to "shape" or "form", we should identify with all forms of attributing life to the inanimate (Epley et al., 2007, p. 864). This mechanism refers to human properties, attributes or mental states real or imagined projected onto non-human "subjects" and objects; these attributes include experience, metacognition, intentions, emotional states, but also behavioural traits (ibid.). Cecilia Roselli, Leonardo Lapomarda and Eduardo Datteri, in their article *How culture modulates anthropomorphism in Human-Robot Interaction: A review* (2025), remind us that 'tendency to "humanize"' everything was a subject of philosophical analysis in ancient Greece, where Xenophanes was the first to use the term 'anthropomorphism' to illustrate how Greek gods were invariably light-skinned and blue-eyed, whereas African gods were invariably dark-skinned and dark-eyed" (Roselli Cecilia Roselli, Leonardo Lapomarda and Eduardo Datteri, in their article *How culture modulates anthropomorphism in Human-Robot Interaction: A*).

In detail, several key features can be identified that help reveal the essence of anthropomorphism. This process can be understood as the cognitive predisposition to attribute human nature or characteristics of human uniqueness to non-human technological, mental, or natural objects (Ruijten, 2015, pp. 11-13; Roselli et al., 2025, p. 1; Kowalik, 2015; Szpunar, 2023). "If we encounter an object whose action we do not understand, cannot explain its action or behaviour, we superimpose matrices familiar to us from the human social world, i.e. human matrices, onto the situation. In other words, anthropomorphisation provides us with an intelligible and useful vocabulary through which that which is incomprehensible and alien somehow becomes closer and tamer, because it contains a human element" (Szpunar, 2023, p. 28).

One of the most important and influential theories explaining why people attribute human characteristics (thoughts, intentions, emotions) to non-human entities is considered to be the three-factor theory of anthropomorphisation, formulated by Nicholas Epley, Adam Waytz and John Cacioppo (2007). Identifies three main psychological factors that determine the propensity to anthropomorphise. This is elicited agent knowledge, a factor that refers to whether people possess knowledge or cognitive schemas that can be applied to understand and predict the behaviour of a given non-human agent. In other words, the more an object appears to have human-like characteristics, such as eyes, a face, a voice, the ability to communicate, and movement at a human pace, the easier it is to anthropomorphise it. The second factor is effectance motivation, which refers to the human need to control and understand the environment. When people encounter non-human entities whose behaviour is unclear, unpredictable or difficult to explain, they may anthropomorphise these entities to give them meaning and a sense of control. Attributing human intentions, thoughts or emotions to them

can make their behaviour seem more understandable and predictable, and thus easier to control. (Epley et al., 2007; Waytz et al., 2010). The last factor relates to sociality motivation and refers to the human need for belonging, social connection, and avoidance of loneliness. When people feel a lack of social connection or loneliness, they may anthropomorphise non-human entities (e.g., pets, electronic devices) to satisfy their social needs. They then treat them as ‘friends’, ‘companions’, or ‘confidants’. This mechanism helps to reduce feelings of isolation and provides a substitute for social interaction (Epley et al., 2007; Epley et al., 2008; Szpunar, 2023).

Anthropomorphism as a cognitive strategy can be implicit and spontaneous or intentional and reflexive (Ruijten, 2015, p. 13), it can be thought of psychologically, i.e. when people perceive something as ‘human’, but also technologically, when, for design reasons, a tool is consciously given human characteristics (Ruijten, 2015, pp. 15-16), we then speak of anthropomorphic design (Fischer 2021). This recognition directly relates to the *Computers Are Social Actors* (CASA) model, which is one of the most important theoretical contributions to the field of human-machine communication. This model suggests that humans apply the same heuristics that are used in human-to-human interactions to non-human artificial agents (e.g. computers, chatbots and robots) and therefore interact with them as if they were humans (Nass, Siminoff, Steuer, 1994; Nass, Moon, 2000; Roselli et al., 2025).). In other words, individuals unthinkingly, i.e. using specific heuristics, apply social rules and expectations to machines, and it should be anticipated that this also applies to any digital solution. Two dimensions seem to be key in these diagnoses; on the one hand, there is the automatic way of reacting, combined with the social character of this reaction, both of which are considered as design cues to trigger a psychological response in humans. In this sense, Kerstin Fischer proposes to consider design anthropomorphism as the conscious shaping of a response aimed at triggering anthropomorphising behaviour in humans, i.e. to obtain in humans an observable behavior in contact with technological objects, analogous to the one they manifest towards each other (Fischer, 2021, pp. 4-2). Anthropomorphisation in the design of robot, for example, is conceived as triggering psychological mechanisms that lead people to attribute human-like characteristics to robots, thus ensuring smooth and successful interactions between them (Roselli et al., 2025).).

It is now possible to speak of a significant body of work, both scientific and applied, realising the extent of the use of design anthropomorphism. Andreas Janson (2023, p. 3) has reviewed such research and applications, here are some examples he describes:

- 2009: Lingyn Qiu and Izak Benbasat – a study of the impact of anthropomorphic design in terms of modality and performance on the effectiveness of a recommendation agent - conclusions: communication with embodiment and voice (compared to plain text) positively affects ‘social presence’, as well as trust, perceived friendliness and propensity to use a recommendation agent.

- 2010: Kathleen Keeling et al. – a study of the impact of communication styles on trust and intention to visit a website - findings: task-oriented communication style influences trust, especially when searching for goods/services. Socially oriented communication contributes to trust and increases the intention to visit the website.
- 2011: Clemens F. Köhler et al. – a study of the influence of conversational content and social actor style on new customer adaptation - conclusions: Both functional and social content have a positive impact on customer adaptation, but there must be a balance between the two conversational styles.
- 2014: Tibert Verhagen et al. – investigating anthropomorphic tendencies and communication style as moderators of perceived social presence and personalisation - conclusions: a socially oriented communication style reinforces the positive impact of benevolence and developing competences focused on personalisation also develops the virtual agent's sense of social presence, and social presence and personalisation have a positive impact on user satisfaction.
- 2015: Jennifer Hill et al. – exploring differences in the quality and content of conversations between humans and humans interacting with machines - findings: dialogues between humans were more varied and longer. More messages were used in dialogue between humans and chatbots.
- 2018: Theo Araujo – investigating the effect of name and language style on the activation of anthropomorphic perceptions – conclusions: anthropomorphic perceptions towards a chatbot are activated towards agents with a human name and using an informal language style, and this in turn allows stronger emotional connections to be built with the company represented by the human chatbot.
- 2020: Adam et al. – investigating the relationship of the anthropomorphic elements used in the design and the foot-in-the-door technique on building user compatibility; conclusions: there is a positive relationship between the anthropomorphic perception-evoking elements used and the use of the foot-in-the-door technique on perceived compatibility with the chatbot.
- 2021: Rajat Roy and Vik Naidoo, study of the effect of conversational styles triggering anthropomorphic perceptions on users' temporal orientation and evaluation of chatbot effectiveness, conclusions: chatbot effectiveness depends on users' temporal orientation and informal conversational style, both parameters indirectly affect the perception of the brand that uses chatbots to communicate.
- 2023: Joohee Kim and Il Im – investigating the effect of a non-human actor's appearance, on the release of anthropomorphic perceptions related to the chatbot's intelligence rating - conclusions: the anthropomorphic response depends on perceptions of the agent's appearance and intelligence rating. Users attribute a greater range of humanity to agents perceived as intelligent but disembodied than to

‘intelligent’ and ‘poorly designed’ physical agents; A. Janson – analysing anthropomorphic aspects, personification and communication style as attributes influencing the perception of chatbots. His research shows that the personification of the chatbot, but also the social orientation of the communication, have a clear impact on the perception of the chatbot. Both positively influence the level of recognised social presence, but only communication style directly influences satisfaction with the chatbot. Furthermore, social presence is a fundamental parameter of importance when evaluating a chatbot, with factors such as trust, perception of empathy, and feelings of satisfaction from contact with the chatbot (Jason, 2023, p. 4).

These examples point to the significant ‘social suggestiveness’ of digital technology, which is achieved by design through the use of automatic cognitive and behavioral strategies, depriving users of control over their reactions because they are reflexive in nature, and this fact generates the dilemmas highlighted by Brian. J. Fogg, admonishing "designers must be aware of the ethical implications of designing psychological cues into their products" (Fogg 2003, p. 100). More and more attention is being paid to this design aspect, and the term ‘dark patterns’ has even been coined to describe unethical design practices using, among other things, cognitive automatisms (Luguri, Strahilevitz, 2021; Kho, Seah., 2023; Roffarello, Russis, 2023; Ehsan, Riedl, 2024; Yablonski 2024). The following section of the article is devoted to this issue.

3.2.2. *Ethical dilemmas of anthropomorphic design*

Intuitively, we recognise that using mechanisms in design that are triggered in users automatically, outside of their control, brings concerns of ethical violations, but having a hunch is not the same as trying to understand the situation and consciously decide what kind of influence we are able to accept. Hence, the need for a little more in-depth reflection. However, this requires the adoption of a conceptual framework that allows it to be carried out according to methodological rules. First of all, it is necessary to choose an adequate research area, and in this case it is worth following a pragmatic criterion, as it is not a question of building theory but of simple indications allowing one to separate the ‘bright patterns’ of design from the ‘dark’ patterns" ones. It seems that, in this case, the most appropriate would be applied ethics, which from its essential "tries to give answers to the practical moral questions we ask in everyday life (Jackson, 2021, p. 1). Secondly, develop moral evaluation criteria specific to the activities in question, taking into account the context, these are ethical criteria related to social impact. Third, analyze the project activities in terms of the criteria developed earlier.

3.2.2.1. *Applied ethics*

According to Aleksandra Kuzior, "the term applied ethics began to be used only in the 1970s. This trend of practical philosophy grew out of a certain powerlessness in ethics itself. Applied ethics (or rather practical ethics) is an ethical reflection on practical problems and attempts to solve them thanks to the tools used" (Kuzior, 2021, p. 18). In Encyclopedia Britannica we read "applied ethics, the application of normative ethical theories i.e. philosophical theories regarding criteria for determining what is morally right or wrong,

good or bad—to practical problems". However, applied ethicists are not only an activity to which moral principles are supposed to apply, but also a method because applied ethics "refers to any use of philosophical methods to treat moral problems, practices, and policies in the professions, technology, government, and the like" (Beauchamp, 2003, p. 3).). Regardless of the doubts raised by the very notion of applied ethics, formulated mainly by philosophers (Sójka, 2007, pp. 120-1220), several characteristics can be mentioned. Firstly, it involves all stakeholders, and above all practitioners, for whom ethical dilemmas arise in action. Secondly, it must be subject to updating, adapting to real-life actions, and thirdly, it is mainly concerned with dilemmas that play out socially, helping to establish the rules we as a society want to follow. Fourthly, in its analyses it refers to specific cases in order to be able to formulate more general recommendations on the basis of these, and fifthly it is dialogical, i.e. its findings are worked out by the consensus of the stakeholders involved in the dilemma and their arguments (Sójka, 2007, pp. 122-124). Finally, practical dilemmas provide the context within which normative concepts are formulated (Darwall, 2003, p. 18; Sójka, 2007, p. 124).

In summary, applied ethics, using methods of analysis typical of normative ethics, diagnoses dilemmas and attempts to formulate the principles needed to resolve them in relation to specific areas of action (Beauchamp, 2003; Allhoff, 2011; Attfield, 2022; Meynell, Paron, 2023).

3.2.2.2. Applied ethics of social influence

In line with the tenets of applied ethics, the criteria used for moral judgement are always situated in relation to a particular form of action. Similarly, in the case of exerting social influence, it is necessary to identify a framework that makes judgement possible; in turn, the construction of criteria requires the delineation of reasonably precise denotational areas to refine the understanding of social influence. Lisa Rashotte defines social influence as change in an individual's thoughts, feelings, attitudes, or behaviors that results from interaction with another individual or a group (Rashotte, 2007). In turn Philips G. Zimbardo i Michael R. Leippe emphasise that the process of social influence involves a person's behaviour that has the effect (or is born out of such an intention) of changing another person's behaviour, feelings or thoughts about the stimulus. [...] There are many techniques of social influence, but they all boil down to relatively few, very basic processes related to the human way of thinking, remembering, feeling and making decisions (Zimbardo, Leippe, 2004, pp. 19-20; Osika, 2005; Osika, 2012). Influence takes place in several distinct interaction systems, but the tool of influence is communication, largely persuasive. It seems that nowadays, limiting influence to shaping information flows is insufficient, as social influence processes are increasingly thought of in terms of experience design (Norman, 1988; Osika, 2019). In this case, the components that determine the influence exerted need to be recognised in a new way. Bernd H. Schmitt lists six strategic modules of experience, these are: sensory arousal; cognitive processes such as learning, evaluation of preferences, appreciation of excellence; emotions; higher (spiritual)

experiences; a sense of agency; and social relationships and the associated sense of belonging and identity (Schmitt, 1999; Boguszewicz-Kreft, 2021).

In relation to design anthropomorphism, this extended spectrum of influence will be of particular importance due to the accumulation of “triggers” for automatic responses that guarantee efficiency. And it is this high range of efficiency that is particularly threatening from an ethical point of view because it creates the possibility of taking control over the user. On the other hand, it also seems unjustified to hastily label any form of design anthropomorphism as unethical, because when a robot designed for human collaboration “betrays human symptoms” designed during its construction in order to facilitate human comfort, we will doubt whether this is a form of non-ethical action.

Dealing with such dilemmas requires establishing the criteria for moral judgement that we can adopt; within applied ethics it is common to situate judgements in relation to human acts (Hartman, 2008; Cichosz, 2008; Osika, 2012). These criteria include, for example, “the intentions and motives of the actor, the moral qualities (virtues) that come to the fore in a given deed, the moral values that are realised by a given deed; the conformity of the deed with the applicable rules of conduct and the commitments undertaken; the conformity of the deed with the conscience” (Hartman, 2008). In the criteria developed, it is also worth taking into account two traditions of evaluating actions, i.e. the intentionalist one, which emphasises the intention of the act, and the consequentialist one, which emphasises the role of the effects of actions. This condition is fulfilled by the set developed by Marcin Cichosz, which includes: the assessment of motives, the assessment of intentions, whereby in the case of motives it is about the cause of the action, and in the case of intentions it is about the intentions accompanying the action; the third criterion is the components after the execution of the action, i.e. the assessment of the relation of the action to social norms, the assessment of the person acting, and also the assessment of the effect (Cichosz, 2008, p. 51).). The indicators introduced by Cichosz build a grid that allows for an ethical analysis of exerting influence (Osika, 2012), as we can juxtapose the moral evaluation of project intentions with the ethical judgement of the actual effects that users are more or less aware of.

3.2.2.3. Antropomorphic design – areas of uncertainty

As the subject of the article is design activities, only these will be subjected to ethical evaluation, given the narrowness in the title regarding areas of influence, the examples cited will focus on the use of the mechanism of anthropomorphism. However, it seems that this analysis can be more general, and, due to the categorisation grid developed, it can be considered as a kind of quasi model for ethical evaluation of project activities. In order to give more clarity, it will be in tabular form. It will use the criteria proposed by Cichosz, framed comparatively as ‘ethical activities’/‘non-ethical activities’. - this will bring out the ambiguity of using the mechanism of anthropomorphisation during design and the moral dilemmas that arise.

Table 1.
Categorisation grid for ethical design impact assessment

	Before action			After action	
	Motives	Intentions	Social norms	Person acting	Effects
Ethical actions	Designers combine the user's needs with their own, e.g. the anthropomorphisation mechanism is incorporated into the design brief, but it is intended to create a sense of security for the user; this in turn allows the company to generate profit by building its brand, and the design group gains a reputation as professionals	When designing a particular product, designers use anthropomorphism to enhance the user's quality of life, e.g. a rehabilitative technological solution that encourages frequent use of the	When designing a given product, designers use anthropomorphism to mimic behavioural norms, e.g. facilitating a relationship with technology by using polite conventions when interacting with a chatbot	When designing a given product, designers use anthropomorphism to make it easier for the user to act with it - Jakob's law - 'people using a digital product or service immediately know how to do it' (Yablonski, 2024, p. 1)	The effect of using the anthropomorphisation mechanism is reduced stress when using a digital device
Unethical actions	Designers use the mechanism of anthropomorphisation during design, but it is intended to trigger automatic responses to cover design deficiencies or make users dependent on the product	Designers, when designing a given product, use anthropomorphism to build trust to force user settings that facilitate data capture	When designing a particular product, designers use anthropomorphism to mimic behavioral norms in order to trigger a behavioral pattern, such as building a strong emotional connection with the company	Designers use anthropomorphism when designing a given product by 'sewing' elements of their stereotyping behavior into a digital solution	The effect of using the anthropomorphisation mechanism during design is to create psychologically harmful behaviors and habits

Source: Own elaboration.

The suggestions in the table above show that the ethical evaluation of design solutions that use an automatically triggered anthropomorphisation mechanism can be carried out against a given solution at the level of motives and intentions accompanying the design, and, as it were, post factum, when the design has been implemented we can monitor the effects of the design at the level of norms, the evaluation of those acting, and the ethical dimension of the effects of using a given digital solution. An important fact emerges from this analysis, namely that the evaluation of design intentions can be verified by an impact evaluation, which may suggest that a reflection integrating both types of evaluation is necessary to be able to fully demonstrate the real impact and the positive or negative sign of this impact.

It is also worth emphasising that in the case of motives and intentions, it is the moral awareness of those designing and implementing a given solution that is important, while in the case of effects, it is the users themselves or certain institutions acting on their behalf who should take control measures and exclude unethical projects from the social space. Attention is already paying more and more attention to the so-called 'dark patterns' (Ehsan, Riedl, 2024; Yablonski, 2024), the identification has educational values for users, as it makes them aware of the mechanisms used to change their attitudes. On the other hand, the creation of lists of such

patterns is a form of moral rectification of the design community, making it possible to speak clearly on the 'light side of power', as certain types of solutions are "'stigmatized".

An example of this is the 'notifications' feature. The creators of this functionality may have had pure intentions, aiming to provide users with neutral information about changes that could be important to them. Over time, modifications to the strategy of building economic value in social networking services meant that notifications enabled in applications automatically became the unethical tool for exploiting attention that they are today, but only after the fact can we assess the effects. In turn, with regard to anthropomorphism, let us assume that the designer of a gambling application consciously uses human attributes to trigger automatic reactions designed to win the user's favour and make them addicted to it. In this case, our ethical assessment will concern intentions and motives rather than effects. In this sense, the quasi-model of moral assessment is universal because it allows us to refer to both situations, i.e. intentions, motives and effects.

The proposed model for ethical evaluation of design solutions is not perfect; however, its aim was more to start a discussion on the necessity of undertaking this type of reflection in view of the fact that automatic cognitive mechanisms are used in the design of solutions that are now becoming a "natural" part of our living environment. Consequently, their influence, unconscious to us, can significantly direct our behaviour and habits, not necessarily in accordance with our intentions and values. Therefore, it is worth reclaiming the right to make responsible decisions in this regard.

4. Discussion

From the very beginnings of the emergence of digital technology and the emergence of artefacts associated with it, we have observed symptoms of anthropomorphisation made to both devices and programmes (Wiezenbaum, 1976; Turkle, 2013). This is hardly surprising, as the cognitive tendency to humanise the inanimate has been recognised since antiquity in relation to gods, animals, objects, etc. (Epley et al., 2007; Ruijten, 2015; Roselli et al., 2025; Kowalik, 2015). One conception that allows us to understand the workings of this mechanism points to three main psychological factors, it is the triggering of the schema on the basis of human resemblance, in the case of uncertainty anthropomorphisation helps to make sense, and in the case of loneliness it helps to offset 'social hunger' (Epley'a, Waytza, Cacioppo, 2007; Epley et al., 2007; Epley, 2008; Szpunar, 2023). Mostly anthropomorphic reactions are automatic in nature and serve as a way for humans to alleviate dissonances of a social nature. One type of anthropomorphism is the so-called technological anthropomorphism in which, for design reasons, a given tool is consciously given human characteristics (Ruijten, 2015; Nass, Siminoff, Steuer, 1994; Nass, Moon, 2000; Roselli et al., 2025). This approach is about the deliberate

shaping of responses to trigger anthropomorphizing behaviour in humans (Ficher, 2021). In these cases, the aim is to ensure smooth and successful interactions with the product, service (Ficher, 2021; Roselli et al., 2025). Many aspects of the impact of design anthropomorphism have already been studied (Janson, 2023; Qiu, Benbasat, 2009; Keeling et al., 2010; Köhler et al., 2011; Verhagen et al., 2014; Hill et al., 2015; Araujo, 2018; Shemekhi et al., 2018; Adam et al., 2020; Roy, Naidoo, 2021; Kim, Im, 2023; Janson, 2023). And it is precisely this fact that provokes ethical considerations as to whether the use of automated responses violates the autonomy of users. The most appropriate area for this kind of reflection seems to be applied ethics, as that field of ethics in which ethical reflection on practical problems is undertaken using methods typical of normative ethics (Darwall, 2003; Beauchamp, 2003; Sójka, 2007; Allhoff, 2011; Kuzior, 2021; Meynell, Paron, 2023). In this reflection, it was necessary to address the essence of influence (Rashotte, 2007; Zimbardo, Leippe, 2004; Osika, 2005) and the ethics of influence (Fogg, 2003; Osika, 2012), understood as the ethics of action (Hartman, 2008; Cichosz, 2008; Osika, 2012). It can be expected that this model will be helpful in delineating so-called 'dark patterns' (Luguri, Strahilevitz, 2021; Ehsan, Riedl, 2024; Yablonski, 2024) capable of restoring control over design processes, through awareness of what mechanisms of automatic perception are used during design, an educational value, and to initiate work on institutional prohibition of unethical design practices.

5. Conclusions

As indicated in the “Introduction”, UX/UI design for digital solutions today uses a number of psychological mechanisms, which, by design, are intended to respond to user's needs. However, when we are aware that the mechanisms rely on largely automated user responses, an analysis of the ethical aspects of this situation seems obvious. Two research methods, a bibliometric study and a conceptual analysis, were used to carry out such an analysis. The bibliometric analysis has established a growing interest in the issue of anthropomorphism in design reference, so the problem is gaining attention. On the other hand, as part of the conceptual analysis, according to the assigned research tasks:

1. concepts such as anthropomorphism, design anthropomorphism, applied ethics, applied ethics of social influence were defined,
2. the relationships between the key concepts were established, including in which design areas the mechanism of anthropomorphism is used,
3. Through the development of a quasi-model of moral evaluation, the existence of possible ethical dilemmas was indicated, while obtaining a tool to facilitate such evaluation.

Further research highlighted the need to identify so-called “dark design patterns”, as suggested by Mustafa Suleyman, co-founder of the pioneering artificial intelligence development companies DeepMind and Inflection AI, in the development of technology we can expect a number of processes to slip through our fingers. Therefore, it is sometimes necessary to take containment measures that are complementary in technical, social, legal dimensions; this containment is to address mechanisms that help monitor the development of technology at each level (Suleyman, 2024, p. 28). This monitoring should also include design processes, but for such monitoring we need a categorisation framework to help understand what we are monitoring. The developed quasi-model for ethical assessment of the use of design anthropomorphism can act as one such tool.

As previously indicated, in accordance with the principles of applied ethics, certain normative assumptions constituting an analytical framework are necessary for the moral evaluation of actions. The creation of these assumptions is conceptual in nature, constituting a theoretical model, but its success is ultimately determined by ‘tests’ on specific actions. In the case in question, it will fulfil its function if we can use it to analyse any UI/UX solution and assign it the status of an ethical or unethical model. This requires further analytical work.

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LOGISTICS MODELS OF CRITICAL SITUATIONS, THEIR USE DURING WARFARE

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Purpose: The purpose of the research is to create models for applied information technology research of logistics processes of transporting goods and people during the period of the country's martial law.

Design/methodology/approach: To achieve the specified goal, the following tasks must be solved: creation of optimization models for planning the transportation of weapons and military equipment to the front line; creation of optimization models for planning the evacuation of the population to the rear. Research methods are based on optimization and simulation models, which allow planning and choosing rational ways of transporting goods and people in the conditions of martial law. Used mathematical methods and models: system analysis, methods of transport logistics, integer (Boolean) optimization, multi-criteria optimization, methods of expert evaluation. The subject of research is the models, methods and applied information technology of virtual distributed control of carriage transportation in conditions of threats.

Findings: In the work, a research of the logistics processes of transportation during the period of the country's martial law was carried out. Current areas of research related to the transportation of military cargo to the front line, as well as the evacuation of the population from the front-line zone to the rear, are separated. The main logistic indicators that must be used to evaluate transportation processes under the conditions of military threats have been formed (transportation time, transportation risks, transportation cost, the number of the population being evacuated). Optimization models have been created for choosing rational routes of transportation to the front line and to the rear. Local optimization of logistics indicators was carried out, taking into account limitations on the permissible time and risk of transportation. Multi-criteria models were created for finding compromise solutions for transportation logistics.

Originality/value: The scientific novelty of the research is related to the creation of a complex of original optimization models, which can be used to analyze and plan the logistics of transporting weapons and military equipment to the front and evacuating the population to the rear. The proposed approach is the basis for the creation of applied information technology for the planning of transportation logistics during the period of the country's martial law.

Keywords: model, logistic indicators, optimization, multi-criteria formulation of the optimization problem.

Category of the paper: Research paper.

1. Introduction

The state of war in the country forced to review the logistics processes of transportation (Алексієв, О., Алексієв, В., Неронов, 2023; Федорович, Гайдєнко Пуйденко, 2017; Федорович, Западня, Іванов, 2016; Федорович et al., 2023; Федорович et al., 2022a; Федорович, Прончаков, 2020; Федорович, Сломчинський, Пуйденко, 2018; Федорович et al., 2020; Федорович et al., 2022b; Федорович et al., 2022c). There are new areas in logistics that need to be explored for effective transportation planning in the face of military threats. Especially important are the directions of logistics, which are related to the transportation of weapons and military equipment (WME) to the front line and the transportation (evacuation) of the population to the rear from the front-line areas. Therefore, the topic of the proposed publication is relevant, in which optimization models are created for the rational choice of transportation routes under martial law conditions. The purpose of the research is to create models for applied information technology research of logistics processes of transporting goods and people during the period of the country's martial law. Tasks that are solved in the work:

- creation of optimization models for planning transportation of WME to the front line,
- creation of optimization models for planning the evacuation of the population to the rear.

2. Methods

Research methods are based on optimization and simulation models, which allow planning and choosing rational ways of transporting goods and people in the conditions of martial law. Used mathematical methods and models: system analysis, methods of transport logistics, integer (Boolean) optimization, multi-criteria optimization, methods of expert evaluation. The subject of research is the models, methods and applied information technology of virtual distributed control of carriage transportation in conditions of threats.

3. Results

3.1. Optimization model for planning transportation of weapons and military equipment to the front line

One of the urgent tasks, which is related to the implementation of effective operational and tactical actions on the battlefield, is the formation of the necessary reserves of weapons and military equipment (WME) for the front line. The front line includes actual military local zones (MLZ) in which active combat operations are conducted. It is necessary to form the necessary stocks of anti-terrorist weapons in the MLZ for conducting successful operational and tactical actions. Therefore, the task of finding relatively safe ways of supplying WME to the frontline in conditions of military threats is urgent. To solve the given problem, we will use the integer (Boolean) programming method. Let's enter a variable x_{ijk} :

$$x_{ijk} = \begin{cases} 1, & \text{if the } j\text{-th way of supplying WME to } i\text{-th MLZ with } k\text{-th warehouse} \\ & \text{of logistics components (transshipment, storage, distribution,} \\ & \text{temporary stop, etc);} \\ 0, & \text{otherwise.} \end{cases} \quad (1)$$

At the same time, it is necessary to: $\sum_{j=1}^{n_i} \sum_{k=1}^{m_j} x_{ijk} = 1$, which means the mandatory choice of a specific way of supplying WME to i -th MLZ from k -th composition of logistics components, where N is the number of MLZ on the front line; m_j is the number of possible warehouses of logistics components per j -th way of supply; n_i is the number of possible ways of supplying military goods to i -th MLZ.

Let's introduce the main logistics indicators for evaluating and choosing a possible option for transporting MLZ to the front line:

1. R are the risks of supplying MLZ to the frontline, in conditions of military threats.
2. T is the time required for the supply of MLZ to the front line.
3. W are the stockpiles of weapons, which are formed on the front lines to fulfill the actual operational and tactical tasks of the military leadership.

Let's present the indicators R , T , W taking into account the variables x_{ijk} :

$$R = \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} r_{ijk} x_{ijk} , \quad (2)$$

where r_{ijk} is the risk of delivering military cargo to i -th MLZ on j -th way of supply from k -th composition of logistics components.

$$T = \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} t_{ijk} x_{ijk}, \quad (3)$$

where t_{ijk} is the time required for the transportation of military cargo to i -th MLZ for j -th way with k -th possible composition of logistics components.

$$W = \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} w_{ijk} x_{ijk}, \quad (4)$$

where w_{ijk} is the number of batches of WME that can be moved by j -th possible way of delivery from k -th composition of logistics components to i -th MLZ.

We will create optimization models for solving the task of forming WME stocks on the front line for effective combat operations on the battlefield.

1. Minimization of the risks of the formation of WME stocks in the conditions of the actions of military threats:

$$\min R, \quad R = \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} r_{ijk} x_{ijk}, \quad (5)$$

while fulfilling the restrictions:

$$T \leq T^*, \quad T = \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} t_{ijk} x_{ijk}, \quad (6)$$

where T^* is the permissible (planned) time of delivery of WME to the front line.

$$W \geq W^*, \quad W = \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} w_{ijk} x_{ijk}, \quad (7)$$

where W^* is a stockpile of anti-aircraft weapons, which must be formed to fulfill the actual operational and tactical tasks of the military leadership.

2. Maximization of WME stocks on the front line for successful combat operations:

$$\max W, \quad W = \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} w_{ijk} x_{ijk}, \quad (8)$$

while fulfilling the restrictions:

$$R \leq R^*, \quad R = \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} r_{ijk} x_{ijk}, \quad (9)$$

where R^* is the acceptable risk of the supply of WME in the conditions of the actions of military threats.

$$T \leq T^*, \quad T = \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} t_{ijk} x_{ijk}. \quad (10)$$

It is possible to formulate a multi-criteria optimization problem using indicators R , T , W .

In this case, it is necessary to form a complex indicator:

$$K = \alpha_R \overset{\vee}{R} + \alpha_T \overset{\vee}{T} + \alpha_W \overset{\vee}{W}, \quad (11)$$

where α_R , α_T , α_W , are the "weights" of indicators R , T , W , $\alpha_R + \alpha_T + \alpha_W = 1$.

$\overset{\vee}{R}$ is a normalized indicator R :

$$\overset{\vee}{R} = \alpha_R \frac{R - R_{\min}}{R^* - R_{\min}}, \quad (12)$$

where $R_{\min}$ is the minimum value of the indicator R after its optimization.

$\overset{\vee}{T}$ is the standardized indicator of delivery time:

$$\overset{\vee}{T} = \alpha_T \frac{T - T_{\min}}{T^* - T_{\min}}, \quad (13)$$

where $T_{\min}$ is the minimum time value T after its optimization.

$\overset{\vee}{W}$ is a normalized indicator W :

$$\overset{\vee}{W} = \alpha_W \frac{W_{\max} - W}{W_{\max} - W^*}, \quad (14)$$

where $W_{\max}$ is the maximum value of the WME stock after its optimization.

It is necessary to find:

$$\begin{aligned} \min K &= \alpha_R \overset{\vee}{R} + \alpha_T \overset{\vee}{T} + \alpha_W \overset{\vee}{W} = \alpha_R \frac{R - R_{\min}}{R^* - R_{\min}} + \alpha_T \frac{T - T_{\min}}{T^* - T_{\min}} + \alpha_W \frac{W_{\max} - W}{W_{\max} - W^*} = \\ &= \frac{\alpha_R}{R^* - R_{\min}} \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} r_{ijk} x_{ijk} + \frac{\alpha_T}{T^* - T_{\min}} \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} t_{ijk} x_{ijk} - \frac{\alpha_W}{W_{\max} - W^*} \sum_{i=1}^N \sum_{j=1}^{n_i} \sum_{k=1}^{m_j} w_{ijk} x_{ijk} - \\ &- \frac{\alpha_R R_{\min}}{R^* - R_{\min}} - \frac{\alpha_T T_{\min}}{T^* - T_{\min}} + \frac{\alpha_W W_{\max}}{W_{\max} - W^*}. \end{aligned} \quad (15)$$

3.2. Optimization models for planning evacuation transportation to the rear

The modern war led to the evacuation of the population from the front-line zone to the rear. Migration processes have arisen, for which it is necessary to create logistical evacuation chains. Therefore, the study of evacuation flows is relevant to assess the ability of the transport network to carry out the planned transportation of people to temporary places of residence (TMR). While planning evacuation processes, it is necessary to form a set of places (M), which are capable of receiving the population, with their capabilities to meet social needs. Then, it is necessary to form ways of transporting people, in conditions of risks (R) military threats, estimate the cost (W) and plan time (T) evacuation. Let's create an optimization model,

which can be used to determine rational ways of evacuating the population (F) from the front-line zone to possible places of temporary residence in the conditions of the country's martial law. Let's enter an integer (Boolean) variable x_{plk} :

$$x_{plk} = \begin{cases} 1, & \text{if the transportation of people to the } p\text{-th place of residence will be carried out} \\ & \text{using the } l\text{-th transportation route with the } k\text{-th warehouse of logistics} \\ & \text{components (temporary stop, transition from one route to another, distribution of} \\ & \text{evacuation flows, etc.);} \\ 0, & \text{otherwise.} \end{cases} \quad (16)$$

As the main logistical indicators of the evacuation process, we will consider:

1. The time required to evacuate people (T).
2. The cost of the population evacuation process (W).
3. Risks of military threats (R).
4. Number of population to be evacuated (F).

Taking into account the variables x_{plk} , the logistic indicators of population evacuation are as follows:

$$T = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} t_{plk} x_{plk}, \quad (17)$$

where:

m_p is the number of possible ways to evacuate the population to p -th place TMR;

n_l is the number of possible warehouses of logistics components for their use on l -th way of transportation;

t_{plk} is the time required to move people to p -th place of the TMR taking into account l -th selected evacuation route and k -th composition of logistics components.

$$W = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} w_{plk} x_{plk}, \quad (18)$$

where w_{plk} is the cost of transporting people to p -th possible place of TMR, taking into account the chosen one l -th way of transportation and k -th composition of logistics components.

$$R = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} r_{plk} x_{plk}, \quad (19)$$

where r_{plk} is the risk of transporting people, in conditions of military threats, in p -th possible place of TMR taking into account the chosen one l -th way of transportation and k -th composition of logistics components.

$$F = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} f_{plk} x_{plk}, \quad (20)$$

where f_{plk} is the number of the population that will be directed to p -th place of the TMR taking into account the chosen one l -th way of transportation and k -th composition of logistics components.

The following formulations of the optimization problem are possible, which are related to the evacuation of the population to the rear:

1. Minimize the time required to evacuate the population:

$$\min T, \quad T = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} t_{plk} x_{plk}, \quad (21)$$

taking into account the limitations:

$$W \leq W^*, \quad W = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} w_{plk} x_{plk}, \quad (22)$$

$$R \leq R^*, \quad R = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} r_{plk} x_{plk}, \quad (23)$$

$$F \geq F^*, \quad F = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} f_{plk} x_{plk}, \quad (24)$$

where:

W^* is the planned cost of the population evacuation process;

R^* is the permissible risk of the evacuation process, which is associated with possible actions of military threats;

F^* is the planned number of the population that will be evacuated from the front-line zone to the rear.

2. To maximize the number of the population that will be evacuated from the front-line zone to the rear:

$$\max F, \quad F = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} f_{plk} x_{plk}, \quad (25)$$

taking into account the limitations:

$$T \leq T^*, \quad T = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} t_{plk} x_{plk}, \quad (26)$$

$$W \leq W^*, \quad W = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} w_{plk} x_{plk}, \quad (27)$$

$$R \leq R^*, \quad R = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} r_{plk} x_{plk}, \quad (28)$$

where T^* is the planned time for population evacuation.

3. Minimize the risks of population evacuation:

$$\min R, \quad R = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} r_{plk} x_{plk}, \quad (29)$$

taking into account the limitations:

$$T \leq T^*, \quad T = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} t_{plk} x_{plk}, \quad (30)$$

$$W \leq W^*, \quad W = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} w_{plk} x_{plk}, \quad (31)$$

$$F \geq F^*, \quad F = \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} f_{plk} x_{plk}. \quad (32)$$

A multi-criteria formulation of the population evacuation optimization problem is possible. To do this, we will introduce a complex criterion in the form of an additive composition of logistic indicators T, W, R, F :

$$Q = \alpha_T \overset{\vee}{T} + \alpha_W \overset{\vee}{W} + \alpha_R \overset{\vee}{R} + \alpha_F \overset{\vee}{F}, \quad (33)$$

where $\alpha_T, \alpha_W, \alpha_R, \alpha_F$ are the "weights" of indicators T, W, R, F , $\alpha_T + \alpha_W + \alpha_R + \alpha_F = 1$; $\overset{\vee}{T}$,

$\overset{\vee}{W}, \overset{\vee}{R}, \overset{\vee}{F}$ are the normalized values of indicators T, W, R, F :

$$\overset{\vee}{T} = \frac{T - T_{\min}}{T^* - T_{\min}}, \quad (34)$$

$$\overset{\vee}{W} = \frac{W - W_{\min}}{W^* - W_{\min}}, \quad (35)$$

$$\overset{\vee}{R} = \frac{R - R_{\min}}{R^* - R_{\min}}, \quad (36)$$

$$\overset{\vee}{F} = \frac{F_{\max} - F}{F_{\max} - F^*}. \quad (37)$$

It is necessary to minimize the complex criterion Q :

$$\begin{aligned} \min Q, \quad Q = & \alpha_T \overset{\vee}{T} + \alpha_W \overset{\vee}{W} + \alpha_R \overset{\vee}{R} + \alpha_F \overset{\vee}{F} = \frac{\alpha_T}{T^* - T_{\min}} \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} t_{plk} x_{plk} + \\ & + \frac{\alpha_W}{W^* - W_{\min}} \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} w_{plk} x_{plk} + \frac{\alpha_R}{R^* - R_{\min}} \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} r_{plk} x_{plk} - \frac{\alpha_F}{F_{\max} - F^*} \sum_{p=1}^M \sum_{l=1}^{m_p} \sum_{k=1}^{n_l} f_{plk} x_{plk} - \\ & - \frac{\alpha_T T_{\min}}{T^* - T_{\min}} - \frac{\alpha_W W_{\min}}{W^* - W_{\min}} - \frac{\alpha_R R_{\min}}{R^* - R_{\min}} + \frac{\alpha_F F_{\max}}{F_{\max} - F^*}, \end{aligned} \quad (38)$$

where $T_{\min}$, $W_{\min}$, $R_{\min}$, $F_{\max}$ are the extreme values of indicators after their optimization.

3.3. Optimization models for taking preventive measures against the influence of military threats during the transportation of goods and people

The outdated transport infrastructure has a large number of vulnerabilities that affect the disruption of the transportation of goods and people, especially during the period of martial law, under the conditions of military threats.

The following main existing vulnerabilities can be identified:

- physical and moral aging of components of the transport network (bridges, intersections, viaducts, highways, etc.),
- bottlenecks that lead to the accumulation of goods and people (transport queues, temporary stops, redistribution according to transportation directions, etc.),
- places where climatic phenomena occur more often (flooding, mud avalanches, soil disturbances, etc.).

During the period of martial law, the country may become vulnerable due to possible actions of military threats (arrivals of missiles, drone attacks, bombings, etc.), which leads to disruptions in transportation, occurrence of emergency situations, disasters with loss of life.

Therefore, the topic of the proposed research is relevant, in which the influence of military threats on the vulnerability of the transport infrastructure, which is used for transportation to the front and to the rear in the period of the country's martial law, is simulated.

The purpose of the research is to create models for assessing the impact of military threats on the vulnerability of transport infrastructure (TI), for the formation of preventive actions aimed at reducing the risks of the impact of threats on planned transportation both to the front and to the rear.

To research the influence of military threats on IT, we will form a chain of sequence of actions in the form of: modeling the emergence of a military threat $\rightarrow$ excitation of possible vulnerabilities $\rightarrow$ modeling of the scale of TI violations in the form of damages (material and human) $\rightarrow$ formation of a set of preventive actions to reduce or neutralize the effects of military threats.

A set of preventive actions (M) depends on: the scale of violations; losses (P), which arise; from military threats (V); set of vulnerabilities that are excited (W). To assess the effect of military threats, we will form a set of indicators:

1. The risks of military threats – R .
2. Expenses for the elimination of possible losses from the action of military threats – Z .
3. The time required to carry out preventive measures to minimize or neutralize the actions of military threats – T .

We will use integer (Boolean) programming to simulate the impact of military threats on IT. Let's enter a Boolean variable x_{epk} :

$$x_{epk} = \begin{cases} 1, & \text{if the occurrence of the } e\text{-th threat triggers the } p\text{-th set of TI vulnerabilities,} \\ & \text{for which it is necessary to form the } k\text{-th set of preventive actions;} \\ 0, & \text{otherwise.} \end{cases} \quad (39)$$

Then, taking into account the variables x_{epk} indicators R, Z, T have the form:

$$R = \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} r_{epk} x_{epk}, \quad (40)$$

where:

V is the number of possible threats;

r_{epk} is the risk of e -th military threat, which excites p -th composition of vulnerabilities that lead to use k -th composition of necessary preventive actions;

n_p is a set of preventive actions for neutralization p -th composition of vulnerabilities;

m_e is a set of possible compositions of vulnerabilities that can be excited upon occurrence threats.

$$Z = \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} z_{epk} x_{epk}, \quad (41)$$

where z_{epk} are the costs of carrying out k -th component of preventive actions to eliminate possible damages that occur during excitation p -th composition of vulnerabilities from the action of e -th threats.

$$T = \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} t_{epk} x_{epk}, \quad (42)$$

where t_{epk} is the time required for implementation k -th composition of preventive measures necessary to eliminate possible damages that occur during excitation p -th composition of e -th threats.

In the conditions of the state of war in the country, it is extremely necessary to minimize the time (T) to carry out preventive actions regarding the possible influence of military threats on transportation both to the front and to the rear. Therefore, it is necessary:

$$\min T, T = \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} t_{epk} x_{epk}, \quad (43)$$

taking into account the limitations:

$$Z \leq Z^*, Z = \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} t_{epk} x_{epk}. \quad (44)$$

Acceptable risks to prevent military threats:

$$R \geq R^*, R = \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} t_{epk} x_{epk}, \quad (45)$$

where R^* is the assessment by experts of risks for the emergence of military threats to IT.

In conditions of limited capabilities of the country, it is necessary to minimize costs Z to carry out preventive measures against possible actions of military threats.

In this case, it is necessary:

$$\min Z, Z = \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} z_{epk} x_{epk}, \quad (46)$$

taking into account the limitations:

$$T \leq T^*, T = \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} t_{epk} x_{epk}, \quad (47)$$

where T^* is the planned time of the risks of preventing military threats for the implementation of preventive measures against the possible impact of military threats.

$$R \geq R^*, R = \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} t_{epk} x_{epk}. \quad (48)$$

A multi-criteria formulation of the task of planning preventive actions to the influence of possible military threats is possible.

Let's introduce a complex indicator Q :

$$Q = \alpha_R \cdot \check{R} + \alpha_Z \cdot \check{Z} + \alpha_T \cdot \check{T}, \quad (49)$$

where $\alpha_R, \alpha_Z, \alpha_T$ are the "weights" of indicators R, Z, T ; $\check{R}, \check{Z}, \check{T}$ are the values of indicators R, Z, T :

$$\check{R} = \frac{R - R^*}{R_{\max} - R^*}, \quad (50)$$

where $R_{\max}$ is the experts' pessimistic assessment of the risk of military threats affecting IT.

$$\check{Z} = \frac{Z - Z_{\min}}{Z^* - Z_{\min}}, \quad (51)$$

$$\check{T} = \frac{T - T_{\min}}{T^* - T_{\min}}. \quad (52)$$

It is necessary to minimize the complex indicator (Q) to find a compromise solution among indicators R, Z, T :

$$\begin{aligned} \min Q, Q = & \alpha_R \cdot \check{R} + \alpha_z \cdot \check{Z} + \alpha_T \cdot \check{T} = \frac{\alpha_R}{R_{\max} - R^*} \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} r_{epk} x_{epk} + \\ & + \frac{\alpha_z}{Z^* - Z_{\min}} \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} t_{epk} x_{epk} + \frac{\alpha_T}{T^* - T_{\min}} \sum_{e=1}^v \sum_{p=1}^{m_e} \sum_{k=1}^{n_p} t_{epk} x_{epk} - \frac{\alpha_R \cdot R^*}{R_{\max} - R^*} - \frac{\alpha_z \cdot Z_{\min}}{Z^* - Z_{\min}} - \\ & - \frac{\alpha_T \cdot T_{\min}}{T^* - T_{\min}}. \end{aligned} \quad (53)$$

4. Summary

In the work, a research of the logistics processes of transportation during the period of the country's martial law was carried out. Current areas of research related to the transportation of military cargo to the front line, as well as the evacuation of the population from the front-line zone to the rear, are separated. The main logistic indicators that must be used to evaluate transportation processes under the conditions of military threats have been formed (transportation time, transportation risks, transportation cost, the number of the population being evacuated). Optimization models have been created for choosing rational routes of transportation to the front line and to the rear. Local optimization of logistics indicators was carried out, taking into account limitations on the permissible time and risk of transportation. Multi-criteria models were created for finding compromise solutions for transportation logistics.

Used mathematical methods and models: system analysis, methods of transport logistics, integer (Boolean) optimization, multi-criteria optimization, methods of expert evaluation.

The scientific novelty of the research is related to the creation of a complex of original optimization models, which can be used to analyze and plan the logistics of transporting weapons and military equipment to the front and evacuating the population to the rear.

The proposed approach is the basis for the creation of applied information technology for the planning of transportation logistics both to the front and to the rear, taking into account possible military threats, during the period of the country's martial law.

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TECHNOLOGY AND GEOPOLITICS. ARTIFICIAL INTELLIGENCE IN GEOSTRATEGIC SECURITY PLANNING

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Purpose: Artificial intelligence is becoming an essential tool in the functioning of the economy, finance, and security management. In today's theater of war, technological superiority is the most crucial factor, while human masses are relegated to the background. Today, the arms race encompasses not only combat assets on the battlefield but also IT centers, where artificial intelligence is beginning to dominate. It is present both in the strategic planning stages and in the execution of tasks, both political and military.

Design/methodology/approach: Conducting a bibliometric review of online resources, including both scientific publications and journalistic articles on the phenomena analyzed in the article. Due to the specific nature of the phenomenon being analyzed, the bibliography is based on the most recent publications.

Research limitation/implications: This analysis contributes to broader research that appears essential to understanding the technological processes and related geopolitical, geostrategic, and geoeconomic implications currently underway worldwide. This article serves as an introduction to further analyses that appear essential to properly assessing the use of artificial intelligence in global security policy planning and implementation.

Practical implications: Artificial intelligence is becoming one of many tools used in geostrategic management. The experiences of countries supporting defense policy with AI-based analyses should be thoroughly analyzed in other countries, including Poland.

Social implications: Artificial intelligence will be, or rather, already is, a revolution in the planning and execution of tasks related to defense, strategy, security, and geopolitics. Like previous new technologies, it will lead, at least temporarily, to technological unemployment. Many defense and security professions will not withstand competition from AI. Observing these processes in the most technologically advanced countries can help us avoid the pitfalls inherent in the mass use of this new technology.

Originality/value: Drawing on a wealth of sources, this article explores a phenomenon that has been widely studied worldwide. The experiences of global powers, in particular, appear to be pioneering and original in their methods of implementing new technologies in managing geopolitical strategy.

Keywords: Artificial intelligence, technology, geopolitics, geostrategy, security.

Category of the paper: Literature review.

1. Introduction

The swiftly evolving domain of artificial intelligence (AI) is observed not merely as a technological event but as a significant impetus for change within the realms of global geopolitics and security strategies. As AI's influence becomes pervasive throughout every aspect of international relations, ranging from adjustments in military strengths to the revision of economic influence, the heightened significance of the situation is brought to light. The manner in which AI is utilized, governed, and contested by nations will significantly influence the geopolitical structure of the ensuing decades, notably among major global powers such as the United States, China, and the European Union (EU). An examination into the vital connection between technology and geopolitics is offered by this paper, delivering an analysis regarding the ways in which geostrategic security planning is being transformed by AI and the resulting effects on global power dynamics.

Central to this paper is its concentration on the convergence of AI and geostrategy, a subject of escalating importance as dominant powers contend for supremacy within this groundbreaking arena. The pursuit of power, resources, and influence has historically fueled geopolitics, with AI incorporating novel aspects into these time-honored dynamics. AI, in contrast to earlier technological advancements, is not restricted to one sector or use; its capabilities encompass military defense, economic systems, information warfare, and societal governance. For example, the United States and China, frequently cited as AI superpowers, have strategically incorporated AI into their national agendas, utilizing it to bolster both hard power, as seen in autonomous weapon systems, and soft power, which includes technological supremacy and global impact. Simultaneously, Europe, notwithstanding its relative deficit in AI innovation, has arisen as a regulatory authority, endeavoring to reconcile technological progress with ethical oversight. Pressing inquiries are prompted by these developments regarding the equilibrium of power within a multipolar environment and the function of AI in reshaping alliances, conflicts, and sovereignty.

An investigation is guided by the research question: In what ways is artificial intelligence reshaping geostrategic security planning, and what consequences are emerging for the dynamics of global power among major nations? A deeper comprehension of the ways in which AI is not only altering the instruments and methods of statecraft but also redefining fundamental tenets of international relations is aimed for through the exploration of this question. The objectives encompass an analysis of AI's contribution to military innovation, an exploration into the manner in which nations are assimilating AI into their geopolitical strategies, and an evaluation of the risks and prospects presented by AI within the framework of global governance. A comprehensive analysis that underscores not only the competitive facets of AI but also takes into account the potential for collaboration and the advancement of shared governance structures is intended to be provided.

A multifaceted strategy, drawing from a base of literature analysis and critical assessment, establishes the groundwork for this inquiry. A variety of sources, spanning from scholarly publications to policy documents and industry reports, are encompassed within this strategy. The methodologies employed involve comparative analysis—centering on the AI strategies of the United States, China, and the EU—along with scenario analysis, which is designed to forecast possible future paths of AI-driven geopolitics. Furthermore, the study integrates historical analysis, drawing parallels between the present AI competition and past technological rivalries, such as the space race. Particular emphasis is allocated to the ethical, regulatory, and societal facets of AI integration, reflecting upon the wider ramifications for stability and human rights.

Both prospects and obstacles connected to this transformative technology are brought to light by current research on AI and geopolitics. AI's capacity in enhancing military proficiencies, such as self-governing weaponry or surveillance technologies, has been addressed through studies, and national aspirations—China's objective to spearhead AI by 2030, the US's continuous investments in progressive research, and the EU's regulatory endeavors highlighted by the 2024 AI Act—have been documented. However, gaps remain regarding the broader geopolitical consequences, specifically concerning imbalances in power, global governance, and the opportunities for international collaboration. The aim of this paper is to bridge these gaps through the synthesis of existing research and the provision of novel perspectives into the strategic dimensions of AI.

A comprehensive and systematic investigation of the topic is ensured by the structure of this paper. An examination of the global AI competition landscape, with specific emphasis on the strategic competition between the United States, China, and the EU, in addition to the dynamics of technological supremacy and the interplay between private and public sector initiatives, is undertaken in Chapter 2. An analysis of the military and security ramifications of AI, with a focus on defense system integration and information warfare capabilities, is presented in Chapter 3. The synthesis of the results and reflection upon the consequences for power dynamics and prospective routes for subsequent research are concluded in Chapter 4.

2. Methods

This article uses a research method called a literature review to gather, analyze, and synthesize relevant information from a wide range of sources. A literature review is a comprehensive research method. A well-conducted literature review allows for an understanding of the current state of knowledge in a given field and provides reliable answers to research questions (Snyder, 2019). It is an excellent method for analyzing interdisciplinary research. It also allows for the synthesis of research findings and the discovery of areas

requiring further research. The literature review was conducted using Google Scholar and Science Direct. Analyses from recognized geostrategic centers worldwide were also consulted. Additionally, publicly available journalistic sources were used, available on the websites of specialized media outlets covering technology, security, and artificial intelligence. Databases were searched using the following keywords: human resources, artificial intelligence, management, and new technologies. The arguments presented in this article also utilize the logical analysis method. The essence of this method is to use logical tools to distinguish valid reasoning, i.e., reasoning that conforms to the laws of logic, from reasoning that violates them. Logic and its methods allow us to discover the most general structural aspects of our thinking and actions (Peregrin, Svoboda, 2017). Applying the tools of logical analysis to sentences expressed in natural language is justified by the fact that the rules of this language are also subject to the laws of logic.

3. Global AI Competition Landscape

The growing race for AI dominance is changing world power with key actors using competition and technology leadership to reshape the globe. The varying AI regulations and strategies among different nations are impacting the worldwide balance of power, and technological leadership is becoming a significant factor affecting countries' future economic and political positions.

The strategic competition surrounding artificial intelligence (AI) illustrates divergent national interests between the main actors of the global system. While the United States and China are the technological leaders, Europe seeks to dominate AI's regulation. In all cases, the main powers have been making significant investments in AI infrastructure, human capital, and research, seeking to stay at the top of the global race. For instance, the \$2.12 billion artificial intelligence park inaugurated in China exemplifies the country's goal to lead the global AI sector (Horowitz et al., 2018; Vyas, 2025; Marr, 2024; Kalkan Küçüksolak, Fırat, 2023). In the United States, hyperscale cloud providers constitute an advantage to innovate at high speeds, allowing the country to commercialize AI solutions in different sectors (Vyas, 2025). Europe does not have the infrastructure and technological supremacy of its competitors and is thus attempting to be at the forefront of regulation, with the EU AI Act scheduled for 2024 (Gajewski, 2023). Thus, AI is redefining the geopolitical arena with nations embracing the technology to pursue their own strategic interests. This is because AI is becoming integrated into national strategies, influencing military strategies and economic competition and driving geopolitical trends (Mokry, Gurol, 2024).

The United States has been strengthening its private AI sector with a dynamic research and innovation ecosystem (Vyas, 2025). This allows for a fast-moving commercialization of AI systems, with strong participation of the private sector and the use of hyperscale cloud providers. In addition, this ecosystem allows the United States to lead the way in military AI, with the incorporation of AI in the Third Offset Strategy, aimed at keeping the country at the top of the global order, preventing the rise of other nations (Bächle, Bareis, 2022; Vijaya, 2024). While market-driven solutions give a competitive advantage, their effectiveness may be limited by the alignment of company interests with the public interest, ethics, and safety. In addition, concerns have arisen regarding the weakening of operator control over autonomous weapons systems (AWS) in United States policy, which shows the complexities of implementing AI systems into military strategies (Bächle, Bareis, 2022).

China has adopted a state-led industrial policy that aims at becoming the most technologically advanced nation in AI. Investments in China's state-led approach to becoming the most technologically advanced nation have been extensive, in supercomputers and massive projects such as the \$2.12 billion AI park, with state direction being a key to achieving strategic goals (Horowitz et al., 2018; Kalkan Küçüksolak, Fırat, 2023). China aims at being one of the leading countries in areas such as UAV and image/voice recognition by 2025 (Kalkan Küçüksolak, Fırat, 2023). The Chinese AI industry rose by 20.7 percent in 2020, to a total value of \$43.4 billion, because the state-led approach enables strategic growth (Kalkan Küçüksolak, Fırat, 2023). This method, however, poses risks to the competitiveness of the private sector and also causes ethical concerns related to China's surveillance state. This state control also poses a challenge to the EU, which aims to promote ethical principles in its own regulatory environment (Mokry, Gurol, 2024; Kalkan Küçüksolak, Fırat, 2023). For the Chinese government, AI is an important asset in achieving strategic dominance. Thus, its policies reflect China's will to use AI in the development and strengthening of its geopolitical and economic objectives (Bächle, Bareis, 2022; Kalkan Küçüksolak, Fırat, 2023).

For Europe, competition and collaboration on AI are related to a struggle over how to globally regulate the technology. Europe lags behind in industry and technology but can be a leader in global regulation (Gajewski, 2023). It is trying to control the regulation of AI with the adoption of the EU AI Act in 2024, exporting an ethical way to govern the technology (Gajewski, 2023; Garrido Rebolledo, 2025). Although AI regulatory leadership does not automatically lead to technological superiority, it can bring influence beyond a nation's AI industry (Garrido Rebolledo, 2025). As the EU has no control over the suppliers of critical resources such as rare earth minerals, it has only been able to supply one percent of its demand of lithium for batteries (Gajewski, 2023). The EU is thus attempting to export ethical regulation globally, but it also contributes to the rise of digital fragmentation (Mokry, Gurol, 2024). China's digital sovereignty goals and the United States' promotion of an open system are competing with the EU's risk-based approach to AI regulation, causing increased divergences (Mokry, Gurol, 2024; Garrido Rebolledo, 2025).

Competition for talent in the field of AI is global and fierce. AI Ph.Ds. hired straight out of university can expect to be compensated for anywhere between \$300,000 and \$500,000 per year. This global race has driven up wages significantly but may also exclude small companies. For example, the European Union has fewer high-end specialists than the United States (Horowitz et al., 2018). This raises ethical issues for EU countries as top talent can be attracted to China and the United States for more lucrative career options (Horowitz et al., 2018).

The rise of AI is being influenced by infrastructure investments, state policy, talent competition, and technology regulation. The US advocates for open technology markets and multilateral technology collaboration (Mokry, Gurol, 2024). China favors technology sovereignty and control (Mokry, Gurol, 2024), and Europe endorses the ethical regulation of technology and data privacy (Mokry, Gurol, 2024). Divergent approaches to managing technology could increase digital fragmentation, potentially leading to geopolitical competition and rivalry for technology sovereignty and control (Garrido Rebolledo, 2025). Technology regulation becomes a crucial factor of global power, with the risk of nations engaging in technology regulation wars to control the global order (Mokry, Gurol, 2024; Gajewski, 2023).

AI is evolving into a tool to project global power and influence. For example, the development of AI in China contributes to the country's geopolitical goals. In the areas of UAVs and speech recognition, China aims to become a globally dominant country by 2025 (Kalkan Küçüksolak, Fırat, 2023). China can strengthen its global military power through artificial intelligence, but it might increase China's internal and external challenges through surveillance states and by the use of this new form of power in asymmetric wars, possibly creating resistance by smaller countries (Bächle, Bareis, 2022). In addition, the United States is looking at AI as a source of strategic and economic strength, which may also increase its potential for national and corporate security by using its innovation and strength in the areas of algorithms and hyperscale cloud providers to compete in the military AI markets.

Both the United States and China aim to achieve AI weapon supremacy (Bächle, Bareis, 2022). Because there are no universal standards to describe autonomous functions or how to ethically employ them in armed conflicts, it is extremely challenging to develop common approaches and arms controls (Mokry, Gurol, 2024). Nations are trying to implement their own methods to compete in military AI technology, which increases risk for arms races, strategic instability, and human oversight of conflicts, while simultaneously decreasing the likelihood of cooperation (Mokry, Gurol, 2024). Military AI breakthroughs such as AlphaGo (a program that beat Go champion Lee Sedol in March 2016) are not only considered advancements of technology but also serve as national power displays. AlphaGo's victory in Go became extremely popular in China and was a sign that their ambition to become the global leader in AI was attainable (Bächle, Bareis, 2022).

The competition around AI promises significant economic consequences. In 2030, AI is forecast to add \$15.7 trillion to the global GDP (Garrido Rebolledo, 2025). China's economic growth is accelerating with massive investments in supercomputers and by gaining

greater access to the raw materials required for AI development (Kalkan Küçüksolak, Fırat, 2023). The ability of the United States to produce technology on an AI platform may give it an edge (Vyas, 2025; Marr, 2024). However, United States dominance in technology innovation may be harmed if it is excluded from the critical supply chain, because foreign nations control supplies of rare materials, in particular semiconductor raw materials. China may surpass United States AI power because of China's rare earth material availability, strong public research, technology clusters, government support for AI, and the world's largest databases and data market (Kalkan Küçüksolak, Fırat, 2023). China is making progress in establishing its own chip manufacturing supply chain to address the dependence on foreign semiconductors that might hurt its technology plans due to US and EU embargoes. However, China still depends on Taiwan for high-end AI chips, so any Chinese-Taiwan conflict could hurt its future in technology power (Kalkan Küçüksolak, Fırat, 2023). Europe's AI technological dependence may prevent the EU from being as innovative as desired because EU member states depend on imported sources (Gajewski, 2023). Thus, these countries must build capabilities to produce more of their own essential raw materials and components (Gajewski, 2023).

Defense organizations, intelligence agencies, and military think tanks increasingly use strategic foresight, scenario planning, and data-driven, predictive analytics to identify and preemptively respond to threats, with a wide range of possible uses for military and security applications (Wilner, Atkinson, 2025; Marr, 2024). Because technology changes and upgrades are continuously emerging, governments must always be ready to adapt in the defense industry by using legislative measures and international cooperation.

In the last 70 years, war and security have gradually become less visible and more dispersed (Wilner, Atkinson, 2025). AI, with the potential to address new risks such as deepfakes, digital espionage, algorithm manipulation, and cyberattacks, offers capabilities to both enhance security and to increase risk and instability (Wilner, Atkinson, 2025; Marr, 2024). While China may be able to surpass United States AI capabilities, these advances increase the potential for tension because AI helps strengthen national defense plans.

The competition for AI technology leadership between the US, China, and the EU is characterized by different but overlapping strategies that increasingly define the global digital landscape. In 2023, the United States poured €62.5 billion into the AI sector, and this significant investment, combined with its sophisticated innovation ecosystem (Tréhu, Ricart, 2024), strong federal R&D, powerful academic institutions, and private engagement, makes it one of the front runners in the AI race. In addition, the ability to rapidly commercialize new technologies and easily apply them for military use makes the United States unique. However, this strategy comes at a cost of heightened innovation-related moral risk, and this AI-driven dominance raises strategic questions with regard to U.S. ability to set global norms and manage increasing geopolitical risks. Moreover, AI applications are now becoming embedded into defense systems through the Third Offset Strategy, increasing military reliance on emerging technology for dominance in the technological and global order (Bächle, Bareis, 2022, Proroković et al., 2025).

China has also taken a different strategy, relying on state-led industrial policy, investments, and a home-grown advantage: access to domestic data from its over 900 million internet users (Rauf, Iqbal, 2023; Olotu, Famiyesin, 2024). China also has set milestones with plans to become a \$150 billion AI industry leader by 2030 and aims to reshape global governance structures, but also faces high levels of innovation risk related to transparency and ethics. With a centralized form of government that is committed to long-term innovation, China also faces a high level of implementation risk for a low-level degree of policy cohesion related to AI. China is making strategic investments and has made significant strides in the fields of surveillance technology, AI-controlled autonomous systems, and economic AI applications and is determined to pose a challenge to the leading countries in the global power structure. The geopolitics of Chinese technological dominance are further compounded by its use of AI to enhance military systems and modernize, which represents its quest to change global power asymmetries (Bächle, Bareis, 2022, Proroković et al., 2025). By becoming a competitor, China is demonstrating the importance of consolidating dominance of economic, diplomatic, and technology domains.

On the other hand, the EU has emphasized regulating rather than rushing to implement AI. This governance-first approach aims to establish horizontal regulations and standards for AI and its applications, exemplified by the AI Act being slated for implementation in 2024 across the EU member states. These horizontal rules could shape global norms and allow Europe to be the global normative leader for artificial intelligence technology (Tréhu, Ricart, 2024). However, this approach can lead to increased technological dependencies and fragmentation. Europe's regulatory focus on risk assessment is designed to curb innovation to alleviate risk but may impede technological growth to a degree, and reliance on foreign suppliers for strategic inputs in AI infrastructure—such as semiconductors, chipsets, and lithium batteries used in AI-enabled cars and devices—is becoming a significant vulnerability. EU policymakers aim to address the complexities of ethical challenges, moral standards, and protection of fundamental rights, as well as manage the societal risks posed by rapid advancements and increasing data usage (Pernot-Leplay, Pradhan, 2024).

The three models create policy incoherence as each tries to create the worldwide norm (Pradhan, 2024). However, each strives to maintain their own sovereign power, in part by ensuring technological advancements are not at odds with cultural beliefs. All of this causes policy incoherence that may impact multinational corporations and organizations that work globally and must comply with differing sets of regulations. As each nation struggles to stay competitive in the race to AI dominance, it leads to a discussion of whether different geopolitical blocs use AI to reconfigure global power. Are there competitive technology ecosystems that risk dividing nations and creating a global divide and growing inequality? These are strategic questions requiring increased public debate (Pradhan, 2024).

China has set milestones in terms of market share with its aims to have \$60.3 billion in core AI industries by 2025 (Olotu, Famiyesin, 2024). As such, China has established a series of industrial clusters that benefit its champion technology and innovation companies. Policy leadership and strategic implementation of state resources in order to consolidate its position of power is evident by the fact that 90 percent of companies say they depend on government infrastructure for cloud computing and technology resources. By training large-scale AI models with a plethora of diverse domestic data, China has significantly reduced its dependence on foreign data sources and has been a major player in autonomous systems and language models. While the dominance of state actors can alleviate the risk of strategic confusion, ethical risk arises related to the proliferation of surveillance technology that can infringe upon data privacy. The use of AI to enhance surveillance and information control illustrates the centrality of AI in the transformation of war, emphasizing the strategic need for China to leverage digital capabilities to gain superiority in the technological, military, and global order (Pradhan, 2024).

Academic, government, and corporate collaborations enhance U.S. strength and competitiveness in this field. The Third Offset Strategy demonstrates that AI has entered mainstream military operations, ensuring continued technological leadership in autonomous weapon systems and predictive analytics and improving information awareness and decision-making support on battlefields (Tréhu, Ricart, 2024; Bächle, Bareis, 2022). Even though America dominates global markets, strategic questions relating to global competitiveness, standards, and military readiness remain in the face of rising dominance by China. The need for open alliances is demonstrated through transatlantic regulatory and standard cooperation that attempts to forge collective power, but these attempts also are challenged due to underlying geopolitical tensions and competitive interests (Pham, 2024). However, the focus on the free market poses several risks including competing interests of corporations that may not serve strategic security priorities, while open sourcing poses ethical, military, and market threats. America had a relatively late start to consolidate its defense technology strategy, initially focused on retaining military superiority but gradually extending to meet the challenge posed by China, Russia, and other countries (Proroković et al., 2025; Pradhan, 2024).

The EU has chosen to pursue policy goals through extensive horizontal regulation and an emphasis on policy cohesion (Tréhu, Ricart, 2024). A governance-first approach requires the development of legal and regulatory standards for AI. The EU AI Act (European Commission, 2021) provides these requirements for high-risk AI applications related to biometric surveillance, law enforcement technologies, and others, and ensures protection of fundamental rights, which contributes to public confidence (Pernot-Leplay, 2025). This can reduce policy incoherence and strategic confusion for industries and promote standards compliance. However, this also may bring about risks of increasing compliance costs and reduced competitiveness and innovation. While the EU is attempting to position itself as the norm leader with a governance-first policy that promotes the integrity of data protection

standards and the safeguarding of rights in cyberspace, its strategic position of power and competitive advantage is hindered by private investment that is less than half the investment that China can access. For Europe to compete on the global stage, it would have to triple or quadruple its investment in private AI companies from the €9 billion it spent in 2023. Ultimately, the policy initiatives reflect Europe's deep concern about the social, cultural, and economic consequences of emerging technology and reflect the values of the continent. The normative leadership role attempts to address economic and security challenges as well as improve policy coherence by increasing cooperation and trust among geopolitical blocs (Pradhan, 2024).

All three countries are shifting the measurements of power from GDP and military assets to new measurements that include technology dominance (Korkmaz, 2024). Each nation is focusing on advancements in military technology that reduce risks to personnel and enhance intelligence and communication capabilities through the use of artificial intelligence, which is a leading indicator of global strategic importance. AI's rapid influence on military applications, diplomatic actions, and economic prosperity underscores its role in the evolving global balance of power. Still, it seems that innovation benefits and access to AI is concentrated with just a few powers. The need to prevent further stratification and inequities in the Global South must be addressed (Pham, 2024). Regulatory sandboxes, such as the creation of the Global Financial Innovation Network (GFIN), are just one example of a global strategy to manage and mitigate risks and help harmonize regulations and standards in a rapidly evolving technological landscape (Tréhu, Ricart, 2024). Technological interoperability and digital dependencies now have an effect on how alliances, conflicts, and relationships in the global order will be structured and how global power balances will be decided (Proroković et al., 2025).

The different and sometimes conflicting AI-led strategies of the U.S., China, and the EU, which impact competition, collaboration, standardization, and power structures, define this digital shift and pose a complex task in determining sustainable policy coherence across national and global levels (Pernot-Leplay, 2025).

4. Discussions

The nature of modern warfare and strategic stability is being transformed through the growing incorporation of artificial intelligence into military and security systems, with both operational opportunities and ethical dilemmas being presented. The ways in which AI is reshaping defense capabilities, information operations, and the wider security environment will be explored in this section, highlighting its vital function in current geopolitics. The shifting dynamics of power and conflict in the AI age are illuminated by an understanding of these developments in the context of global competition and governance.

AI in defense and warfare has revolutionized operational efficiency and introduced profound strategic considerations, exemplified by AI-equipped drones and drone swarms on the battlefield. A 2019 study revealed that Israeli AI-enabled drones operate significantly more effectively than their counterparts without AI. Similarly, nano-drones equipped with autonomous navigation systems have disrupted traditional doctrines that rely on large platforms, bringing about strategic challenges for military planners (Clauberg, 2024). However, the implementation of AI in defense systems also raises questions about the accountability of AI decisions and their potential to amplify conflict risks.

The US and China both view AI as integral to national security and have sought to develop defense-related AI systems. While the US has prioritized innovation through the Third Offset Strategy and DARPA's \$2 billion AI Next campaign, which emphasize contextual and adaptive reasoning, China's approach has been centrally organized. The United States' \$100+ million annual investment in NSF grants and the market-driven nature of the nation's AI development pose significant challenges in directing AI to address ethical or national interests (Araya, King, 2022). China, in contrast, adopts long-term industrial policies and invests heavily in AI, benefiting from a substantial domestic data pool and centralized decision-making, facilitating civil and military AI applications. However, it also raises serious ethical and privacy concerns (Bächle, Bareis, 2022).

AI is already deployed in military systems across almost 100 countries. Drones, nano-drones, and decision-support platforms are examples of AI technologies used in modern warfare, as is their integration in equipment such as the M142 Himars artillery system (Clauberg, 2024). AI-enabled drones, used for targeting decisions, analyze airborne imagery to instantly identify and engage targets in the blink of an eye (Clauberg, 2024). By minimizing human involvement in targeting decisions, the identify-decide-act cycle is accelerating, leading to the compression of time cycles in warfare. This compressed cycle may potentially destabilize global security, especially in crises, as AI makes strategic decisions autonomously and at rapid speed.

Advances in AI, such as large language models, domain-specific models for national crisis and conflict management, and recommendation systems for diplomatic negotiations, are increasingly prevalent. These AI models are used to analyze conflict scenarios and propose strategies, potentially transforming traditional conflict resolution and militarized bargaining. For instance, these models may predict how military responses from allies to a regional crisis can influence a dictator's incentives to invade a neighboring country. The opacity of AI in decision-making processes leaves policymakers uncertain about AI recommendations, especially since such systems are constructed differently at different levels and can yield varying results from the same input information (Cole et al., 2025). The implications of this uncertainty call for governance structures over the use of AI in defense and diplomacy, which must take into account varying national strategies. Without such AI governance, destabilizing

crisis management may arise, as some national crisis management systems will react to a crisis in ways their adversaries do not foresee.

AI is also gaining ground in cyber warfare, information operations, and security strategies, with major countries investing in this area. Due to the speed and scale that AI can be leveraged, adversaries are capable of running sophisticated cyberattacks, conducting sophisticated misinformation campaigns, and sabotaging digital systems, among others. These kinds of applications can force defense planners to make alterations in technical architectures, making them more robust. In addition, AI and cyber operations often lead to blurred boundaries between non-conventional and conventional warfare, thereby impacting strategic decision-making in a more complex manner (Correal, 2025). This raises the need for a sector and international response to address the issue of AI militarization.

The arrival of region-specific AI platforms, such as DeepSeek, is altering the structure of global technological power by intensifying the global digital arms race. Diverse strategic interests, shown in the divergent regulations between the US, EU, and China, result in different digital ecosystems with low interoperability. Low interoperability means low reliability of defense supply chains and low reliability of supply chains for the production of dual-use systems. Corporations and nations must ensure effective cross-border international cooperation to navigate diverging strategic and regulatory environments. This will provide more security for these supply chains. The current path of technological development suggests that decisions made over the next few years will determine whether AI is used to foster competition or cooperation (SpecialEurasia OSINT Unit, 2025).

The rise of AI for defense-related purposes also poses complex and potentially transformative issues for humanity, spanning both social and ethical domains. Automation-driven unemployment, increasing inequalities, and societal fragmentation, all with their accompanying policy challenges, may be some of the consequences of the increasing implementation of AI in defense systems. These issues call for cross-sector, interdisciplinary collaboration and careful planning and governance. If nations do not carefully consider the implementation of AI in defense systems, the societal resilience necessary for effective adaptation may not be enough (Gerlich, 2024; Silini, Molina, 2024). The transformation of defense and security systems by AI raises concerns about the human costs of this new arms race and highlights the imperative for carefully thought out defense planning that balances innovation with the economy and with the human condition.

Artificial intelligence (AI) in information warfare has enabled disinformation campaigns and psychological manipulation to such an extent that it changes the way that conflicts are fought and political operations are conducted. AI has enabled the creation of highly realistic deepfakes and of mass and automated propaganda, which undermines democratic systems. During the 2023 Slovak elections, audio deepfakes were used to influence the outcomes of the elections (Pauwels, 2024). Through the mass collection of personal data, as evidenced in Facebook's role in the 2018 US elections, AI has also enabled microtargeting, which allows

users to manipulate voting behaviors and public opinion. This highlights the strategic implications of AI in influencing political processes and the challenges that national governments will face in countering these operations (Pauwels, 2024).

The use of AI in disinformation campaigns also inhibits the ability to detect and attribute manipulative operations due to the overwhelming amount of AI-generated content. State and non-state actors utilize AI to destabilize societies without physical violence, adding an extra level of risk that the increasingly complex information environment needs to manage. As AI becomes more able to mimic human behaviors and perform scalable disinformation campaigns, power in information warfare shifts from traditional tools to algorithmic ones. Detection and international policy are needed to combat the risks, which may prove challenging to enforce in a fragmented world (Bin, Donic, Keke, 2023; Pauwels, 2024).

Another hypothesis is that as the capabilities of AI increase, the threshold to conduct successful psychological operations becomes lower, meaning that smaller actors or even a single individual can conduct large-scale manipulative campaigns. This challenges the notion that security risks come from states alone, which threatens the global balance of power. Countries or individuals who previously were not able to wield the influence of large-scale campaigns will now be able to compete in the political landscape. This requires that the international community make strides in AI governance and policy to ensure that these advances do not create a net negative benefit (Szczepański, Claros, Chahri, 2024).

The proliferation of AI-enabled disinformation campaigns necessitates the question of whether existing institutions are sufficient in addressing such challenges. The development of AI-aided tools of verification, as well as the implementation of legislative transparency for digital platforms, is crucial to the threat of synthetic content and restoration of trust in truth. However, technology and governance will have to develop in accordance with societal values, which is difficult when dealing with global platforms (Cole et al., 2025).

The scalability and automation that AI enables in disinformation campaigns has meant that it has gone worldwide. For example, the outsourcing of disinformation activities by Russia's troll factories to Ghana and Nigeria aimed to incite racial tensions in the United States (Szczepański, Claros, Chahri, 2024). The rise of this trend emphasizes the transnational dimension of propaganda and manipulation, in that these technologies make it possible for campaigns to go viral on a local, even cultural level (Pauwels, 2024; Szczepański, Claros, Chahri, 2024).

The geographical expansion of AI-enabled propaganda indicates that the reach and impact of campaigns are also increasing. As platforms can automatically adapt content to the current local fault lines, it is easier to exploit vulnerable populations and erode national coherence and interstate relations. Empirical evidence suggests that over 80 countries actively engage in computational propaganda via social media. As AI continues to be used for influence and disruption operations on a global scale, these technological advancements challenge national

security. It is important that global frameworks be put in place to regulate the use and development of such manipulative tools (Szczepański, Claros, Chahri, 2024).

The growing dependence on transnational platforms, coupled with rising external risks, suggests a need to redefine digital sovereignty to ensure that states are in control of what transpires online and maintain access to data flows across borders. Due to AI-driven disinformation campaigns, digital sovereignty is also challenged by threats to state control over national information infrastructures. Although some states are striving to increase their digital sovereignty, it is difficult to ensure this when most of the risks are originating from sources outside of national borders. International cooperation is thus necessary to fight these threats, but this has proven challenging due to competing national interests. If these technological advances are not regulated at an international level, the effects may have devastating impacts. Thus, to avoid any worst-case scenarios, there has to be a development of institutional frameworks to ensure transparency and accountability (Elbashir, 2025).

The scalability of AI in generating and transmitting information leads to increased strategic agility. This is evidenced by an Israeli political consulting firm using AI to sway legislative support in the United States. With AI-generated disinformation, the time needed to adapt to current events is significantly reduced as it can quickly propagate manipulative messages through large-scale and highly automated campaigns. AI challenges the traditional functions of information gatekeepers such as election commissions or regulatory news agencies, due to its ability to disrupt established news sources and spread misinformation and targeted narratives (Pauwels, 2024; Cohen et al., 2023).

Generative AI provides both unprecedented avenues for advanced countermeasures and risks of an “AI influence arms race” by lowering the threshold for highly effective manipulative campaigns. Developing AI-enabled methods to detect synthetic content can significantly improve the defense of manipulation campaigns. With AI, it is becoming difficult to distinguish between the truth and the falsehood. As it becomes more and more commonplace, the danger of undermining all digital content becomes a great risk. Policymakers have to prioritize safeguards to ensure that there will not be widespread societal mistrust of information and that the advances of AI technology will not be undermined (Cole et al., 2025).

AI can assess and target vulnerabilities, identify psychological needs, and deliver messages that are most likely to influence behavior in strategic contexts. China and the United States leverage AI for both domestic and international psychological operations in order to gain a strategic advantage and shape public opinion. As there has been a rise of automated influence capabilities that bypass traditional soft power and hard power tactics, this trend has significantly altered the nature of statecraft. This indicates a need to reassess how to measure power in IR theory (Feakin, 2024; Bin, Donic, Keke, 2023).

As AI makes it easier to conduct psychological operations and reach a global audience, the development of new control mechanisms is crucial to prevent the abuse of these advanced technologies. The ability to conduct large-scale influence campaigns necessitates oversight

frameworks to prevent AI-enabled human rights violations and address the complex ethical dilemmas. To enhance the trustworthiness of AI and diminish the risk of abuse, greater accountability must be established to ensure that the systems are aligned with human and ethical values. The ability of private tech corporations to develop and manage these advanced AI systems raises concerns, because these non-elected and under-regulated organizations can wield a disproportionate amount of power and control over global influence and opinion (Cohen et al., 2023; Bin, Donic, Keke, 2023).

The increasing contest for information dominance will make it necessary for current governance structures to develop to meet the demands and challenges that come with advanced AI. A scenario of AI making complex decisions regarding conflict escalation or termination highlights the lack of existing international frameworks that are prepared to address these risks. The development and standardization of sector-specific control mechanisms, such as AI safety audits or international agreements for data and information integrity, would be beneficial, as it would improve the trustworthiness of the technology and ensure safety and accountability. If governance of AI in information warfare continues at the current rate, it will be fragmented and will not be sufficient to address any concerns (Elbashir, 2025; Cole et al., 2025).

The rise of digital sovereignty and the development of sovereign national language models and cloud services represent a strategy to regain control over digital infrastructures. However, the emphasis on digital sovereignty can also fragment and weaponize AI, leading to the deterioration of governance and collaborative efforts. This can exacerbate risks associated with information warfare due to limited cross-border cooperation. In order to combat the proliferation of AI-enabled manipulative operations, policymakers should advocate for a values-aligned, open, and cooperative model of AI governance, which balances AI security and development by maintaining technological innovation in a safe and democratic manner (Elbashir, 2025).

The continuous development of AI will lead policymakers to deal with the challenge of balancing the innovation of the technology with ensuring AI safety. Technological superiority and societal values must be balanced through institutional frameworks and international cooperation as AI changes global stability and the landscape of information warfare (Cohen et al., 2023; Elbashir, 2025).

5. Conclusion

The transformation of global geopolitics, security architectures, and power distribution by artificial intelligence was examined by this scientific work, with a particular emphasis placed on the continuous competition and interaction among the United States, China, and the European Union. A thorough understanding of how AI is redefining power dynamics,

defense innovation, economic competitiveness, and regulatory influence on the global stage is provided through a systematic analysis of the diverse strategies, technological initiatives, and governance models that are employed by these actors. The central research question regarding the degree to which AI breakthroughs are changing geostrategic security planning, information environments, and states' capacity to project influence in a digital order that is becoming more interconnected and contested was addressed by this investigation. The achievement of the stated objective has been ensured throughout the work through the integration of comparative analysis, scenario-based exploration, and synthesis of international security studies.

Several important findings are articulated in the main body of the paper, and these findings collectively clarify the multifaceted role that AI plays in contemporary international relations. It is demonstrated by the analysis that the competition for AI dominance is not just a race for technological superiority but rather a multidimensional contest that has an impact on the economic, political, and security spheres. The United States makes use of its strong innovation infrastructure and vibrant private sector in order to maintain its position as a technological leader, while China pursues a state-led model that places emphasis on strategic industrial policy, the centralization of resources, and a concentration on technological sovereignty. The European Union, in contrast to the others, is a proponent of an approach that prioritizes ethical standards and regulatory influence above all else. These disparate strategies are manifested in distinct national strategies for the development, implementation, and international standard-setting of AI, which in turn contribute to increasing regulatory fragmentation and the potential for conflicts over digital sovereignty. The integration of AI into defense systems has, in the realm of security, increased operational effectiveness while also raising serious concerns about accountability, crisis escalation, and the weakening of human oversight in important military decisions. A paradigm shift in warfare is indicated by the emergence of autonomous weapons and AI-enabled intelligence systems, in which algorithmic speed and adaptability redefine traditional military doctrines and alliances. Equally, the work reveals the growing centrality of AI in information warfare, emphasizing its role in enabling disinformation on a massive scale, psychological operations, and the manipulation of public opinion across geopolitical boundaries. The vulnerability of societies and democratic institutions to threats that are technologically mediated is highlighted by the proliferation of AI-driven influence campaigns and automated propaganda, which amplifies the urgency of adaptive governance and international cooperation. The complexity and volatility inherent in the current phase of global digital competition is underscored by the rapid evolution of these dynamics, in addition to the speed of technological innovation.

The placement of these findings within the broader research context reveals important contributions to the growing body of literature on AI, security studies, and international relations. The work advances understanding through the synthesis of technological, regulatory, and geopolitical perspectives, as well as through the articulation of how the interplay between

these domains shapes emerging patterns of global order. By clarifying the implications of regulatory divergence and the militarization of AI, the study illuminates the intensifying arms races and the risk of fragmentation among competing governance models—topics of critical debate among leading scholars and policymakers. The necessity of integrating technological expertise with policy analysis in order to generate nuanced insights into the consequences of accelerated AI adoption is underscored by situating the analysis within current theoretical and empirical discourses. Furthermore, the comparative approach deepens appreciation for the complex trade-offs between innovation, ethical governance, and national sovereignty, thus enriching ongoing conversations about the prerequisites for stable and inclusive digital transformation.

A critical reflection on the research process brings to light a number of limitations that are inherent in the process. The generalizability and empirical depth of certain assessments may be constrained by the reliance on secondary sources as well as the methodology, which is primarily qualitative and comparative. Maintaining the currency and relevance of analysis is an ongoing challenge due to the rapid pace at which AI technologies are evolving. Additionally, the scope of this work necessarily precludes an exhaustive exploration of every affected domain, particularly with regard to the perspectives of the Global South or the long-term socioeconomic impacts of AI-driven change. The recognition of these limitations encourages further empirical research, which is enhanced by interdisciplinary and cross-regional collaborations, in order to monitor, contextualize, and anticipate the ramifications of AI advancement as new technologies, alliances, and points of contention come to the forefront.

Looking ahead, the research highlights a number of promising avenues for future research. It is essential to continue monitoring the global AI landscape, particularly as the regulatory competition between major powers intensifies and new governance frameworks are put to the test in real-world scenarios. Important avenues for advancing the field are represented by longitudinal studies that assess the effects of digital fragmentation on international cooperation and global inequalities, as well as investigations into the distinct challenges that are faced by actors who are less technologically advanced. It is becoming increasingly clear that there is a need for robust, adaptive frameworks for collaborative AI risk management and governance, as is the urgency of legislative adaptation to respond to emergent security threats and preserve democratic resilience. Building on these foundations, future research ought to make an effort to bridge the gap that exists between technological innovation and policy development, fostering approaches to AI governance that are informed, inclusive, and responsible at both the national and international levels.

Significant learning gains have been realized as a result of the systematic engagement with the intersections of technology, geopolitics, and societal transformation, which is something that is reflected upon throughout the research process. The investigation has served to reinforce the significance of interdisciplinary analysis as well as the value of critical, comparative research in grappling with the complexities of technological landscapes that are rapidly

evolving. The commitment to contributing to ongoing scholarly and policy conversations on AI governance that is responsible, equitable, and inclusive remains a key motivation. This underscores the broader significance of maintaining vigilance, adaptability, and ethical integrity as artificial intelligence continues to shape the contours of the global order.

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ARTIFICIAL INTELLIGENCE AND MODERN DIGITAL MARKETING

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Purpose: The main goal of this article is to highlight the application of artificial intelligence, primarily in digital marketing. Analysis of this topic is particularly relevant today, especially given the increasing focus on the development of artificial intelligence and its use in digital marketing.

Design/methodology/approach: The article uses the method of analyzing research results on the use of artificial intelligence in digital marketing, available in the literature and online sources.

Findings: Today, artificial intelligence is becoming an inseparable element of modern digital marketing. For companies, this means not only access to new tools, but above all the need for a thoughtful and conscious transformation of the approach to the customer, content, and marketing strategy. What until recently seemed like a futuristic vision is now a real standard in the activities of many modern organizations.

Research limitations/implications: This article presents case studies confirming the use of artificial intelligence in digital marketing, both in Europe and globally. It's worth noting that these analyses are ongoing, as the factors directly influencing the development of digital marketing and its application of the ever-evolving artificial intelligence are constantly evolving.

Social implications: The examples of AI applications in digital marketing presented here are significant for the development of society. They also provide guidance and guidance for the future, suggesting that it's important to be prepared for all situations, including those involving manipulation. This is crucial for the further development of digital marketing and the use of AI.

Originality/value: This innovative article is based on an in-depth analysis of examples from digital marketing showing the use of artificial intelligence achievements, which on the one hand has a positive impact on the human perception of the presented content, but can also have a negative impact on it, for example through fraud and manipulation, and this is what the recipient of content presented through digital marketing should always be aware of.

Keywords: digital marketing, artificial intelligence, management, cognitive technologies, manipulation.

Category of the paper: research paper.

1. Introduction

Artificial intelligence is increasingly entering the world of modern digital marketing, completely changing the way brands communicate with their audiences, analyze data and conduct promotional activities (Deloitte, 2023; Kotler, 2021). Thanks to the use of advanced algorithms, machine learning and analysis of large data sets, digital marketing is becoming more precise, automated and effective (McKinsey & Company, 2023; European Commission, 2018). Artificial intelligence allows for the creation of personalized marketing messages tailored to specific users - taking into account their shopping history, online activity or preferences expressed on websites. Customers receive content that is more relevant and interesting, which increases their engagement and willingness to buy. In parallel, chatbots and virtual assistants are developing, which take over some of the customer service duties, operating quickly and continuously. They can answer questions, suggest products and guide the user through the entire purchasing process - all without human involvement (Kaplan, Haenlein, 2020; Rust, Huang, 2021).

Companies are increasingly using the possibilities of artificial intelligence in the field of data analysis. Systems can predict customer behavior, assess the effectiveness of marketing campaigns and indicate the best moments to publish content or launch ads. Thanks to this, marketing activities are based more on knowledge than on intuition. At the same time, challenges are also emerging, including the need to protect user privacy, responsible data management, and an ethical approach to automation, which can sometimes lead to bias or manipulation (Wedel, Kannan, 2016).

Therefore, the structure of this article was designed to provide a clear and comprehensive presentation of the analyzed issues. The first part presents the definitions and essence of digital marketing, its main forms, communication channels, and tools used in business-customer relationships. The importance of digital marketing in the context of dynamic technological changes and growing consumer expectations is also discussed.

The second part of the article is devoted to the characteristics of artificial intelligence and an analysis of its role in shaping contemporary marketing strategies. Particular attention is paid to content personalization mechanisms, the use of machine learning algorithms to predict consumer behavior, the automation of communication processes, as well as challenges related to ethics, data protection, and responsible technology management.

The third part presents case studies and examples of practical applications of artificial intelligence in marketing, encompassing both solutions commonly used by businesses and emerging phenomena such as computer-generated digital influencers (CGI). The impact of these tools on building brand image, audience engagement, and shaping new models of relationships between consumers and market players is analyzed.

The final section summarizes the discussion, draws synthetic conclusions, and identifies potential risks and limitations resulting from the implementation of AI technologies in digital marketing. It also highlights possible directions for future research, including the development of hybrid models of human-AI collaboration and forecasts for the further evolution of marketing communications in the era of digital transformation.

2. Digital marketing and its types

For many years, the vision of humans coexisting with robots and their interactions has captured the imagination, not least because numerous films, books, and games have explored this topic. People have often asked themselves the following questions:

- Where will humanoid beings be able to replace humans?
- How far in the future will this happen?

This future is becoming a reality with advances in computer graphics. Its current capabilities, applied to influencer marketing, have allowed for the creation of a new form of life – digital influencers (Davenport, Guha, Grewal, Bressgott, 2020).

Any marketing that utilizes electronic devices and can be used by marketers to convey promotional messages and measure their impact throughout the customer journey. In practice, digital marketing typically refers to marketing campaigns that appear on a computer, phone, tablet, or other device. It can take many forms, including online video, display advertising, search engine marketing, paid social advertising, and social media posts (Kietzmann, Paschen, Treen, 2018). Digital marketing is often compared to "traditional marketing", such as magazine ads, billboards, and direct mail. Surprisingly, television is often lumped into traditional marketing.

Digital marketing, also known as internet marketing, is the promotion of brands to connect with potential customers using the internet and other forms of digital communication. This includes not only email, social media, and online advertising, but also text and multimedia messaging as marketing channels (Technologie kognitywne ..., 2025).

Essentially, if a marketing campaign involves digital communication, it is digital marketing.

There are as many specializations within digital marketing as there are ways to interact using digital media. Here's an example: Search engine optimization.

Search engine optimization, or SEO, is technically a marketing tool, not a form of marketing in itself. Balance defines it as "the art and science of making websites attractive to search engines". The "art and science" of SEO is what matters most. SEO is a science because it requires examining and weighing various factors that contribute to achieving the highest possible ranking.

Today, the most important elements to consider when optimizing a website include: Content quality, User engagement level, Mobile friendliness, Number and quality of inbound links.

The strategic use of these factors makes SEO a science, but the unpredictability inherent in it makes it an art. There is no measurable measure or consistent rule for achieving a high ranking in SEO. Google changes its algorithm almost constantly, so accurate predictions are impossible. What we can do is closely monitor our website's performance and make appropriate adjustments.

According to statistics:

- 90% of consumers find personalization "very" or "somewhat" appealing,
- 81% of consumers would like the brands they interact with to understand them better,
- 77% of companies believe in the value of real-time personalization.

For example, in the United States, there are currently over 40,828 Digital Marketing Managers.

42.0% of all Digital Marketing Managers are women, and 53.9% are men. The average age of a Digital Marketing Manager is 38.

3. CGI examples

Digital influencers are virtual characters, computer-generated images (CGI). They are a unique substitute for human influencers. We've often seen the effects of CGI technology in film productions, bringing fantastical characters to life (Chatterjee, Rana, Dwivedi, Kumar Roy, 2021), such as Steven Spielberg's "Avatar". The goal is to create an image that closely resembles a real person.

A "living" example of how this can be achieved is influencer Miquela Sousa, also known as Lil Miquela. The character was created in 2016 by Trevor McFedries and Sarah DeCou of Brud. Her portfolio includes brands like Prada and Calvin Klein (Drenten, Brooks, 2023). She boasts several music tracks available for streaming on Spotify.

Miquela's greatest and most surprising achievement in 2018 was being named one of the twenty-five most influential people in the world in 2018, according to the iconic American socio-political magazine "Time".

If you want to get to know her, check out the "I Am Miquela" commercial: <https://youtu.be/TQvUwghIOcQ>, and below you can see her photo (Figure 1).



Figure 1. Digital influencer Miquela Sousa.

Source: <https://youtu.be/TQvUwghIOcQ>

Another example of a digital influencer is Shudu. The world's first digital model. Created by photographer and artist Cameron James Wilson in 2017, it has gained over 200,000 followers on Instagram. However, its popularity has sparked much controversy over its promotion of an idealized standard of African beauty and its creation by a white male (Netizens, 2019). The following video explains the secrets of "producing" digital fashion: <https://youtu.be/Dyhp8E4WcLM>, and below you can see also her photo (Figure 2).

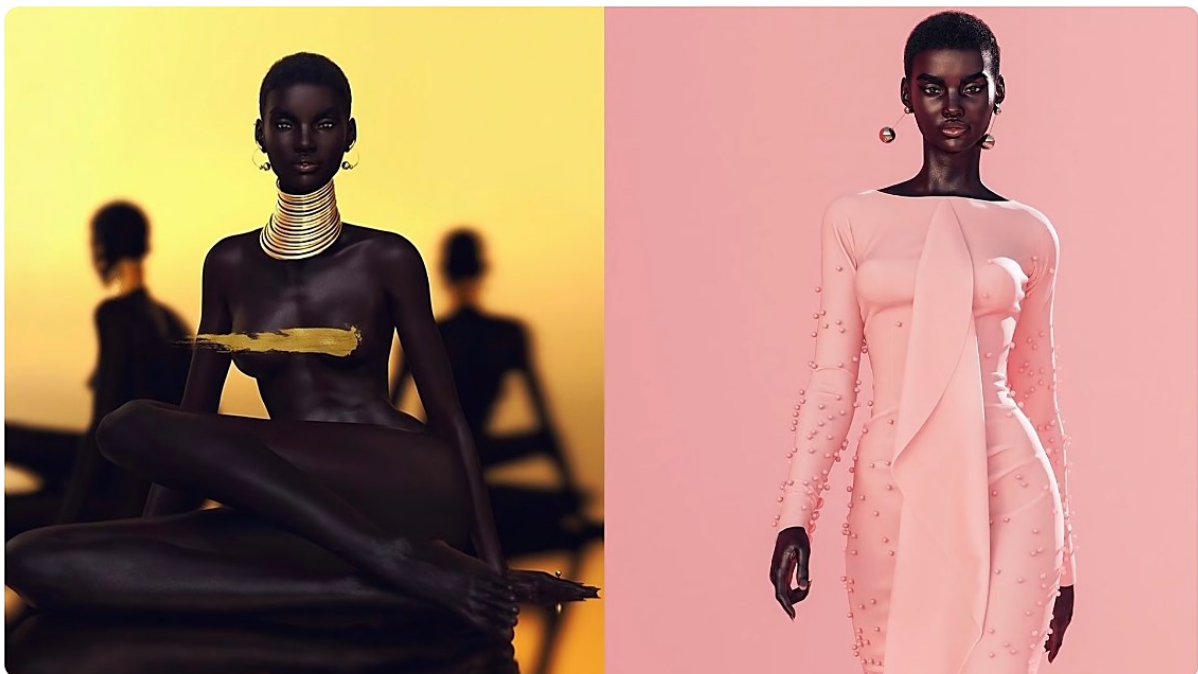


Figure 2. Virtual Supermodel Star Shudu.

Source: <https://youtu.be/Dyhp8E4WcLM>

Their greatest advantage is the ability to design completely from scratch, without a specific background (unless a specific marketing concept calls for a different scenario), which reduces the risk of controversy surrounding the character.

This demonstrates complete control over the influencer's message, the values, "behaviors", and style they promote.

Digital influencers can be tailored to perfectly fit the brand, including their appearance. They are known to visually attract individuals with atypical looks, evoking sympathy (Miquela's restless face) or a certain fascination (Shad's deep skin tone).

The advantage of a digital influencer is their complete willingness to work in any conditions, their ability to get sick, their lack of down days, and their lack of personal problems.

The use of digital influencers in marketing is not without its drawbacks, however. A computer-generated character can trigger a phenomenon known as the "uncanny valley" in audiences. This term describes the anxiety experienced when interacting with a human-shaped robot. The more closely a robot imitates a living being, the greater its anxiety will be, especially when it comes to moving objects. Digital influencers are still a new and rare phenomenon in the online world, which can exacerbate this rather unpleasant effect, especially since humans tend to approach innovative concepts with trepidation.

4. Conclusions

The use of digital influencers in marketing undoubtedly deserves special attention, as it represents one of the most striking manifestations of how artificial intelligence and digital technologies are transforming communication strategies (Kwiliński, Tkachenko, Kuzior, 2019). Virtual brand ambassadors, created entirely with CGI or powered by AI, already function in social media ecosystems, gathering thousands or even millions of followers. Their popularity results not only from technological curiosity but also from the way they perfectly reflect and embody the values of the brands they represent. They can be designed to meet precise aesthetic expectations, maintain flawless consistency in communication, and remain available at all times, which makes them attractive tools for companies striving for absolute control over brand image.

With the further development of CGI and AI technology (Nowak, 2018; Deloitte, 2018), the role of such digital influencers may fundamentally reshape the face of online marketing. Unlike human influencers, they are immune to scandals, controversies, or sudden shifts in personal beliefs that could damage a brand's reputation. Brands gain a tool that combines creativity with predictability, offering an opportunity to build long-term, carefully managed narratives. Moreover, these virtual figures may gradually evolve beyond traditional marketing roles, becoming cultural phenomena in their own right—icons of a new digital era.

However, this innovation is not without controversy. For some, digital influencers spark admiration for their precision, futuristic design, and the sheer scope of technological possibilities they embody. They illustrate the progress of AI and blur the boundaries between fiction and reality in a way that captures the imagination. Yet, for others, they create a sense of distance and even alienation. The interactions with artificially generated personalities, no matter how sophisticated, may lack authenticity and emotional depth. In an age where consumers increasingly seek transparency and human connection, there is a risk that such figures could be perceived as manipulative or superficial. This ambivalence will likely define the future discourse around their use in marketing.

It is worth noting that although these solutions exist today, they are still more of a projection of the future (Kuzior; Sobotka, 2021). Virtual influencers and AI-driven marketing campaigns remain experimental fields rather than fully mainstream practices. Most consumers continue to follow and interact primarily with real people whose authenticity, life stories, and unpredictability form an essential part of their appeal. Nevertheless, trends in digital marketing suggest that the boundary between the real and the artificial will increasingly blur. As AI technology advances, virtual personalities will not only look and act more realistically but also respond to user emotions, adapt to individual preferences, and simulate empathy at a level that is difficult to distinguish from human behavior.

From a strategic perspective, the future of digital marketing may lie in hybrid models that combine the advantages of human and virtual influencers. Brands might employ CGI figures to maintain consistency and innovative appeal, while at the same time collaborating with real personalities to preserve credibility and authenticity. Such coexistence could create richer, multi-layered campaigns that speak simultaneously to rational curiosity and emotional needs.

In conclusion, artificial intelligence is not just a supporting tool in modern marketing—it is increasingly becoming a driver of innovation that redefines the very foundations of communication. Digital influencers, as one of the most visible manifestations of this process, embody both the promises and the risks of the technological revolution. They demonstrate how far marketing can go in adapting to digital realities, while also reminding us of the importance of human authenticity in a world saturated with simulations. Whether they remain niche curiosities or evolve into the mainstream, their role will certainly grow, and their existence will continue to provoke reflection on the boundaries of authenticity, creativity, and human interaction in the age of artificial intelligence.

In summary, artificial intelligence is one of the key factors shaping contemporary digital marketing. Its application not only enables the automation of communication processes, the analysis of large data sets, and message personalization, but also redefines the relationship between brand and audience. Companies that consciously utilize the potential of AI gain a competitive advantage, can respond faster to consumer needs, and create more engaging user experiences.

On the other hand, it is important to emphasize that the dynamic development of technology is not without challenges. Among the most significant are threats related to privacy protection, algorithm transparency, audience manipulation, and limiting the authenticity of the message. The example of digital influencers demonstrates that the boundary between the real and virtual worlds is increasingly blurred, which can lead to both innovative forms of communication and ethically questionable phenomena.

The analysis indicates that the future of digital marketing will depend on the skillful combination of technological potential and social responsibility. Developing standards for the ethical use of artificial intelligence, educating users, and creating transparent communication models is essential. In the longer term, we can expect the development of hybrid solutions in which human skills and AI-based systems coexist, enabling a balance between technological efficiency and authenticity of the relationship with the recipient.

For this reason, artificial intelligence should be viewed not only as a tool supporting marketing activities, but also as an element initiating a new stage in the development of communication, requiring reflection, responsibility, and conscious management.

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**CODE INSTEAD OF LAW: *LEX ALGORITHMICA*
AS A MODE OF GOVERNMENT OF THE LIVING**

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Purpose: This paper explores *lex algorithmica* as a novel form of algorithmic governance that displaces traditional legal processes with computational decision-making. It analyzes how this shift reconfigures key political-legal concepts—sovereignty, freedom, responsibility, and justice—under the conditions of surveillance capitalism.

Design/methodology/approach: Using a genealogical method rooted in social and legal philosophy, the study traces the evolution of modern power from Bentham's panopticon to Foucault's biopower, Deleuze's control societies, and the surveillant assemblage of Haggerty and Ericson. It combines these with contemporary critiques by Hildebrandt, Yeung, and Zuboff to develop the concept of datafication-power, a successor to knowledge-power.

Findings: The research reveals that *lex algorithmica* operates as an opaque, predictive form of normativity embedded in infrastructure rather than institutions. Algorithmic systems determine what is visible, possible, or permissible—often without legal deliberation or accountability. Sovereignty shifts from state institutions to platforms; freedom becomes a variable shaped by code; and justice is undermined by personalization, automation, and opacity. The paper argues that algorithmic rule challenges the foundational liberal assumption of the subject as a reasoning and autonomous agent.

Research limitations/implications: This is a theoretical study; future empirical research should examine specific cases (e.g., scoring systems, predictive policing, automated decision-making) to test and refine the proposed framework.

Practical implications: The article calls for legal and regulatory innovations that can address the normative force of code. It suggests that law must be reimagined as a reflective practice responsive to computational infrastructures and predicative systems.

Social implications: The findings highlight risks to democratic deliberation, public reasoning, and civic freedom. They contribute to debates on data governance, algorithmic justice, and digital sovereignty, underscoring the need for ethical oversight of platforms power.

Originality/value: The paper develops a philosophical genealogy of *lex algorithmica*, positioning it as a transformative mode of power. It offers a unique synthesis of classical and contemporary theories, relevant to scholars in legal philosophy, digital ethics, and political theory.

Keywords: *lex algorithmica*; algorithmic governance; digital sovereignty; Foucault; surveillance capitalism.

Category of the paper: Conceptual paper.

1. Introduction: A New Form of Normative Power

With the development of digital technologies, we are witnessing a profound transformation of power structures, which increasingly take the form of automated, opaque, and non-negotiable decision-making systems. At the center of this transformation lies the concept of *lex algorithmica*—a set of rules generated and enforced by algorithmic systems, operating beyond the structures of enacted law and without institutional guarantees of procedural fairness. The term, developed by authors such as Karen Yeung (2017) and Mireille Hildebrandt (2015), refers to a form of normativity produced by code—dynamic, personalized, and unaccountable to mechanisms of democratic deliberation. Code replaces the statute, and prediction supplants argumentation.

This process constitutes a key component of surveillance capitalism, which—as argued by Shoshana Zuboff (2019)—not only captures and analyzes human behavior but also shapes and directs it, subordinating users to commercial, political, and regulatory objectives. In this context, *lex algorithmica* is not merely a set of technical rules but a form of power that is both epistemic and existential—one that redefines the basic concepts of law and political subjectivity: sovereignty, freedom, responsibility, justice, and even the very idea of the subject.

The aim of this article is to analyze *lex algorithmica* as a mode of government of the living, developing along a genealogy of power techniques: from Bentham's panopticon (Bentham, 2011), through Foucault's concepts of biopower and governmentality (Foucault, 2009, 2010), to Deleuze's society of control (Deleuze, 2018) and Haggerty and Ericson's theory of the surveillant assemblage (Haggerty, Ericson, 2000).

2. The Panopticon as a Figure of Modern Power

The genealogy of *lex algorithmica* as a mode of governance leads us back to the classical figure of modern surveillance—the panopticon of Jeremy Bentham. Designed at the end of the eighteenth century as a model of the ideal prison, the panopticon was meant to enable complete visibility of the observed and total invisibility of the observer. The mechanism of power was based not on constant intervention but on uncertainty and internalized control: the inmate did not know whether they were being watched at a given moment but assumed they were always being watched (Bentham, 2011). The panopticon did not so much restrict physical freedom as it reshaped internal freedom—introducing mechanisms of self-control, submission, and moralization through the very structure of space and gaze.

Michel Foucault, reinterpreting panopticism in *Discipline and Punish* (2009), expands it beyond the prison: it becomes a technology that organizes all of modernity. Schools, hospitals, factories, and barracks—all operate as disciplinary devices that order bodies and behaviors. Power functions through normalization and standardization, rather than prohibition or violence. The body becomes the “target surface of power”: compliant, classified, and modifiable.

From Foucault’s perspective, panopticism does not destroy freedom—it shapes it (Foucault, 2009, pp. 206-208). As he notes: “Panopticism is the general principle of modern disciplinary power, whose operation consists in maintaining power relations in which individuals are graspable and continually visible, yet at the same time free and autonomous in their conduct” (Foucault, 2009, p. 208).

The individual remains formally free but functionally subordinated to the logic of visibility and evaluation. This principle of apparent autonomy, sustained by constant visibility, will prove especially important in later, digital forms of governance: the platform user also “can do whatever they want”, but only within the limits strictly defined by code and invisible profiling mechanisms.

In this sense, panopticism becomes a prefiguration of *lex algorithmica*: a shift from power based on direct intervention to power that organizes the environment of action. Whereas Bentham designed an architecture of control in which visibility would discipline the subject, and Foucault analyzed panopticism as the matrix of modern disciplinary institutions, contemporary digital platforms transform this model toward environmental, distributed, and computational normativity. As Foucault wrote: “Panopticism is a formula of power that renders individuals visible and subject to the effects of power, while simultaneously enabling their constant classification, assessment, and normalization” (Foucault, 2009, pp. 207-208).

In digital systems—such as Amazon, Google, or Facebook—classification and normalization no longer require visibility in the classical sense. They are replaced by the permanent operability of data. *Lex algorithmica* does not operate through the gaze but through automated decision-making; it does not need a severe observer but a predictive model. As Shoshana Zuboff observes: “The power of digital platforms does not lie in observing individuals but in automatically shaping their future behaviors—without the need for intervention, judgment, or even the subject’s awareness” (Zuboff, 2019, pp. 377-378).

Code does not watch—it classifies, recommends, excludes. It does not require a central tower because surveillance is embedded in infrastructure. Just as panopticism enforced discipline through the possibility of being observed, *lex algorithmica* models user behavior through content personalization, scoring, and invisible decision frameworks. Power shifts from the level of institutions to the level of the environment—from enacted norms to encoded norms.

3. Biopower and the Government of the Living: Techniques of Population Normativity

In the later stages of his theoretical work, Michel Foucault develops his analysis of power toward a new paradigm—biopower, that is, power that “takes life into its care” (Foucault, 2010, p. 282). Biopower does not focus on disciplining individual bodies but on managing entire populations—nations, demographic groups, statistical collectivities—through administrative procedures, demographic knowledge, and security technologies. Its goal is the optimization of life: ensuring health, productivity, fertility, and efficiency while minimizing risks, losses, and costs.

In parallel, Foucault formulates the concept of governmentality, understood as a set of techniques for influencing individuals and populations not through prohibition but through the organization of their action environment—through calculations, forecasts, and targeted incentives. As he writes: “To govern is to structure the possible field of action of others; it is an action upon the actions of others” (Foucault, 2010, p. 36). In this sense, power does not so much restrict freedom as it configures it—defining its frameworks, scenarios, and operational algorithms:

“One cannot govern without producing some form of freedom, without organizing it, without determining its points of application” (Foucault, 2010, p. 63).

Contemporary systems based on *lex algorithmica* continue this logic but at a new scale and within a new ontology of action (Hildebrandt, 2015; Yeung, 2017). Predictive data models, classification, and scoring systems become tools for governing the living. Digital platforms organize not only what we see but also what remains unseen; not only what we can do but also what is blocked, deemed risky, or unnecessary. Just as biopower emerged from public health administration, urban planning, and hygiene, so algorithmic biopower arises from the logic of platformization, behavioral optimization, and data extraction.

This shift is crucial for understanding freedom—both in the sense of classical negative liberty (as the absence of external constraints) and positive liberty (as the capacity for self-determination), following Isaiah Berlin’s distinction (Berlin, 1991). In Foucault’s genealogy, there is no freedom “before” power—every form of freedom is historically constructed and configured by power relations. If freedom, in the classical liberal view, was based on the assumption of a rational, autonomous subject capable of choice under conditions of transparency (Rawls, 1994), then in the age of automated rules and personalized normativity, choice becomes a product of the system rather than its prerequisite. Freedom ceases to be a space of sovereignty and becomes a system variable—subject to optimization, parameterization, and dynamic risk management.

4. Society of Control and Datafication: A New Architecture of Digital Power

In his brief essay *Postscript on the Societies of Control* (2018), Gilles Deleuze proclaims the end of the disciplinary society in the Foucauldian sense and announces the emergence of societies of control. Whereas disciplinary institutions (school, factory, prison) were enclosed spaces where the individual was subjected to normalization, the society of control operates without boundaries, in open circuits—through continuous monitoring, updating, and real-time modulation of the individual. “We no longer find ourselves enclosed in a disciplinary society - Deleuze writes - instead, we are in a society of control, which is in the process of replacing it. No need to confine anymore; control is carried out in open spaces” (Deleuze, 2018, p. 151).

This is not institutional power but networked and infrastructural power—diffuse, modulatory, and flexible. The individual is no longer the primary unit of analysis; instead, we encounter data about the individual: profiles, tokens, and registry entries. Power no longer requires direct observation—it operates via digital signals that allow profiling and intervention without physical contact, judgment, or consent.

This shift leads us to a fundamental mechanism of contemporary governance: datafication. This is the process by which actions, emotions, decisions, and relationships are transformed into digital data—measurable, processable, and subject to algorithmic inference. As Nick Couldry and Ulises Mejias (2019) argue, datafication is not just a technology but a new form of epistemic power: the act of “taking the world as a source of data”. It is an operational ontology that allows not only the representation of reality but also its production, classification, and regulation.

In this perspective, *lex algorithmica* appears as an apparatus of datafication—power, functioning analogously to Foucault’s model of knowledge—power. In the traditional configuration, knowledge—produced and legitimized by institutions (e.g., science, medicine, law)—served to regulate bodies and populations; it was the basis for intervention, classification, and the shaping of norms. As Foucault demonstrated, there is no knowledge without power and no power without knowledge—every form of knowing carries a normative order (Foucault, 1977/2009).

In the age of *lex algorithmica*, this role is assumed by a new apparatus: datafication—power. Data take on the role of technical truth—they are treated as the native representation of reality, and their algorithmic processing becomes the basis for decisions about access, risk, fit, or social value. Normativity is no longer written in law but emerges dynamically from data operations—without deliberation, without legitimation, and often without the subject’s awareness.

This shift represents not only a technological evolution but an epistemological and political revolution: a transformation of what is considered knowledge and how knowledge becomes power—from written text to code, from judgment to scoring, from institutions to infrastructure.

5. The Surveillant Assemblage: Complex Power Architecture in the Post-Panoptic Era

In response to the transformations of the disciplinary society and the rise of the society of control, Kevin Haggerty and Richard Ericson propose the concept of the surveillant assemblage as a tool for describing contemporary forms of power. In their article *The Surveillant Assemblage* (2000), they present surveillance not as a coherent institutional structure but as a dispersed configuration of techniques, devices, and logics that connect ad hoc, dynamically, and beyond centralized control. This is a form of post-institutional power, operating on data—transforming bodies into digital profiles, behaviors into risk vectors, and individuals into digitally managed objects. As Haggerty and Ericson argue: “The surveillant assemblage operates by abstracting human bodies from their territorial settings and separating them into a series of discrete flows. These flows are then reassembled into virtual ‘data doubles’, which can be scrutinized and targeted for intervention” (Haggerty, Ericson, 2000, p. 611).

Surveillance is no longer about disciplining the body in space but about decontextualizing information, transforming and recirculating it across networks that cross traditional institutional and systemic boundaries (Haggerty, Ericson, 2000, p. 613).

In this model, surveillance has neither a single center nor a unified goal. It links state logics (police, courts, intelligence agencies), market logics (platforms, advertising, credit scoring), and technological logics (algorithms, sensors, cameras, APIs) into hybrid systems that escape traditional categories of law and politics. This is infrastructural and operational power, not governing through norms but through flows—of data, access points, and predictive outcomes.

Lex algorithmica, in this context, is neither law in the classical sense nor its simulation—it is a layer of code that enforces rules in real time, often without the subject’s knowledge or recourse of the subject” (Yeung, 2017, p. 511; Hildebrandt, 2015, pp. 71-73). Haggerty and Ericson write about “the blurring of the distinction between those who watch and those who are watched” (Haggerty, Ericson, 2000, p. 618)—and this is undoubtedly what *lex algorithmica* does: it transforms the user into a function of the system that they themselves help co-create through data, clicks, and reactions.

It is within the framework of the surveillant assemblage that the new configuration of the datafication–power apparatus becomes most visible: there is no longer a single institution that collects data and makes decisions—there are interconnected systems that automatically reconfigure the rules of action, adapting them to the user’s profile, location, history, and behavior. *Lex algorithmica* thus becomes a keystone: the code that binds the assemblage, unifies its logic, and enforces decisions without the need for human intervention.

6. Summary: Toward a Legal Philosophy of the Code Age: Sovereignty, Justice, and Resistance in the World of *Lex Algorithmica*

From the perspective of the genealogy presented here — from Bentham’s panopticism, through Foucauldian biopower and the society of control, to the surveillant assemblage and the datafication-power apparatus—it becomes evident that *lex algorithmica* is not merely a technological problem. Rather, it represents a fundamental challenge for contemporary philosophy, especially legal philosophy. Code not only regulates behavior—it redefines key concepts of law, subjectivity, responsibility, justice, and freedom. As Mireille Hildebrandt observes: “Lex algorithmica shifts normativity from text to code, from deliberation to computation, from the sovereign to the dataset” (Hildebrandt, 2015, p. 102). Power is no longer expressed through norms but through predictive models; it is not enacted by an institution but generated by data and updated by algorithms (Yeung, 2017, p. 126).

This entails a redefinition of the very notion of sovereignty—no longer as dominion over territory or people, but as the operational capacity to program the rules that determine what is possible, visible, probable, or permissible. The digital platform becomes the sovereign, managing not only communication and economic infrastructures but also the logic of normativity embedded in interface design, scoring systems, and recommendation engines. As Yanis Varoufakis puts it: “The new form of domination does not consist in wielding political control over the state but in controlling the code—algorithms decide who sees what, when, and how. It is not the market that rules, but the cloud” (Varoufakis, 2023, p. 186, translated from Polish edition; see original in Varoufakis, 2023). According to him, we are witnessing the transformation of capitalism into technofeudalism, in which power is no longer political or market-based but infrastructural and predictive.

In this context, freedom does not disappear—it is transformed into a system variable, governed by predictive models and personalization. If in Isaiah Berlin’s framework, negative liberty meant the absence of external constraints and positive liberty the capacity for autonomous action (Berlin, 1991), then in today’s *lex algorithmica* systems, the boundaries of freedom are no longer drawn by political authority but by platform infrastructure. In classical liberalism, the limits of freedom had an ethical-social character. As John Stuart Mill wrote: “The only freedom that deserves the name is that of pursuing our own good in our own way, so long as we do not attempt to deprive others of theirs” (Mill, 1995, p. 87). Freedom ends where the freedom of another begins. In Mill’s view, this “other” was typically the state. Today, however, it is not the state that restricts individual agency, but the logic of code, which constructs what is possible, accessible, and permissible—without needing violence or prohibition.

In *lex algorithmica* systems, this principle is suspended: it is no longer our relation to others, but the individual's behavioral profile and predictive value that define what is possible or allowed. The code—invisible, unargued, automated—governs without asking.

From the perspective of justice and freedom, the problem of *lex algorithmica* lies in its lack of deliberation, accountability, and recourse. Algorithms operate rapidly, automatically, and often opaquely—they are not subject to moral critique, intention analysis, or procedural assessment. In legal systems, even the strictest rule can be challenged, appealed, or argued. *Lex algorithmica* removes that possibility through personalization, atomization, and automation—it offers no space for the kind of rational justification that law is bound to in theories of justice. Ronald Dworkin argued that freedom and justice are inseparable because: “A free man is someone who has the right to be treated with dignity—as a rational being who can be the recipient of a justification, not merely the object of someone else's decision” (Dworkin, 1998, p. 93). And elsewhere: “Being treated as an equal citizen means having the right that every government decision that affects one's life and liberty be made in accordance with a fair procedure” (Dworkin, 1998, p. 126).

In *lex algorithmica*, such procedures are absent—decisions are generated by statistical models, without explicit rules, accountable authors, or an appealable authority. What is lost is not only transparency but also the moral justification of law itself. In these conditions, analyzing statutes or institutions is no longer sufficient. What is needed is a new philosophy of power and freedom in the age of code—one capable of recognizing that modern domination is no longer expressed through prohibition but through the design of environments of action that organize what is visible, possible, and permissible. As Mireille Hildebrandt writes: “Law must reclaim its role under the conditions of code—not as text, but as a reflective practice vis-à-vis operational technologies” (Hildebrandt, 2015, p. 73, trans. mine). Such a philosophy must not restrict itself to diagnosis—its task is to generate a language of resistance to a power that does not shout but modulates. As Shoshana Zuboff points out, the threat today does not lie in censorship but in the fact that: “Knowledge becomes the property of power, and ignorance—a state administered by the system” (Zuboff, 2019, p. 497).

For this reason, we need a form of reflection that:

1. Unmasks the invisible mechanisms of behavioral and environmental design.
2. Rebuilds concepts of freedom and responsibility that can make sense in a world governed by data.
3. Identifies spaces for existential and epistemic resistance that do not merely refer to past models of sovereignty but instead create new forms of community, co-responsibility, and awareness.

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CHALLENGES RELATED TO PATIENTS' SPATIAL ORIENTATION IN A HOSPITAL ENVIRONMENT AND TECHNOLOGICAL INTERVENTIONS – THE SOCIAL ASPECT

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Purpose: The purpose of the paper is to analyze the challenges of hospital wayfinding faced by patients and to evaluate the potential of technological interventions in supporting navigation. The study aims to demonstrate how integrating social research with technical design can contribute to creating more intuitive and user-friendly navigation systems in healthcare facilities.

Design/methodology/approach: The research was conducted by an interdisciplinary team using a methodological triangulation approach. Methods included exploratory walks, covert and overt observations of patients, semi-structured interviews, focus groups with hospital staff, and surveys. A prototype of a mobile wayfinding application, developed in Unity with the Vuforia Engine, was tested in real hospital settings. Both qualitative and quantitative data were collected and analyzed.

Findings The study identified key spatial areas that caused patient disorientation, primarily due to complex layouts and inconsistent signage. Testing the mobile application confirmed its effectiveness in reducing navigation errors and lowering patient stress levels. Participants positively evaluated the application's usability and clarity, while also suggesting enhancements such as voice assistance, interactive maps, and detailed location descriptions.

Research limitations/implications: The research was limited to one hospital route (registration–mammography) and a relatively small group of participants, which constrains the generalizability of findings. Future studies should employ larger samples, longitudinal designs, and advanced quantitative tools such as eye-tracking or digital trace analysis to capture navigation difficulties more comprehensively.

Practical implications: The findings emphasize the importance of integrating architectural solutions with digital tools in hospital wayfinding design. Designers are encouraged to adopt user-centered approaches, test solutions in real-world conditions, and develop hybrid systems combining physical signage with digital navigation support.

Social implications: Improved hospital wayfinding systems can enhance patient comfort, reduce stress, and foster inclusivity, particularly for vulnerable groups such as older adults and individuals with cognitive impairments. Enhanced navigation support can also improve hospital efficiency and patient safety.

Originality/value: The paper contributes original insights by combining social science methods and user research with the design and evaluation of technological solutions for hospital wayfinding. It demonstrates an interdisciplinary framework that can inform both academic inquiry and practical implementation in healthcare design.

Keywords: wayfinding, hospital navigation, mobile applications, user-centered design, patient experience.

Category of the paper: Research paper / Case study.

1. Introduction

Wayfinding, i.e. the process of orienting oneself in space and making decisions about the direction of movement in a hospital environment, has been the subject of interest of researchers from various fields for many years – from environmental psychology, through architecture, to universal design and ergonomics (Carpman, Grant, 2002; Devlin, 2014). As hospital structures become more complex, the risk of disorientation among patients, visitors, and medical staff increases. Difficulties in finding one's way around healthcare facilities can lead not only to organizational delays, but also to increased stress and reduced satisfaction with care (O'Neill, 1991; Hölscher et al., 2012).

Previous studies indicate that an effective spatial orientation system should take into account both architectural aspects (clarity of spatial layout, reference points, color contrast) and psychosocial aspects—the diverse cognitive abilities of users, their experiences, and emotions associated with navigating a difficult environment (Marquardt, 2011; Noraslı, Çınar, 2024). However, the literature tends to focus on the design and technological perspective, while marginalizing research on the actual behavior of patients and their opinions on orientation in the hospital space. This approach leads to the creation of solutions that are visually appealing but not always effective in clinical practice.

Contemporary concepts, such as wayshowing (Møllerup, 2013), point to the need to move from analyzing the process of finding one's way to examining how space and visual communication tools actively support users in making navigational decisions. This type of approach requires the integration of multiple research perspectives and the systematic involvement of patients and staff in the process of testing proposed solutions. Social research in the context of wayfinding is crucial to understanding how users perceive and function in public and private spaces. It allows us to identify non-obvious barriers to orientation, such as stress, disorientation, feelings of confusion or uncertainty, which can affect both well-being and the effectiveness of movement in a given space. Wayfinding is not just a technical issue – it largely depends on the individual experiences, perceptions, and emotions of users. From a spatial design perspective, understanding users' subjective feelings, their aesthetic and functional assessments, and observing their behavior as they move through space allows for the creation of more intuitive, comfortable, and safe environments.

The aim of this article is to analyze the challenges related to patients' spatial orientation in a hospital environment and to assess the potential of technological interventions supporting the wayfinding process. The study, conducted by an interdisciplinary team, is based on an approach combining social methods (observations, interviews, focus groups) with testing a mobile application prototype in real-life conditions. The results obtained aim to show how the integration of user research with the design of technological solutions can contribute to the creation of more intuitive and user-friendly healthcare spaces.

2. Literature review

The growing complexity of healthcare buildings means that patients, visitors, and even medical staff are exposed to difficulties in finding their way around complex spatial structures. The literature indicates that the lack of effective solutions in this area can lead to delays, increased stress and confusion, as well as a decrease in overall satisfaction with medical care (Carpman, Grant, 2002; Devlin, 2014).

Classic works in environmental psychology have already emphasized that spatial orientation is a complex phenomenon, dependent on both architectural configuration and the individual cognitive abilities of users. Carpman and Grant (2002) point out that wayfinding should be treated broadly—as a cognitive and social process, not just a technical signage problem. In this approach, it is crucial to take into account the diverse needs of users: the elderly, patients with limited mobility, and people with cognitive impairments.

A.S. Devlin (2014) also made a significant contribution to the development of knowledge. Analyzing research in the field of environmental psychology, she pointed to the role of perceptual and emotional factors in the process of finding one's way. She emphasizes that an effective spatial orientation system in healthcare facilities must take into account both visual elements (color, contrast, symbols) and factors related to stress reduction, including the legibility of space, the logical placement of reference points, and the consistency of visual messages.

An important aspect of research on spatial orientation in hospitals is also the analysis dedicated to specific user groups. G. Marquardt (2011), focusing on people with dementia, emphasizes the role of architectural design in facilitating movement and maintaining patient autonomy. The author's review shows that elements such as clear landmarks, contrasting colors, natural light, and an intuitive corridor structure have a significant impact on the effectiveness of orientation. In this sense, research on wayfinding becomes part of a broader discussion on inclusive design and patient-centered care (Morag et al., 2016).

From the perspective of architecture and design practice, the studies by B.J. Huelat (2007) and P. Mollerup (2013) are particularly valuable. Huelat, drawing on her experience in implementing wayfinding systems in healthcare facilities, presents a set of guidelines for the implementation of signage, visual information systems, and spatial planning. The author emphasizes the need to integrate design solutions with organizational processes in the hospital. Mollerup (2013), on the other hand, proposes the concept of wayshowing, which broadens the perspective of research on spatial orientation. According to the author, it is not enough to analyze how users find their way (wayfinding), but it is necessary to examine how space and its elements “show the way” to users. This shift in emphasis is important for the interdisciplinary design of healthcare spaces.

Among empirical studies, O'Neill's (1991) work is of classic importance, as he demonstrated that the configuration of spatial plans and the presence of signs have a direct impact on the accuracy and speed of orientation in buildings. These results are confirmed by contemporary analyses, such as a study of a Turkish hospital in Konya (Noraslı, Çınara, 2024), which indicates that the colors and textures in the circulation areas of the hospital significantly affect the effectiveness of finding one's way. Researchers who used spatial analysis tools such as space syntax described the degree of complexity of the architectural layout and predicted potential points of disorientation (Hölscher et al., 2012; Mazurkiewicz, Sitek, 2024). These findings are particularly relevant in the context of growing interest in technological solutions, including mobile applications and augmented reality systems, which are increasingly being integrated into the physical architectural environment (Ženka et al., 2021).

The presented literature review clearly indicates that spatial orientation in hospitals is an interdisciplinary problem (Borges, da Silva, 2015). The research combines psychological, architectural, ergonomic, technological, and humanistic-social perspectives, with a common denominator being the diversity of research methodologies. Psychology uses laboratory experiments, memory tests, and virtual reality studies; architecture and ergonomics use spatial analyses, case studies, and field observations; technology uses digital experiments and analysis of data from mobile devices (Harper et al., 2020); and social sciences use qualitative methods, interviews, and ethnographic research. Such a wide range of methods not only allows for a better understanding of the mechanisms of spatial orientation, but also for the formulation of practical recommendations for designers, decision-makers, and healthcare institutions.

Despite the multitude of research approaches and the interdisciplinary nature of the analyses, several significant research gaps can be identified in the literature. Firstly, research conducted in laboratory conditions or strictly controlled environments (e.g., virtual reality, simulation experiments) predominates, which limits the ability to fully capture the complexity of the real experiences of patients and visitors in hospitals. Second, although many studies focus on specific groups, such as the elderly or patients with cognitive impairments, relatively few integrate these findings with the perspective of medical staff, whose orientation and mobility are critical to patient safety and work efficiency. Finally, although many studies emphasize the

need for interdisciplinarity, in practice most research remains rooted in a single field – psychology, architecture, or ergonomics – without fully exploiting the potential for collaboration between these areas. This gap opens up space for projects that systematically combine the knowledge and tools of multiple disciplines, engaging both researchers and students from different fields in research on creating more user-friendly and accessible hospital environments.

3. Methods

The aim of the research was to broaden knowledge about the problems patients face in finding their way to important areas in hospitals and to present how to combine social science methodology with the design of technical solutions. The information obtained was used to construct a tool to help patients find their way around the hospital on the route: main entrance – registration – mammography room. As a result of the project, a prototype application was created using the Unity 6000.12 engine with the Vuforia Engine plugin based on a point cloud representing a fragment of the building. The proposed solution was then tested by end users on the hospital premises. The study, conducted by an interdisciplinary team of researchers and students as part of the PBL (Project Basic Learning) project, included both qualitative and quantitative methods, which made it possible to capture both the subjective experiences of users and the objective difficulties that arise in the process of spatial orientation. Social research constitutes a large part of the search for knowledge about the relationship between the user of a space and the space itself.

In order to identify the essence of the problem, the following research methods and techniques were used in the module on social issues:

- Research walks – researchers (22 people) walked the route. The aim of this stage was to familiarize themselves with the route and to identify and evaluate the functionality of direction signs and landmarks. This method helped to predict difficult places on the route to the destination.
- Covert observations of patients' behavior while finding their way to the mammography room (10 patients). To deepen the analysis, covert observation of patients independently searching for the mammography room was also used. Without revealing their role, the researchers recorded difficulties in spatial orientation based on a specially designed observation questionnaire, which included, among other things, the time taken to complete the route, places of disorientation, patients' emotional reactions, ways of searching for information, and interactions with staff. This type of methodology allowed the orientation process to be captured in situ, i.e., in the natural context of space use. This observation allowed natural behavior to be captured, unaltered by awareness of

participation in the study, providing an important supplement to the results of the research walks.

- Unstructured interviews with patients after completing the route (8 interviews) made it easier to identify the significant difficulties patients had in finding their way, orienting themselves in space, remembering elements of space, and preferences in ways of obtaining information in hospital facilities. This research method allowed for a comparison of patients' previous experiences and perceptions with the actual spatial layout of the hospital in Gliwice.
- Focus group interview with hospital staff. Another element of the research was a focus group involving hospital staff, including registration staff and medical personnel. The group discussion made it possible to gather knowledge about the staff's experiences with common problems patients have in finding their way around, as well as their expectations regarding potential tools to support the navigation process. Analysis of the data from this stage allowed the organizational and ergonomic perspectives to be taken into account in the design of the application.

In the next stage, the usability of the proposed solutions was tested. The following methods were used for this purpose:

- A survey after patients completed the route using the prototyped application. After developing the initial version, 14 research walks with patients were conducted. Each participant was tasked with finding their way using the application and then taking part in a questionnaire-based interview assessing, among other things, the intuitiveness of the interface, the usefulness of the directions, the level of stress reduction, and the ease of completing the route. The use of this tool enabled a systematic comparison of participants' experiences and the identification of key elements requiring improvement in subsequent versions of the app.
- Open observations of patients using the prototype app on the route from registration to the mammography room.

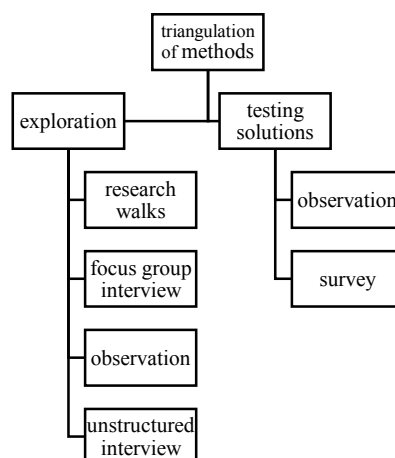


Figure 1. Methods used in the orientation study.

All stages of the research were planned in accordance with the principle of methodological triangulation, combining field observations, qualitative interviews, and group focus discussions. This made it possible to obtain a more complete picture of the phenomenon: from the individual experiences of patients, through the organizational perspectives of staff, to the functional testing of the technological tool. The collected qualitative data (interview transcripts, focus group records, observation notes) were subjected to thematic analysis using open and axial coding procedures. Quantitative data (e.g., number of confusion points) were analyzed using basic descriptive statistics, which allowed for a comparison of objective difficulties with participants' subjective assessments.

4. Results and discussion

During their research walks, the researchers were able to experience the physical space of the hospital in which patients move around and the difficulties encountered by anyone who has to find a specific location in it for the first time. The preliminary conclusions facilitated the preparation of a route diagram and the creation of an observation sheet with the most problematic locations marked (Figure 2).

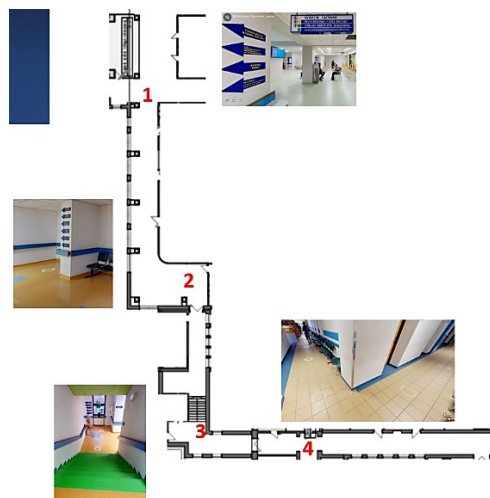


Figure 2. Diagram of the route under investigation.

Source: Prepared by B. Rożałowska.

During the focus group stage with staff, the key links between the various functional areas relevant to contact with patients using the breast clinic were examined, and characteristic points within the hospital where contact with individual medical procedures takes place were defined. The expectations of the staff regarding the most important functionalities and features of the application were also determined. As a result, it turned out that due to time pressure, the need for an effective hospital navigation tool was much greater than the capabilities of the design team. It became necessary to limit the scope of the work and determine the area that could be

developed. Reducing the scope of the research to a single route in the hospital: registration-mammography also had educational benefits. It allowed for a more detailed examination of the problem and provided valuable guidance for possible future actions.

The data obtained during patient observations, interviews, and research walks identified the most important points of misinformation that require architectural intervention and special attention when designing an application to support patients on the registration-mammography route.

The conclusions from the observations indicate that one of the most difficult moments on the route is at the registration desk on the first floor. From there, patients are directed to the mammography room. Both observations and interviews prove that this is the point where confusion about the route occurs most often. Among the 10 people observed, as many as 4 chose the wrong direction. The main reason for these mistakes is related to the physical characteristics of the space and the misplacement of directional signs. There are many corridors in this area, and the directional signs on the side wall are often overlooked. In addition, patients misinterpret the instructions given by the registration staff, which is due to their different positions in the space and their inability to objectively describe the spatial situation (Figure 3).



Figure 3. The beginning of the journey from registration to mammography.

Source: Photo: B. Rożałowska.

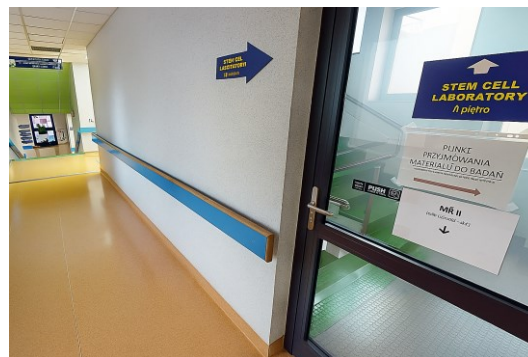


Figure 4. An additional corridor on the route making it difficult to choose the right path.

Source: Photo: B. Rożałowska.

Another difficult place for patients is the additional corridor with another set of green stairs visible behind glass doors. After being instructed by staff to follow the green stairs, patients had trouble choosing which way to go (Figure 4, Figure 5).

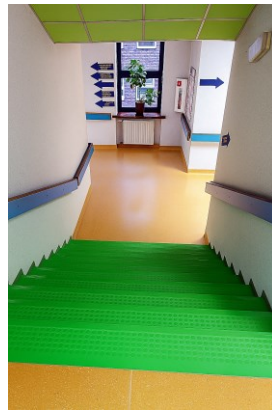


Figure 5. Green stairs as an element of space identification.

Source: Photo: B. Rożałowska.

Furthermore, the subjects rarely looked at the direction signs at the end of the corridor (Figure 5). Too much information causes confusion, resulting in errors of perception. This leads to choosing the wrong direction or increased uncertainty about the correctness of the choices made.

The schematic diagram shows the most difficult moments on the route from registration to the RM office (Figure 6).

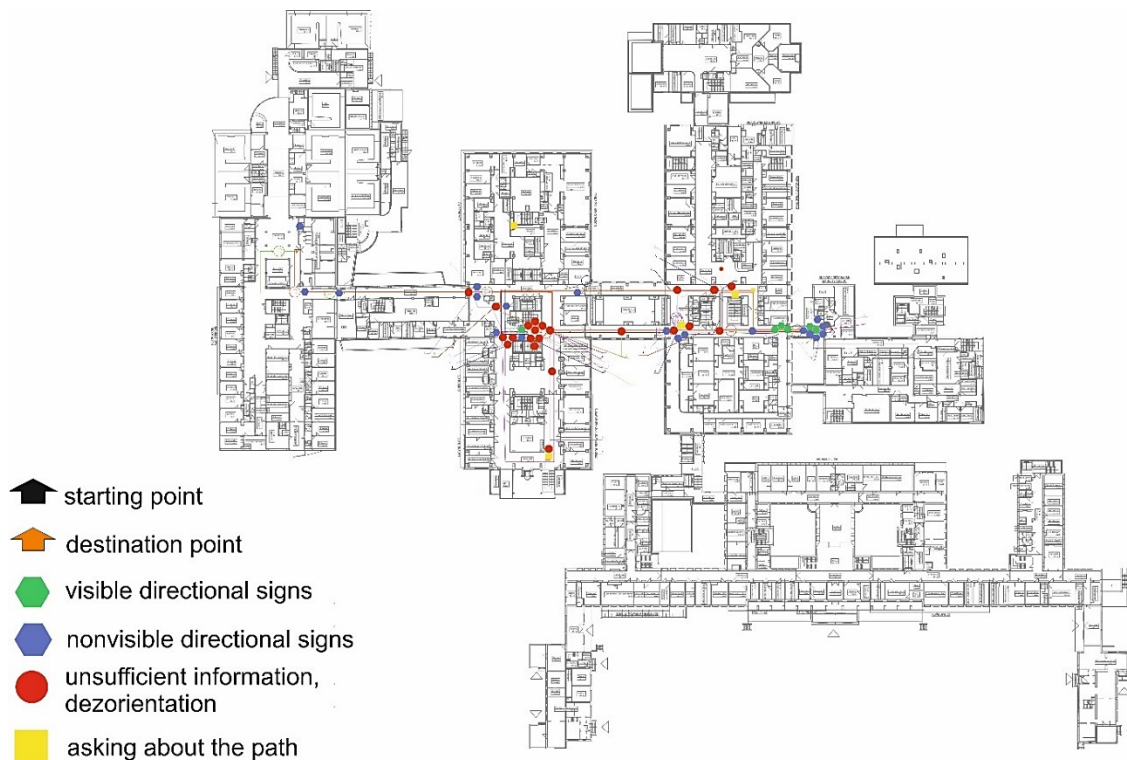


Figure 6. Results of behavior mapping for the route leading to Magnetic Resonance Imaging.

Source: Compiled by A. Szewczenko.

The results of the study indicate that the starting point is the most problematic part of the route. This is where there is the greatest lack of clear information on how to find the direction leading to the destination. Another difficult section of the route is in the middle, where there is also a lack of clear directional signs. Another problem occurs at the end of the route, where there are many signs, but they are not clear enough.

During the focus group stage with staff, the key links between the various functional areas relevant to contact with patients using the breast clinic were examined and characteristic points in the hospital space where contact with individual medical procedures takes place were defined. The expectations of the staff regarding the most important functionalities and features of the application were also determined.

Fourteen patients were involved in testing the usability of the application showing the way to the mammography room. The interface had previously been tested for legibility, aesthetics, and ergonomics. An example of the application screen is shown in Figure 7.



Figure 7. Sample views of the application interface.

Source: Developed by Z. Ścibura, P. Olszówka.

The results of testing the route using the app indicate a significant improvement in spatial orientation. The ease of use of the app and the clarity of the messages displayed were rated positively. Importantly, respondents also suggested adding additional information such as: department names, office and floor numbers, a voice assistant, a search tree for objects, and a map of the facility. Considering these suggestions should increase the usability of the app in the future, if the project is developed further.

The above research can serve as inspiration on how to improve navigation within the hospital on particularly difficult routes, where the direction of travel and floors change several times. Adopting a user-centric approach is essential to understanding the inconveniences encountered along the way, related to the characteristics of the terrain and the existing signage. Messages directing users to their destination should clearly appeal to the user of the space and not require additional thought or experimentation. The transition from the concept of wayfinding (how users find their way) to wayshowing (how the space shows users the way) is the essence of actual improvement in spatial orientation.

5. Summary

The research conducted confirmed that spatial orientation in hospitals poses a serious challenge for both patients and medical staff. An analysis of user behavior showed that key difficulties arise in areas with complex spatial configurations, where signage is illegible or overly scattered. The identified areas of confusion require both architectural and informational intervention, including better placement of signs, simplification of visual messages, and consistency in the signage system.

Testing of a prototype application supporting the process of finding one's way showed the validity of using technological solutions based on a user-oriented approach. The use of a digital tool contributed to a reduction in the number of orientation errors and stress among patients, while also pointing to directions for further development, such as the implementation of voice functions, extended location descriptions, and interactive maps.

One of the key problems with spatial orientation systems in hospitals is an excessive focus on the architectural design process or the implementation of technological solutions, while neglecting research into the actual experiences and behaviors of patients. As a result, the solutions created are often highly aesthetic and modern, but they do not fully meet the real needs of users – especially the elderly, those with cognitive impairments, or those with reduced mobility. The lack of systematic involvement of patients in the design process leads to navigation tools that are ill-suited, which in practice can be unintuitive or generate additional stress.

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A REVIEW OF ENVIRONMENTAL DISCLOSURE PRACTICES IN TOP-LISTED COMPANIES IN POLAND: SCOPE, METHODOLOGIES AND ALIGNMENT WITH EU ESG STANDARDS

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Purpose: The aim of the study is to evaluate the maturity of environmental disclosure practices among companies listed in the WIG20 index in Poland in light of the evolving European Union (EU) sustainability regulations.

Design/methodology/approach: The research is based on desk research and the content analysis of publicly available sustainability disclosures, annual reports and management board activity statements for 2024, published by companies listed in the WIG20 index in 2025.

Findings: The analysis of the WIG20 index companies and their compliance with EU ESG environmental matters (E) reveals that while the companies demonstrate awareness of their obligations regarding non-financial environmental disclosure, the quality and consistency of their reporting remain limited. Most of them still heavily rely on descriptive, qualitative information, with quantitative data provided primarily in the category of climate change and GHG emissions. And thus, all companies disclose information on climate change (ESRS E1), including GHG emissions in scopes 1, 2 and 3, 35% of the companies disclose information on their business conduct related to pollution (ESRS E2), 40% on water and marine resources (ESRS E3), 35% on biodiversity and ecosystems (ESRS E4) and finally 60% on resource use and circular economy (ESRS E5). Additionally, there are significant asymmetries in the length, structure and reliability of environmental disclosures across the WIG20 index companies.

Originality/value: Despite the increasing significance of non-financial disclosure, to the best of our knowledge, comprehensive and methodologically robust research on the current state of environmental reporting amid European companies remains limited. To address this gap, this study examines the scope, methodological approaches and degree of alignment of environmental reporting of WIG20 index listed companies in Poland with the EU ESG requirements.

Keywords: ESG, environmental reporting, WIG20 index, sustainability, non-financial disclosure, Poland.

Category of the paper: Research paper, Case study.

1. Introduction

In the contemporary business landscape, the expectations of stakeholders towards corporate accountability have intensified. Companies, particularly medium- and large-sized ones, are under growing pressure regarding environmental, social and governance (ESG) responsibility. Following Eccles & Klimenko (2019), ESG is no longer perceived merely as a compliance obligation, but increasingly as strategic drivers of innovation, competitiveness, and long-term value creation.

Companies in the European Union (EU) has encountered substantial changes in sustainability regulations in recent years. In terms of non-financial (sustainability) reporting, two the most relevant are Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting, known as CSRD, and Commission delegated Regulation (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards, known as ESRS.

Sustainability reporting means the disclosure of information related to sustainability matters, including the following key aspects: the undertaking's business model and strategy, the time-bound targets related to sustainability matters with absolute greenhouse gas emission reduction targets at least for 2030 and 2050, the role of governance bodies, adopted policies, due diligence processes, principal actual or potential adverse impacts across operations and the value chain along with measures taken and their outcomes, as well as the principal risks and dependencies related to sustainability matters, their management, and the relevant indicators (Directive 2013/34/EU, 2013). Despite the regulatory description of sustainability reporting, managers demonstrate substantial discretion in the reporting frameworks, the quality of information reported and assurance obtained, which result in significant heterogeneity of reporting practices across undertakings (Dinh et al., 2022).

The aim of the study is to evaluate the maturity of environmental disclosure practices among companies listed in the WIG20 index in Poland in light of the evolving European Union (EU) sustainability regulations. With the Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS) coming into force, companies are expected to adopt more rigorous, transparent and standardised environmental reporting frameworks. Despite the increasing significance of non-financial disclosure, to the best of our knowledge, comprehensive and methodologically robust research on the current state of environmental reporting within the European context remains limited, particularly regarding eastern European countries. To address this gap, this study examines the scope, methodological approaches and degree of alignment of environmental reporting of WIG20 index listed companies with the EU ESG requirements, particularly in relation to the following ESRS

environmental categories: climate change (E1), pollution (E2), water and marine resources (E3), biodiversity and ecosystems (E4) and resource use and circular economy practices (E5).

2. Methods

The research is based on desk research and the content analysis of publicly available sustainability disclosures, annual reports and management board activity statements for 2024, published by companies listed in the WIG20 index in 2025.

Warsaw Stock Exchange Index (WIG20) is a price index of the largest companies quoted on the Stock Exchange, serving as proxies for a country's economic stability and a crucial reference point for both domestic and international investors. The WIG20 index has been calculated since 16th April 1994 on the basis of stock exchange turnover and the prices of shares in 20 major and most liquid companies in the WSE Main List (GPW, 2025b). The WIG20 index may not include more than 5 companies from a single exchange sector.

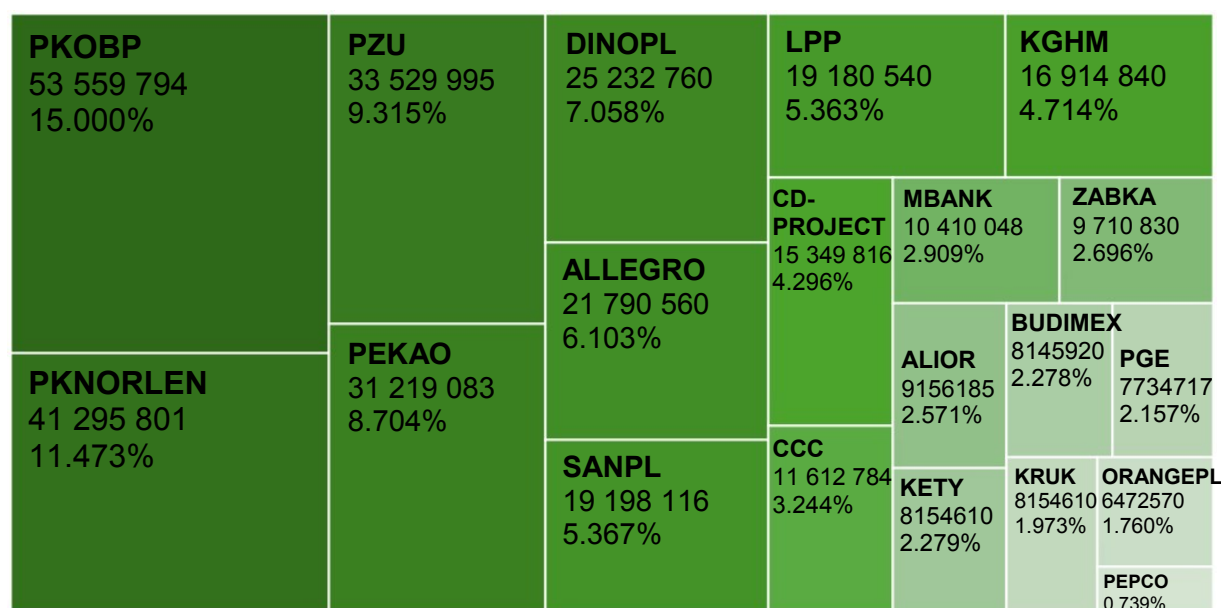


Figure 1. Constituents of the WIG20 index (with market capitalization and share, in thousands of PLN and % accordingly).

Source: GPW, 2025a.

The composition of the WIG20 index is subject to regular revisions to ensure it accurately reflects the current Polish equity market dynamics. A comprehensive annual review is conducted based on data following the last trading session in January, complemented by quarterly adjustments, that may result in substantive modifications to the index constituents. The ranking is based on 12-month turnover values and free float capitalization based on closing price selected from the last 5 trading sessions before the ranking day (GPW, 2022). The share

of a single company in the index may not exceed 15%. In line with this framework, the most recent adjustment to the WIG20 index was conducted on 20th June 2025 (Figure 1).

Environmental matters that should be disclosed by companies under the European sustainability reporting standards (ESRS E) include:

- ESRS E1 Climate change: climate change adaptation, climate change mitigation and energy.
- ESRS E2 Pollution: pollution of air, water, soil and living organisms and food resources, substances of concern, substances of very high concern and microplastics.
- ESRS E3 Water and marine resources.
- ESRS E4 Biodiversity and ecosystems: direct impact drivers of biodiversity loss, impacts on the state of species and the extent and condition of ecosystems, and impacts and dependencies on ecosystem services.
- ESRS E5 Resource use and circular economy: resources inflows, including resource use and resources outflows related to products and services and waste (Commission delegated Regulation (EU) 2023/2772, 2023).

3. Results and discussion

The analysis of sustainability disclosures, annual reports and management board activity statements of the WIG20 index listed companies for 2024, published in 2025, showed that all of the companies provide some information on the ESG, environmental matters. This indicates that the companies are aware of their obligations resulting from the EU regulations. Additionally, the disclosure of non-financial information strengthens companies' legitimacy in the perception of external stakeholders. This may also result from growing public pressure on companies to be more transparent and accountable for their performance and business conduct, including the area of environmental risks and opportunities.

The degree of alignment of the WIG20 index listed companies with the ESRS varies across categories (Figure 1). In general, compared to other categories, the companies disclose the most comprehensive quantitative information on climate change (ESRS E1). Regarding the remaining environmental matters, the companies provide only limited information on their business conduct related to pollution (ESRS E2), water and marine resources (ESRS E3), biodiversity and ecosystems (ESRS E4), and resource use and circular economy (ESRS E5), with strongly descriptive, qualitative focus. Respectively, 35%, 40%, 35%, and 60% of WIG20 index companies disclose such information.

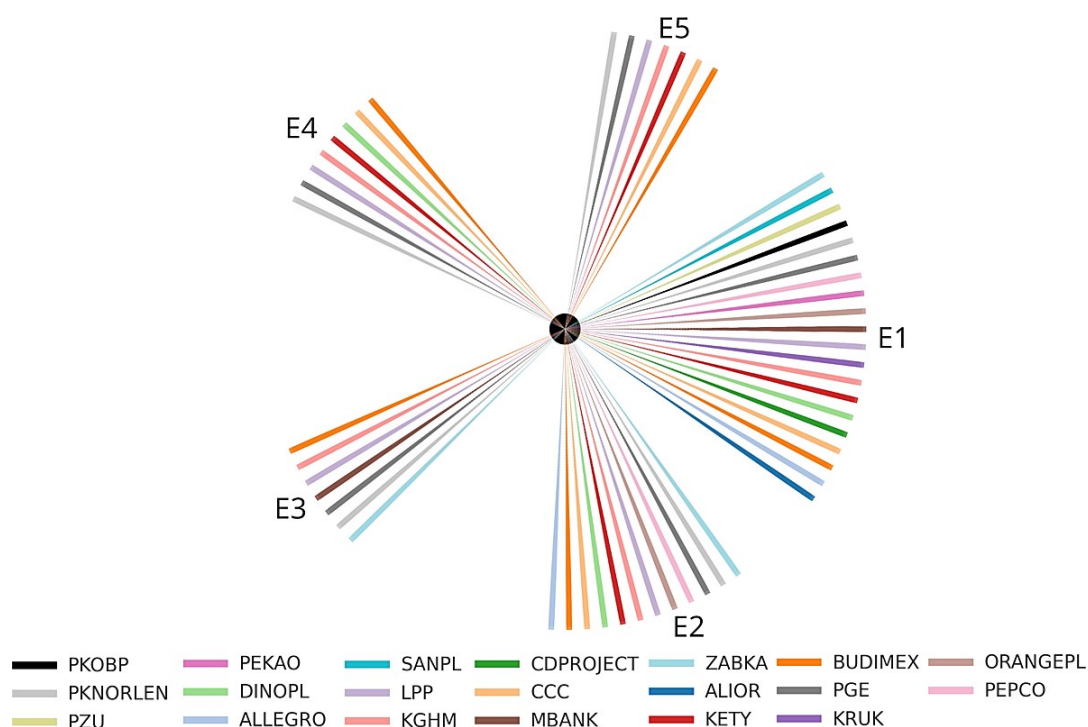


Figure 2. Degree of alignment of WIG20 index listed companies with the EU requirements, in relation to the following ESRS environmental categories: Climate change (E1), Pollution (E2), Water and marine resources (E3), Biodiversity and ecosystems (E4) and Resource use and circular economy (E5).

Source: Own study.

3.1. Climate change

Climate change (ESRS E1) constitutes the first component of the environmental disclosure framework, addressing, in particular, climate change adaptation, climate change mitigation and energy-related matters, to the extent that they are relevant to climate change (Commission delegated Regulation (EU) 2023/2772, 2023). Regarding climate change mitigation, companies shall disclose transition plans for climate change mitigation covering, among others, greenhouse gases (GHG) emission reduction targets and climate change mitigation actions, including “changes in the undertaking’s product and service portfolio and the adoption of new technologies in its own operations, or the upstream and/or downstream value chain” (Commission delegated Regulation (EU) 2023/2772, 2023).

All companies listed in the WIG20 index disclose information on climate change, although the scope and the level of detail vary across subcategories (ESRS E1) (Table 1). Uniform policies and internal regulations on climate change adaptation and mitigation have either already been implemented or are currently being developed across the companies. Nevertheless, clear disclosures on adaptation measures are provided by only a limited number of companies. Following the Annual Report of Allegro.eu S.A. Group (2025) these measures include physical actions, such as additional fire protection, as well as non-physical actions, including routine security tests, crisis protocols and trainings.

All WIG20 index listed companies quantify their greenhouse gas (GHG) emissions under scopes 1, 2, and 3, with some having already set group-wide objectives for carbon footprint reduction. The Allegro Group, for instance, has committed to reducing GHG emissions (scope 1 and 2) by 43% by 2030, compared to the base year of 2021, through monitoring energy consumption, implementing energy efficient infrastructure and increasing the use of renewable energy (Allegro S.A., 2025). The CD Projekt Group has identified climate-related risks and opportunities and declared the reduction of GHG emissions in scopes 1 and 2 by 42% by 2030, compared to 2023 as the base year (CD Project S.A., 2025). The decarbonization strategy of the CD Projekt Group is based on improving the energy efficiency of its buildings, increasing the share of renewable electricity in total energy consumption and further expanding photovoltaic installations at its Warsaw campus. Finally, the Kęty Group aims to cut scope 1 and 2 GHG emissions by 25% per tonne of production by 2025, relative to the 2016 base year, and to achieve climate neutrality by 2050 (Kęty S.A., 2025).

Regarding the energy-related matters, all WIG20 index listed companies monitor their energy consumption, collect relevant data and declare measures to mitigate their negative environmental impacts, while working towards concrete plans and targets for reducing GHG emissions, enhancing energy efficiency and transitioning to renewable energy sources.

Table 1.

The compliance of the WIG20 index companies with ESRS E1: Climate change

WIG20 index companies	ESRS E1: Climate change		
	Climate change adaptation	Climate change mitigation	Energy
PKOBP	Plan preparation	Plan preparation	Monitoring
PKNORLEN	Existing plan for 2026	Existing plan	Monitoring
PZU	Internal regulations	Plan up to 3 years	Monitoring
PEKAO	Internal regulations	Internal regulations	Monitoring
DINOPL	Internal regulations	Internal regulations	Monitoring
ALLEGRO	Existing plan	Existing plan	Reduction plan
SANPL	Plan preparation	Plan preparation	Monitoring
LPP	Internal regulations	Internal regulations	Monitoring
KGHM	Internal regulations	Internal regulations	Monitoring
CDPROJECT	Existing plan	Existing plan	Reduction plan
CCC	Internal regulations	Plan preparation	Monitoring
MBANK	Plan preparation	Plan preparation	Monitoring
ZABKA	Plan preparation	Plan preparation	Monitoring
ALIOR	Internal regulations	Internal regulations	Monitoring
KETY	Existing plan	Existing plan	Monitoring, optimisation
BUDIMEX	Internal regulations	Plan preparation	Monitoring
PGE	Internal regulations	Internal regulations	Monitoring
KRUK	Internal regulations	Internal regulations	Monitoring
ORANGEPL	Internal regulations	Internal regulations	Monitoring
PEPCO	Existing plan	Existing plan	Monitoring

Source: Own study.

3.2. Pollution

Pollution (ESRS E2) constitutes the second component of the environmental disclosure framework, addressing, in particular, pollution of air, water, soil and substances of concern, including substances of very high concern, and prevention, control and reduction of such emissions (Commission delegated Regulation (EU) 2023/2772, 2023).

Only 35% of companies listed in the WIG20 index provide any information on pollution (ESRS E2) (Table 2). These are PKNORLEN, LPP, KGHM, CCC, KETY, BUDIMEX, PGE. The Orlen Group discloses the most comprehensive information on pollution, covering all subcategories through emissions monitoring, implementing internal regulations and undertaking a set of measures aimed at reducing negative impacts on the environment (PKN Orlen S.A., 2025). Although not required, the company additionally addresses noise pollution. There are also other noteworthy initiatives undertaken by WIG20 index companies. For instance, the LPP Group has been a member of the Zero Discharge of Hazardous Chemicals (ZDHC) initiative since 2020 and thus fully complies with the Manufacturing Restricted Substances List (MRSL) established by the organisation (LPP S.A., 2025). Many companies listed in the WIG20 index, including the ones representing banking and financial sector, refrain from publishing information on pollution, arguing that it is not relevant to their operations.

Table 2.

The compliance of the WIG20 index companies with ESRS E2: Pollution

WIG20 index companies	ESRS E2: Pollution					
	Pollution of air	Pollution of water	Pollution of soil	Pollution of living organisms and food resources	Substances of concern/very high concern	Micro-plastics
PKOBP	x	x	x	x	x	x
PKNORLEN	Emissions reduction	Emissions reduction	Low relevance	Low relevance	Emissions reduction	Monitoring
PZU	x	x	x	x	x	x
PEKAO	x	x	x	x	x	x
DINOPL	x	x	x	x	x	x
ALLEGRO	x	x	x	x	x	x
SANPL	x	x	x	x	x	x
LPP	x	x	x	x	Roadmap to Zero ZDHC	x
KGHM	Monitoring	Monitoring	Monitoring	x	Monitoring	x
CDPROJECT	x	x	x	x	x	x
CCC	No emission	No emission	No emission	x	No emission	Internal regulations
MBANK	x	x	x	x	x	x
ZABKA	x	x	x	x	x	x
ALIOR	x	x	x	x	x	x
KETY	Monitoring	Monitoring	x	x	Monitoring	Monitoring
BUDIMEX	Monitoring	Monitoring	Monitoring	x	Monitoring	x
PGE	Monitoring	Monitoring	Monitoring	x	x	x
KRUK	x	x	x	x	x	x
ORANGEPL	x	x	x	x	x	x
PEPCO	x	x	x	x	x	x

Source: Own study.

3.3. Water and marine resources

Water and marine resources (ESRS E3) constitutes the third component of the environmental disclosure framework, addressing, in particular, water consumption, water withdrawals, water discharges, water discharges in the oceans as well as extraction and use of marine resources (Commission delegated Regulation (EU) 2023/2772, 2023). Consequently, following Commission delegated Regulation (EU) 2023/2772 (2023) the undertakings shall implement policies aimed at improving water management within their own operations and throughout the upstream and downstream value chain.

Only 40% of companies listed in the WIG20 index provide any information on water and marine resources (ESRS E3), with their disclosures strongly focusing on water consumption. These are: PKOBP, DINOPL, LPP, KGHM, CCC, KETY, BUDIMEX and PGE (Table 3). Regarding the KGHM Group, key objectives encompass reducing the emission of pollution into water bodies and ensuring the efficient management of resources, however no measurable targets related to water resources and water pollution have been established (KGHM S.A., 2025). The Budimex Group has already adopted the Water Footprint Policy aimed at defining and establishing the principles and criteria governing activities related to water and wastewater management within the Group's operations and its value chain (Budimex S.A., 2025). Overall, companies concentrate their activities on monitoring and optimising water consumption, including the implementation of water-saving technologies.

Table 3.

The compliance of the WIG20 index companies with ESRS E3: Water and marine resources

WIG20 index companies	ESRS E3: Water and marine resources	
	Water	Marine resources
PKOBP	Monitoring	x
PKNORLEN	x	x
PZU	x	x
PEKAO	x	x
DINOPL	Internal regulations	x
ALLEGRO	x	x
SANPL	x	x
LPP	Monitoring	x
KGHM	Monitoring	x
CDPROJECT	x	x
CCC	Plan preparation	x
MBANK	x	x
ZABKA	x	x
ALIOR	x	x
KETY	Monitoring	x
BUDIMEX	Water Footprint Policy	x
PGE	Monitoring	x
KRUK	x	x
ORANGEPL	x	x
PEPCO	x	x

Source: Own study.

3.4. Biodiversity and ecosystems

The biodiversity and ecosystems (ESRS E4) represents the fourth component of the environmental disclosure framework, addressing, in particular, the resilience of the undertaking's strategy and business model with respect to biodiversity and ecosystems, as well as their alignment with relevant local, national and global public policy objectives concerning biodiversity and ecosystems (Commission delegated Regulation (EU) 2023/2772, 2023). Consequently, following Commission delegated Regulation (EU) 2023/2772 (2023) the companies shall adopt policies to manage its “impacts, risks, dependencies and opportunities related to biodiversity and ecosystems”.

Only 35% of companies listed in the WIG20 index provide any information on the biodiversity and ecosystems, with the scope and depth of the disclosure varying depending on the company profile. These are: PKNORLEN, LPP, KGHM, CDPROJECT, MBANK, ZABKA and BUDIMEX (Table 4). The Orlen Group, for instance, adopted the Biodiversity Policy in 2023 and plans to implement the Biodiversity Action Plan to 2030 in the coming years (PKN Orlen S.A., 2025). The LPP group strengthens its commitment to the use of bio-based certified materials, primarily cotton (Cotton made in Africa, CmiA) and viscose fabrics (LPP S.A., 2025). The Budimex Group collects data, monitor impacts and has already adopted internal regulations regarding the biodiversity and ecosystems (Budimex S.A., 2025). Additionally, it has established the following objectives: analysing the interdependencies between the company's operations and biodiversity, evaluating its impacts on biodiversity, and conducting calculations to determine its Corporate Biodiversity Footprint (CBF) in 2025. Despite discrepancies between actual and expected measures, all companies referring to ESRS E4 acknowledge the importance of protecting the biodiversity and ecosystems and, very often, actively engage in initiatives aimed at their preservation and restoration.

Table 4.

The compliance of the WIG20 index companies with ESRS E4: Biodiversity and ecosystems

WIG20 index companies	ESRS E4: Biodiversity and ecosystems			
	Direct impact drivers of biodiversity loss	Impact on the state of species	Impacts on the extent and condition of ecosystems	Impacts and dependencies on ecosystem services
PKOBP	x	x	x	x
PKNORLEN	Internal regulations	Low relevance	Monitoring	Internal regulations
PZU	x	x	x	x
PEKAO	x	x	x	x
DINOPL	x	x	x	x
ALLEGRO	x	x	x	x
SANPL	x	x	x	x
LPP	Monitoring	Monitoring	Monitoring	Monitoring
KGHM	x	Low relevance	Low relevance	x
CDPROJECT	x	x	Plan preparation	Not relevant
CCC	x	x	x	x

Cont. table 4.

MBANK	Internal regulations	x	x	Internal regulations
ZABKA	Low relevance	Low relevance	Low relevance	Low relevance
ALIOR	x	x	x	x
KETY	x	x	x	x
BUDIMEX	Internal regulations	Internal regulations	Internal regulations	Internal regulations
PGE	x	x	x	x
KRUK	x	x	x	x
ORANGEPL	x	x	x	x
PEPCO	x	x	x	x

Source: Own study.

3.5. Resource use and circular economy

The resource use and circular economy (ESRS E5) constitutes the fifth component of the environmental disclosure framework, addressing, in particular, “the transition away from extraction of non-renewable resources and the implementation of practices that prevent waste generation” (Commission delegated Regulation (EU) 2023/2772, 2023). This is, however, the environmental matter that is receiving a growing attention from scholars, investors and financing organizations.

60% of companies listed in the WIG20 index provide information on the resource use and circular economy (ESRS E5), albeit with considerable variation in both scope and level of detail. These are: PKNORLEN, DINOPL, ALLEGRO, LPP, KGHM, CCC, ZABKA, KETY, BUDIMEX, PGE, ORANFEPL, PEPCO (Table 5). The Allegro Group, for instance, has adopted the Circularity and Waste Policy to address the resource use and circular economy. Its key objective is to achieve 100% sustainable packaging in Allegro Group’s own operations by 2028, mitigating the environmental impacts of waste management and fostering a closed-loop approach through the application of eco-design principles, waste reduction, reuse, and recycling across all stages of the product life cycle (Allegro S.A., 2025). The Kęty Group has declared a 75% share of aluminum scrap in extruded products and committed to increasing the share of recyclable packaging films and laminates by 5% by 2025 compared to the base year of 2020 (Kęty S.A., 2025). On the other hand, Dino Polska Group has not identified any significant risks and opportunities related to the transition towards a circular economy. Consequently, although the company declares “reducing the amount of waste generated, proper segregation of waste and minimising commodity losses”, it has not specified any quantitative targets (Dino Polska S.A., 2025). The remaining WIG20 index companies mainly employ qualitative disclosure to communicate their resource use and circular economy framework, with a focus on monitoring and optimising resource reuse and waste management throughout the value chain and systematically applied practices.

Table 5.

The compliance of the WIG20 index companies with ESRS E5: Resource use and circular economy

WIG20 index companies	ESRS E5: Circular economy		
	Resources inflows, including resource use	Resources outflows related to products and services	Waste
PKOBP	x	x	x
PKNORLEN	Monitoring	Monitoring	Monitoring
PZU	x	x	x
PEKAO	x	x	x
DINOPL	Low relevance	Low relevance	Monitoring
ALLEGRO	Circularity and Waste Policy	Circularity and Waste Policy	Circularity and Waste Policy
SANPL	x	x	x
LPP	Monitoring	Monitoring	Monitoring (Reduction, reuse and recycling)
KGHM	Monitoring	Monitoring	Monitoring (Reduction, reuse and recycling)
CDPROJECT	x	x	x
CCC	Monitoring and internal regulations	Monitoring and internal regulations	Monitoring (Reduction, reuse and recycling)
MBANK	x	x	x
ZABKA	Monitoring	Monitoring	Monitoring
ALIOR	x	x	x
KETY	Monitoring	Monitoring	Monitoring
BUDIMEX	Plan preparation	Plan preparation	Monitoring (Reduction, reuse and recycling)
PGE	Monitoring	Monitoring	Monitoring
KRUK	x	x	x
ORANGEPL	Monitoring	Monitoring	Monitoring
PEPCO	Monitoring	Monitoring	Monitoring

Source: Own study.

4. Conclusions

The analysis of the WIG20 index companies and their compliance with EU ESG environmental matters (E) leads to the double-nature conclusions. It reveals though that while the companies demonstrate awareness of their obligations regarding non-financial environmental disclosure, the quality and consistency of their reporting remain limited. Most of them still heavily rely on descriptive, qualitative information, with quantitative data provided primarily in the category of climate change and GHG emissions. Moreover, there are significant asymmetries in the length, structure and reliability of disclosures across companies, largely due to the absence of a common methodology and standardized provisions, with the exception of GHG reporting.

Consequently, to ensure full compliance with the evolving EU ESG regulations and enhance their robustness, the WIG20 index companies should broaden the scope and improve the quality of their environmental disclosures. This requires the promotion of uniform reporting standards,

the adoption of comparable indicators, and the development of tools. Ultimately, greater transparency, standardization, and comparability are essential to enable stakeholders to navigate and evaluate corporate environmental performance more effectively.

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THE POTENTIAL OF DIVERSITY. DIRECTIONS OF DEVELOPMENT OF METROPOLIS

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Purpose: The area of interest focuses on the functioning and development of the only officially established metropolis in the country to date, namely the Upper Silesian-Dąbrowa Basin Metropolis, covering a vast urban area. Despite functioning in a relatively culturally homogeneous region, almost every city in the Upper Silesian area, depending on its character, chooses different paths of development, focusing on the potential that constitutes its greatest value, distinguishing it from others.

The article focuses mainly on issues related to the cultural potential of the cities selected for analysis, which differ in terms of their origins, degree of economic development and cultural potential.

Since one of the key objectives of creating a metropolitan area was to establish conditions for the harmonious and sustainable development of all its elements, it seems obvious to ask how this process is progressing almost a decade after the creation of the Silesian Metropolis.

Project/methodology/approach: The article is explanatory and descriptive in nature.

The research methods adopted in this study indicate a qualitative type of research. These include both observation techniques and content and document analysis, carried out on the basis of observed phenomena and facts occurring in urban space. Based on an analysis of the literature on the subject and existing factual data (desk research), the process of development and creation of selected urban areas within the Upper Silesian-Dąbrowa Basin Metropolis will be presented.

Findings: One of the key assumptions related to the establishment of an administrative metropolitan area is to ensure the balanced/symmetrical development of the municipalities and cities that comprise it, in accordance with the principle that bigger is better. Hence the need to look at some of the phenomena occurring in selected areas of the Upper Silesian-Dąbrowa Basin Metropolis, established almost a decade ago, with particular emphasis on the implementation of their culture-creating functions and the development of creative industries.

Originality/value: The innovative aspect of the article lies in the analysis of the development directions adopted by selected cities, the first officially established metropolis in the country, with particular emphasis on creative industries. The results of the analysis and the conclusions drawn may allow for the use and implementation of similar solutions in other cities in order to stimulate their future development and build their own image.

Keywords: metropolitan area, cultural heritage, revitalisation, cultural development, creative industries.

Category of the paper: empirical research (observation) and desk research.

1. Introduction

The article focuses on the problems of the functioning and development of the only officially established metropolis in the country to date, covering a vast urban area known as the Upper Silesian Agglomeration.

The 1990s brought political and economic changes to Poland, and with them began the era of postmodernity. The industrial era came to a natural end.

The Upper Silesia region, whose character and development were inextricably linked to industry, had to redefine itself in the face of changing realities.

The region's potential was recognised in its size and diversity, which led to plans to transform the Upper Silesian area into a metropolitan area.

The idea of creating a Silesian metropolis first emerged in 2007, when 14 municipalities decided to establish the Upper Silesian Metropolitan Union.

On the website of the Upper Silesian Metropolitan Union, which initiated the creation of the then 'Silesia' Metropolis, we read that its primary goal is: 'to create a dynamically developing metropolitan centre capable of effectively competing with other metropolitan centres in the country and in Europe'¹.

Ten years since the creation of the Upper Silesian Metropolitan Union – on 16 March 2017, the Polish Senate finally passed a bill on the metropolitan union in the Silesian Province.

Currently, the **Upper Silesian-Dąbrowa Basin Metropolis** – as it was ultimately named – comprises 41 municipalities (including cities, with a total population of over 2 million), which, despite their diverse origins and historical backgrounds, are united and characterised primarily by the region's common post-industrial heritage.

Based on his research on the potential of the creative industry in the Upper Silesian conurbation, even before the official establishment of the Metropolis, Professor Andrzej Klasik concluded that it was possible to 'build' and promote the development of:

- Katowice as a city of high culture, music and the music industry.
- Bytom as a city of performing arts and cultural events in a post-industrial setting.
- Zabrze as a city of technical monuments and post-industrial tourism (Klasik, 2014).

A summary of the eight years of the officially established Metropolis encouraged reflection on how such a large area in terms of territory and population is developing, which, despite many similarities, is a mosaic of diverse potentials that make it up.

¹ www.silesiametropolia.eu/s,9.htm z dn. 27.12.2024.

2. Materials and methods

Sticking to the strict definition or description of the set of characteristics that define a metropolitan city, in addition to the quantitative dimension, which states that "agglomerations with at least half a million inhabitants or more can be included in this category, there are also qualitative criteria, such as the excellence of services, institutions and facilities, innovative potential in technical, economic, social, political and cultural terms, as well as the uniqueness and specificity of the place" (Jałowiecki, Szczepański, 2006, pp. 210-211).

This obviously raises the **question** of the effect and scale of the synergy achieved in the development of the areas comprising the newly established Silesian Metropolis. This question is therefore the focus of the research presented in this article.

The analysis of the development of municipalities associated with the Metropolis has been narrowed down, for understandable reasons, to a few examples of cities, such as the capital of the Metropolis, Katowice, and selected cities located in the centre of the Metropolis, such as Bytom, Zabrze and Ruda Śląska. The aim of this analysis is to conduct a comparative study on how their creative and cultural potential is being utilised.

The research undertaken for the purposes of this study is explanatory and descriptive in nature. The research method used is a contribution to a study on the socio-cultural development trends of selected cities in the Upper Silesian-Dąbrowa Basin Metropolis.

The technique used was primarily observation of the phenomena under study, occurring in the cities selected for analysis, based on a thorough analysis of revitalisation processes, cultural changes and the development of creative industries. These observations were also based on an analysis of documents confirming the above phenomena and their scale. Desk research was also used, referring to the theories of researchers focusing on the issues of urban revitalisation and creativity.

3. Results, discussion and conclusions

3.1. The first metropolis

The basic assumption behind merging smaller territorial structures into larger administrative and economic entities is to strengthen their joint potential.

‘Clothing’ units that contribute their potential in a jointly functioning entity enriches the whole, and larger units find it easier to stand out from the rest.

Mutual support for activities serving common interests also provides an opportunity for much more rational management of budgetary resources.

Some of these activities were undertaken long before the idea of creating a joint metropolis emerged, such as the existence of the Municipal Transport Union (currently the Metropolitan Transport Union), which operates in the field of rational, joint passenger transport policy.

Another spectacular example of a very effective form of such activities is the joint promotion initiative of the 'product' known as the Silesian Voivodeship Industrial Monuments Route, established in 2005. As we read on the Trail's website: "The Industrial Monuments Route is a thematic, car-based tourist and cultural route connecting sites related to the industrial heritage culture of the Silesian Province. Currently, it comprises 40 sites"².

It is also an award-winning tourist product. In 2008, it received the Golden Certificate of the Polish Tourist Organisation for the best tourist product in the country.

In January 2010, it was the only trail from Central and Eastern Europe to join the European Route of Industrial Heritage (ERIH).

For four years, a joint initiative has also been implemented to promote interesting historical sites in the region under the name 'Kierunek GZM' (Destination GZM)³.

The effectiveness and efficiency of this type of joint action is proof that joint activities have a much greater chance of success, and promotion under a common banner is much more effective than individual activities, which often require constant resistance to strong competition.

3.2. The 'periphery' of the metropolis

Although many joint, successful initiatives and projects have emerged in the Metropolis area, it would be overly optimistic to say that this area is developing evenly.

Eight years have passed since the official establishment of the Metropolis, and it is becoming increasingly clear that the creation of the Metropolis with its capital in Katowice has resulted in the concentration of metropolitan functions mainly in that area. Thus, a so-called satellite system has crystallised, with Katowice occupying a central position, while the remaining 40 municipalities in the region, depending on their size, potential and the inventiveness of their authorities, are developing more or less in parallel.

Such a huge urban organism as a metropolis must, by its very nature, be highly diverse internally, but this is not a problem; it can even be considered an undoubted asset of a region where such enormous diversity can be found: cultural potential, social capital, rich landscape and urban and architectural layouts.

The problem is rather whether, in such a large and diverse urban organism, there is a real chance for the parallel development of all the areas belonging to it.

² <https://zabytkitechniki.pl/staticcontent/27320> z dn. 31.03.2025.

³ <https://www.slazag.pl/kierunek-gzm-2025-festiwal-mikrowypraw-po-gornoslasko-zaglebiowskiej-metropolii> z dn. 25.06.2025.

3.3. Diversity in unity – on the development paths of selected cities in the Metropolis

According to a 2013 report by the 'Financial Times', even before the official establishment of the Metropolis in question, it was estimated that: 'Apart from Katowice, Chorzów, Gliwice, Tychy, Bielsko-Biała, Żory, Sosnowiec, Częstochowa and Mysłowice are the so-called cities of the future of the Silesian Province, which have a chance for great development'⁴.

To this day, Katowice remains the undisputed leader in the region, having been distinguished in as many as six categories prepared by the British daily, partly because the city places great emphasis on the development of so-called leisure and creative industries, which proves to be extremely important for potential investors.

This raises the question of what really determines the success of some cities in the region compared to others belonging to the newly created Metropolis?

One of the publications issued by the Krakow Institute for Urban Development discusses, among other things, the importance of cultural functions in the process of urban development and revitalisation: "The process of deindustrialisation began in the 1960s in Western Europe. In Poland, the industrial function was maintained until the 1990s. The industrial heritage left behind gradually deteriorated. In the 21st century, measures were taken to revitalise these spaces. It turned out that former industrial buildings are attractive places for cultural activities. Cultural institutions began to give these places a new identity and enabled the use of post-industrial facilities for other functions" (Siwirska, 2017, p. 131).

An excellent example of investment in post-industrial potential is the city of **Zabrze**, which has been hailed today (in line with the predictions of Professor A. Klasik) as the Polish capital of industrial tourism.

In addition to the well-known historic Guido Mine, Zabrze's major tourist attractions also include (awarded the Main Prize in the category of cultural heritage protection and revitalisation) an underground tourist route, namely the Main Key Heritage Adit.

However, it is important to note that this type of revitalisation entails the development of other initiatives that are important for increasing the attractiveness of the city, related to the location of prestigious cultural events in their area, using the original space.

The cultural creativity of a city is now recognised worldwide as a decisive factor in determining the status, value and attractiveness of a place. These topics were also the focus of the Creative Cities Congress, organised in 2018 in **Katowice** – the second UNESCO Creative City in Poland.

Suffice it to mention the Katowice Culture Zone created around the 'Spodek' Sports and Recreation Hall, which also includes the revitalised post-industrial facilities of the former 'Katowice' Mine, adapted into the buildings of the Silesian Museum, and one of the most

⁴ Dziewięć miast naszego regionu, które wyróżnił „Financial Times”. To właśnie do nich należy przyszłość. Dziennik Zachodni (2019.04.12).

modern music buildings in Europe, namely the building of the Polish National Radio Symphony Orchestra (photo no. 1). All these facilities have become venues for prestigious cultural events.



Figure 1. The building of the Polish National Radio Symphony Orchestra in Katowice.

Source: own work.

As Charles Landry, a world-renowned expert on the importance of creativity in urban development, writes:

"We need to change the question: not what value imagination, creativity, culture, heritage, art or design have for urban development. Instead, what is the cost of not thinking about imagination, creativity, culture, design, art and heritage? Name a city that is important on a global scale but weak in these areas. All cities need to gain recognition and be on the global radar in order to increase their prospects for wealth creation and realise their potential. Creativity, cultural distinctiveness, art and a dynamic creative economy are seen as resources and assets in this process" (Landry, 2010, p. 3).

Hence, the lack of appreciation for such an important aspect of city life as culture in its broadest sense and the creative industries associated with it often results in serious consequences in the form of the marginalisation of cities.

Kazimierz Krzysztofek also writes: "The culture of a city is reflected in the character of the space, which is a chronicle of the city's life and a record of its history. The city is both a product and an expression of culture, and at the same time it creates a specific environment for the promotion of culture and its fullest experience thanks to the possibility of confronting many trends and direct access to various forms of its expression" (Krzysztofek, 2005, pp. 37-39)

It would seem that cities with centuries-old traditions and well-developed historic centres, such as **Bytom**, are in a privileged position in terms of exploiting their cultural potential.

Unfortunately, the post-war years were a period of predatory mining policies under the city, resulting in the demolition of many historic quarters, as described by Agata Listoś-Kostrzewa, among others (Listoś-Kostrzewa, 2021).

Nevertheless, even then, the city was important on the cultural map of Silesia due to its numerous cultural initiatives and the location of one of the most prestigious cultural institutions, the Silesian Opera.

The period of local government reconstruction after 1989 was not kind to the city. This was due to the rapid restructuring of industry, which led to a massive increase in unemployment, impoverishment and a rapid outflow of population. For Bytom, this was another difficult moment in its history, following a period of exploitative exploitation.

Therefore, hope appeared with the allocation of a special fund to the city under the Regional Operational Programme of the Silesian Province for 2014-2020 for the comprehensive revitalisation of the city – the amount of EUR 100 million⁵.

Despite such enormous support, a year before the end of the Programme, it turned out that the allocated funds had not been fully utilised and the opportunity for development had not been taken advantage of. Apart from a few investments, both cultural and social, which were implemented thanks to EU funds.

Currently, Bytom lags behind other developing centres in the region, so it is important to remember that the opportunity offered by belonging to a common entity – a metropolis – does not relieve city authorities of their responsibility to implement effective urban policy in municipalities.

However, what gives cause for optimism and allows us to believe that one of the most beautiful cities in the agglomeration will not succumb to complete degradation is the fact that the city has managed to maintain a dance scene, whose origins are linked to the activities of the Silesian Dance Theatre.

The opportunity for cultural development in Bytom, as predicted by Andrzej Klasik (Klasik, 2014), is still seen in, among other things, the ‘development of performing arts and cultural activities in industrial spaces’, thanks to, among other things, the Dance Theatre Department of the Academy of Theatre Arts in Krakow located here and the activities of the Bytom Dance and Movement Theatre Rozbark.

In 2024, Bytom also became the venue for the AGLO Festival, an initiative of Zbigniew Rokita, one of the most popular writers and screenwriters of the younger generation and winner of the NIKE Literary Award.

"There has never been a festival like this in Silesia before, and the 770th anniversary of Bytom, one of the oldest cities in our AGLOmeration, is a perfect opportunity to talk about this region, its inhabitants, history and future. [...] Bytom Cultural Centre will welcome interesting guests, and with them their good books, performances, workshops and walks around Bytom"⁶.

Fortunately, the festival was repeated the following year, with the hope that it would become a permanent fixture in the city's calendar of important cultural events.

Thanks to such initiatives, Bytom, perceived in recent years as a city destroyed and battered, has once again become an arena for interesting cultural events.

⁵ Regionalny Program Województwa Śląskiego na lata 2014-2020 - Ministerstwo Funduszy i Polityki Regionalnej.

⁶ <https://www.bytom.pl/aktualnosci/index/AGLO-Festiwal-czyli-trzy-dni-z-Bytomiem-i-Slaskiem-/idn:41629>

It is also worth noting that the effects of the partial revitalisation that began in the city a few years ago are becoming increasingly noticeable in its space, restoring at least a semblance of its former glory to the city.

Unfortunately, observation of some Silesian cities proves that so-called architectural revitalisation is not always accompanied by effective social revitalisation. The renewal of degraded urban spaces does not always entail giving them new, functional meanings.

Examples of such ineffective revitalisation practices in the region include investments carried out in **Ruda Śląska**.

One of the most spectacular and seemingly successful examples of revitalising attractive post-industrial space in Ruda Śląska was the implementation of a project to renovate the historic Ficinus workers' housing estate.

The Ficinus Colony is a historic workers' housing estate, which is one of the oldest preserved examples of patronage housing in Upper Silesia. The uniqueness of the colony lies in the use of natural sandstone, obtained from nearby quarries, as a building material, which gives it its unique and original value (photo no. 2).



Figure 2. Ruda Śląska – Ficinus Workers' Colony.

Source: own work.

However, as we read: 'For years, Ficinus has failed to meet certain requirements set by the Marshal's Office of the Silesian Province as the institution supervising the Industrial Monuments Route. The threat that Ruda Śląska will practically cease to exist on this route is real' (Pilcok, 2015).

As Andrzej Majer writes: 'Revitalisation is a term that is, however, commonly misused to refer to all types of renovations, adaptations or modernisations, even on a small scale. [...] Construction activities are the most important components of revitalisation, but they do not replace it; there is still a lack of understanding that the people affected are equally important' (Majer, 2014, p. 59).

The lack of a distinct aura in the city that would foster and support the so-called creative industries, which give functional and social value to interesting urban spaces, and the underestimation of the importance of cultural heritage, which shapes the character and specificity of a place (a kind of *genius loci*) is probably the reason for the slowest progress of the metropolisation process here in comparison with neighbouring cities in the conurbation.

Today, the city can be described, without exaggeration, as a ‘cultural desert’ in the middle of the metropolis.

4. Summary

Every city is a complex organism made up of various elements. For a city to develop properly, it must ensure development on various levels.

It is also understandable that cities have their own specific conditions for this development. However, this does not mean that city development planning should focus only on one prominent area of ‘specialisation’, neglecting or ignoring the others. Sooner or later, this type of approach will have a negative impact on its overall development.

A city is made up of people who, in addition to the opportunity to work and live there, want to fulfil other significant needs, such as participation in culture or broadly understood entertainment and leisure.

However, as can be seen from observations of individual cities in the Upper Silesian Agglomeration, now the Upper Silesian-Dąbrowa Basin Metropolis, not all cities have such a comprehensive vision of their development.

One need only look at the cities in the region to see that the most successful ones are those that include the promotion of cultural heritage and the development of the so-called ‘creative industries’ in their strategy, making their space attractive enough to attract the most entrepreneurial and creative people, who are the driving force behind cities such as Katowice, discussed here. Others, after years of neglect, are trying to revive their post-industrial creative potential, such as the capital of industrial tourism, Zabrze, or to revitalise the city space by introducing innovative cultural projects, such as Bytom.

Unfortunately, there is no shortage of examples of cities that are still stuck in a deadlock in this respect, becoming the proverbial ‘cultural desert’ in the centre of a metropolis, as exemplified by Ruda Śląska discussed here. The commonly carried out ‘revitalisation’ is unfortunately limited here to architectural renovation, which is not always synonymous with the social and cultural revival of the space, as shown by the example of the historic ‘Ficinus’ colony in Ruda Śląska.

A ‘living’ city is not only broadly understood infrastructure and physical space, it is above all cultural wealth, which overlaps with the material elements of space and creates a sense of place, belonging, identification with space, in a word, a sense of identity. It is people who give places their atmosphere, specificity and meaning.

Without respect for this special value of the city, which is its broadly understood cultural heritage, it will be difficult to expect success in other areas of life, including economic ones.

In summary, based on the examples given in the article, almost a decade after the establishment of the Silesian Metropolis, it is clear that such a large and diverse urban area in terms of potential is showing clearly concentric development. This means that the most intensive development of metropolitan functions is visible primarily in the capital of the region, Katowice, which today stands out as one of the most dynamically developing and important centres in the country, both in economic and cultural terms.

At the same time, although not as intensively, some large urban centres are developing, such as Gliwice and Bielsko-Biała, with historical metropolitan traditions and great socio-economic, cultural and scientific potential.

Other urban centres, depending on their character or potential, but also as a result of historical turmoil, such as Bytom, are trying to define their place on the map of the Upper Silesian region. This process, although definitely uneven in relation to the centre, which is Katowice, is slowly taking place, as can be seen from the initiatives developed and undertaken there.

It is difficult to expect that the establishment of a joint urban entity such as a metropolis will unconditionally ensure fully balanced development of all its elements.

The metropolis in question was 'stitched together' from completely different fragments, which did not give all its municipalities equal opportunities at the outset. It should also be remembered that each municipality has its own local government and the ability to make autonomous decisions regarding its development.

Thus the statement that the center develops at the expense of peripheral areas may not be entirely justified. In such a diverse and extensive urban entity, each municipality can find and define its role within it, becoming an original element against the backdrop of others; however, much depends on creating an accurate vision of development, based on its own potential and its consistent implementation, as Charles Landry wrote: "City leaders should simultaneously understand how material changes affect the emotional and symbolic perception of space and the subtle systems of the city's social ecology" (Landry, 2013, p. 38, Kinal, 2015, p. 19).

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RESPONSIBILITIES, PRUDENCE AND ECOLOGICAL IMAGINATION IN THE POSTGROWTH CONCEPTION

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Purpose: The aim of the paper is to analyze the categories of responsibility, prudence and ecological imagination, their mutual relations and place in the debate on postgrowth. These concepts are analyzed in the context of the issue of departure of growth, contemporary environmental threats and the complex relationship between humans and nature.

Methodology: The article uses a review of the literature on postgrowth and degrowth, in particular the publications of the French philosopher, economist and pioneer of the degrowth movement Serge Latouche, the British economist and sustainable development researcher Tim Jackson, and the philosopher and researcher of the rhetoric of the Anthropocene Ewa Bińczyk. The literature was analyzed in terms of selected notions and the contexts in which they appear.

Finding: In the era of climate threats and environmental challenges, creating alternative post-capitalist visions of the future is a key responsibility of contemporary humanities, social sciences, politics, and economics. The three interconnected themes analyzed in this article - responsibility, prudence, and ecological imagination - play a key role in understanding of capitalism's harmful delusions and formulating practical solutions for the future. Currently, researchers and humanities scholars engaged in the postgrowth movement play a particularly important role in awakening ecological imagination, preparing the foundations for social change, and creating feasible utopias that take into account environmental costs and planetary constraints.

Research Implications: The results suggest that the contemporary climate crisis is not only an ecological and economic crisis but above all a crisis of the social imagination, which is stuck in the irrational "iron cage" of growth.

Practical Implications: The visions of a post-growth future by promoting an ecological imagination and an ecological economy, they can initiate a departure of the dominant economic model.

Social Implications: The results can encourage a shift in thinking about economic growth, stimulate citizens' imaginations, sensitize them to environmental issues, and inspire education and policies aimed at building a degrowth society.

Originality/value: This article reconstructs the fundamental assumptions of the postgrowth project. It demonstrates that a different economic model based on the pillars of prosperity, sustainability, flow, and a symbiotic relationship between humans and nature, is possible.

Keywords: postgrowth, degrowth, Anthropocene, responsibility, prudence, ecological imagination.

Category of the paper: Review Paper.

1. Introduction

The twenty-first century, referred to by researchers as the Anthropocene, is an era of dramatic environmental challenges and complex relationships between humans and nature. The growing climate crisis and increasing economic disparities urge us to move away from the growth paradigm associated with continuous GDP growth. In the Anthropocene, it is becoming increasingly clear that economic strategies based on continuous growth in consumption and production do not translate into improved social welfare and are unsustainable on a planet with limited resources (Jackson, 2015, pp. 25-44).

At the same time, as Ewa Bińczyk demonstrates, the Anthropocene era is a time when, on the one hand, citizens of developed countries are experiencing a growing sense of empowerment and awareness of their irreversible impact on the planet, while on the other hand, they are accompanied by a feeling of powerlessness and stagnation (Bińczyk, 2018, pp. 47-76). This passivity and helplessness are reinforced by dominant economic systems that invariably fetishise growth and fail to take environmental costs into account in economic forecasts, ineffective and inconsistent geopolitical solutions, and a media industry that promotes extremely individualistic attitudes and hyper-consumption (Bińczyk, 2018, 274-275). The rhetoric used in late capitalism effectively limits the public imagination and means that, despite the real threats, we are unable to question the need for continuous growth in practice. It is therefore not surprising that the belief that it is easier for us to imagine the end of the world than the end of capitalism still prevails.

The response to the challenges and dilemmas of the human era are socio-economic models of greening the economy and cooling down resource consumption, which are alternatives to the primacy of growth and *business as usual*. Increasingly, projects such as postgrowth and degrowth are coming to the fore, redefining our understanding of development, prosperity and the relationship between humans and nature.

The aim of these considerations is to present the idea of departure of growth in the context of three categories that are key to understanding it: responsibility, prudence and ecological imagination. These concepts not only form the systemic political and economic framework of the postgrowth project, but above all constitute its axiological and ethical foundation. As I will attempt to prove, they are not abstract slogans, but have a real impact on the way we think about politics, economics, education and lifestyles. Their presence in the postgrowth discourse allows us to better grasp its specificity and understand the assumptions underlying the socio-cultural transformation that postgrowth entails. In this article, I will refer to the works of Serge Latouche, Tim Jackson and Ewa Bińczyk in order to explain the important role they play in building a degrowth society and shaping symbiotic and sustainable relations between humans and nature. The whole discussion is based on the assumption that the current climate crisis is not only an ecological and economic one, but above all a crisis of social imagination, which is stuck in the irrational 'iron cage' of growth.

2. On the idea of departure of growth

The idea of departure of growth emerged as a reaction to the ever-increasing social and environmental costs associated with unlimited economic growth. Although this postulate is now firmly established in academic and political discourse, its origins date back to the 1970s. It was then that the report for the Club of Rome, *The Limits to Growth*, was published, predicting when the population would reach ecological barriers (Meadows et al., 1972). The 1970s also saw the emergence of a social movement known as *décroissance* (eng. degrowth) in French intellectual circles. The authorship of this term is attributed to André Gorz (Kallis, Demaria, D'Alisa, 2015, p. 37), while the creative development and promotion of the idea of departure of growth is attributed, among others, to the French philosopher and economist Serge Latouche (Latouche, 2009, pp. 7-13). This movement laid the foundations for a number of diverse political, economic and social programmes, which are collectively referred to as postgrowth concepts (Skrzypczyński, 2020, pp. 7-13).

Giorgios Kallis, Federico Demaria and Giacomo D'Alisa, some of the leading theorists of postgrowth, describe it as a planned reduction in production and consumption in highly developed countries, aimed at increasing human well-being and improving environmental conditions (Kallis Demaria, D'Alisa, 2015, pp. 41-43). For Latouche, on the other hand, postgrowth is not only a proposal to slow down the pace of growth, but a project of a profound social and cultural transformation. As Latouche puts it: 'The degrowth society project is eminently revolutionary. We are talking about cultural change, as well as changes in the legal structure and relations of production' (Latouche, 2009, p. 66). Postgrowth therefore focuses not only on reorganising the economy, but also represents a conscious shift towards building a fair, sustainable society that operates within planetary boundaries.

As the postgrowth project is extensive and internally diverse, it encompasses a whole range of concepts that criticise growth, including: ecological economics, doughnut economics, ecofeminism, negative growth and the aforementioned degrowth (Skrzypczyński, 2020, pp. 7-13). In the source literature on the subject, the concepts of postgrowth and degrowth are often equated and used interchangeably, although degrowth is currently considered a more revolutionary and radical model than postgrowth¹. Such interpretative clues can be found in the works of Lukas Hardt and Daniel W. O'Neill (Hardt, O'Neill, 2017, p. 198) or André Reichel, who argues that degrowth is a branch of postgrowth that assumes a radical reduction in growth in all sectors of the economy (Reichel, 2016). Timothy Crownshaw expresses a similar view. While in the case of degrowth, actions are intentional and the need of departure of growth is

¹ Despite the nuances that distinguish the concepts of 'postgrowth' and 'degrowth,' in this article I will refer to both categories, treating them as convergent variations of a future without growth. The use of these terms will be consistent with the terminology adopted by the authors whose works I will refer to in this article (e.g. Serge Latouche, in outlining his vision of a future without growth, uses the term 'degrowth', while Tim Jackson more often uses the term 'postgrowth', and Ewa Bińczyk uses both categories interchangeably).

clearly declared as its overriding goal, in the case of postgrowth, the emphasis is on adapting to the decrease in the rate of growth as a kind of forced adaptation to external changes (Crownshaw, 2019, p. 117).

Despite some minor differences, it is not difficult to notice the common assumptions underlying postgrowth projects. Their distinctive and most important feature is the desire to cool down growth, resource consumption and emissions, criticism of capitalism, resistance to the fetishisation of GDP and treating it as the overriding goal of the economy and the only indicator of prosperity, moving away from the postulate of hyper-consumption in favour of limiting needs, simple living and sustainable consumption, as well as the need for profound changes in socio-cultural habits and practices.

Critical views on growth also share a common axiological core, namely the concern for current and future human well-being and the natural environment. Their aim is to outline strategies that will enable the survival of the *homo sapiens* species as a safely functioning community without exceeding the planet's limits and with respect for other forms of life (Hickel, 2019). It is worth emphasising that the ensuing changes should primarily affect developed countries and should be implemented in a spirit of global justice, without depriving the communities of poor countries of opportunities for development and the benefits that come with it (Kalis, Demaria, D'Alisa, 2015, p. 45). In addition to intergenerational justice, these models of departure of growth set the direction for changes that lead to the building of a society based on values such as community, solidarity, equality, openness, sensitivity to others, care (understood as work and care services), simplicity and sharing.

Clearly, postgrowth survival scenarios and visions of the future arranged in this vein, which constitute an alternative to the still dominant model of civilisation, not only require the courage to imagine a world with a different political and economic structure, but above all are a vision of building a committed, responsible society undergoing metabolic adjustment. The author of the work *Farewell to Growth* writes: '(...) degrowth is conceivable only in a degrowth society, or in other words within the framework of a system that is based upon a different logic' (Latouche, 2009, p. 8). British ecological economist Tim Jackson takes a similar view: '(...) that challenge compels us to develop a different kind of economic structure. But it's clear that this task isn't sufficient. We also have to find a way through the institutional and social constraints that lock us into a failing system. In particular, we need to identify opportunities for change within society – change in values, change in lifestyles, change in social structure – that will free us from the damaging social logic of consumerism' (Jackson, 2015, p. 132).

For several decades now, these researchers have been calling for a reformulation of attitudes, priorities and values that will enable the *homo sapiens* species to survive on our planet, liberate citizens from the murderous race for GDP growth, and pull them out of stagnation and fatalism. This is a shift in narrative from the language of capitalism focused on economic calculation to a language of responsibility, care and far-reaching ethical commitments adapted to current challenges. Shifting the emphasis towards ethical and moral

considerations involves revising and redefining which decisions, actions and choices we should consider prudent, reasonable and feasible in the face of the climate crisis.

Let us therefore outline some of the conditions that need to be met in order for the idea of departure of growth to have any real impact.

3. Responsibility: the ethical foundation of action

The issue of responsibility and its scope is one of the most important, frequently discussed and perhaps best recognised issues in the debate on climate threats and environmental problems. In the Anthropocene era, a time when human activity has become the dominant driving and geological force, responsibility is no longer solely a moral category, but has also become a political and economic category and the foundation for the development of societies. As Latouche notes, the politically engaged project of degrowth is much closer to the ethics of responsibility, which draws attention to the moral significance of agency and refers to the consequences of human decisions, than to the ethics of duty: ‘Whilst this is a political project, its implementation has more to do with an ethics of responsibility than with an ethics of conviction’ (Latouche, 2009, p. 66).

In the growth paradigm, responsibility is usually passed on to individuals and limited to individual consumer choices (e.g., choosing eco-friendly products or sorting waste), ignoring systemic, relational, or intergenerational conditions. Postgrowth, on the other hand, clearly rejects this reductionism and proposes a more complex and broader understanding of responsibility, which includes responsibility for our shared future, for future generations and for other species. For such an expanded scope of responsibility, it is necessary to redefine existing ethical categories and, above all, the traditional understanding of the relationship between humans and nature. According to Bruno Latour, the significant impact of humans on planetary systems and the risk of climate destabilisation have led to nature ceasing to be an ethically neutral category and a silent backdrop to human activities, and becoming an active player that we must reckon with if we want to survive as a species (Latour, 2018).

As early as 1979, an attempt was made by Hans Jonas to formulate the principles of a new ethic appropriate to technological and planetary challenges. The starting point for his project is a new ethical imperative proposed in his book *The Imperative of Responsibility: In Search of an Ethics for the Technological Age* – the imperative of responsibility, which in one of its versions reads: ‘Act so that the effects of your action are compatible with the permanence of genuine human life’ (Jonas, 1996, p. 38). The German philosopher was the first to draw attention to several key issues that, for representatives of postgrowth theories, constitute an indispensable background and starting point for their politically, socially and morally engaged considerations. Firstly, he demonstrated that our actions should be considered in terms

of their long-term effects (Jonas, 1996, pp. 58-60). Secondly, he showed that applying the principle of responsibility requires developing knowledge about the future and developing possible scenarios for rational action that will protect us from the negative consequences of our current decisions (Jonas, 1996, pp. 63-65). In other words, Jonas exposed a significant qualitative change in the possibilities of human action, placing them in broader systems of interdependence (the temporally and spatially expanded scope of human agency), which in turn translated into a change in the scope of responsibility. According to this logic, postgrowth transformation must take into account the long-term nature of human actions and the long-term nature of political and economic decisions. As Jonas emphasises, in a world dominated by technology, where the effects of our decisions and actions are long-term and difficult to predict, ethical reflection must be forward-looking, cautious, reasonable, and should take into account the welfare of those who are absent and the interests of those who are unable to speak up for themselves (including future generations, nature, biosphere).

From the point of view of the considerations carried out in the article, it is the giving of an anticipatory dimension to responsibility that constitutes the greatest value of the ethical project outlined by the German philosopher. Jonas uses 'heuristics of fear' for this purpose, turning the experience of fear for one's own future and the feeling of real danger into a tool that motivates people to take long-term responsibility and to take action to protect life (Jonas, 1996, pp. 63-64). However, according to researchers in the Anthropocene, in the current reality such a strategy will not necessarily do the job. Although the very mechanism of anticipating possible scenarios and creating constructive visions of the future based on them is undoubtedly close to the social utopias created in the postgrowth or degrowth trend, it is worth bearing in mind, as Bińczyk points out, that: 'Catastrophic thinking and focusing on possible threats attract attention, but in the long run, instead of motivating us, they effectively paralyse us' (Bińczyk, 2023, p. 133). The researcher argues that excessive catastrophism and fruitless criticism should be avoided, and, like Ewa Domańska, advocates the need to create alternative and, more importantly, feasible scenarios for the future (Bińczyk, 2023, pp. 136-137; Domańska, 2017, pp. 41-43). According to Domańska, 'creating *critical* hope' is a key responsibility of contemporary humanities and natural sciences (Domańska, 2017, p. 42). The Polish researchers are in agreement that today, as humanity, we need realistic and responsible utopias that give us hope that the future is possible. Meanwhile, political and economic discourses, including those pursued within the framework of sustainable development, are at best reactive and operate *post fatum*. Domańska clearly states that in times when conflicts and threats are intensifying, we need preventive strategies: 'showing different possibilities for coexistence and social life, as well as promoting attitudes desirable for the realisation of these possibilities' (Domańska, 2017, p. 43). Therefore, another important element, alongside responsibility, that is helpful in building committed postgrowth narratives is prudence or common sense, without which it is difficult to imagine the creation of rational protective strategies that can realistically postpone the disasters we face in the Anthropocene.

4. Prudence: practical wisdom in the service of departure of growth

The idea of Greek *phronesis*, treated as the starting point for postgrowth considerations, is directly referred to by Jackson. The British economist points out how much the use of this term has changed today. Jackson notes that: ‘in capitalism, prudence takes the form of a constant desire for accumulation, a powerful economic impulse’ (Jackson, 2023, p. 187). This means that in economies driven by profit measured by GDP growth, economic prudence and common-sense decisions by citizens have been reduced to the accumulation of capital, or more precisely, to sacrificing present consumption in the name of savings for future consumption and future material gains. Jackson bemoans the short-sightedness of such thinking and the impoverishment of the ‘commitment to the future’ (Jackson 2023, p. 190), as investments are referred to in economic parlance, to ‘short-term financial returns’ (Jackson, 2023, p. 195). Of course, this is not the kind of prudence and investment that involves ‘making money from money’ (Jackson, 2023, p. 195) that is meant in the postgrowth model. Therefore, Jackson, criticising prudence understood in this way, clearly signals the need to redefine this concept and identify a ‘new common sense’ on the basis of which a postgrowth type of economy can be built (Jackson, 2023, p. 187). Bińczyk shares a similar opinion, drawing inspiration not only from Jackson’s writings, but also pointing out that: ‘in order to ensure survival and break free from stagnation, we need to rebuild and redefine what we call common sense, abandoning above all the economic modes of so-called business as usual’ (Bińczyk, 2023, p. 191).

In his work *Postgrowth. Life after Capitalism*, Jackson returns to the historical sources of the term we are interested in, distinguishing two important interpretative clues. One of them is the practical and moral dimension of prudence, emphasised by ancient philosophy, which we find, for example, in the thought of Aristotle. Without delving into the intricacies of Stagirite ethics, I will only recall that the philosopher defined it as: ‘a lasting disposition to act based on a correct consideration of what is good or bad for a person’ (Aristotle, 2007, p. 197/1140b). Another clue that Jackson returns to is taken from Titian’s painting *Allegory of Prudence*, the far-sighted, future-oriented dynamics of practical wisdom (Jackson, 2023, pp. 186-188). In his conceptualisation of prudence, the economist emphasises that ‘prudence requires an awareness of continuity over time. (...) learning from the past, preparing for the future, and acting in the present’ (Jackson, 2023, p. 188).

The perspective he adopts rightly brings to mind Jonas’s principle of responsibility mentioned earlier. The British economist, like the German philosopher four decades earlier, argues that human actions, decisions and their possible consequences should be considered from a long-term perspective and thus treated as long-term moral commitments to the future (Jackson, 2023, p. 190). Ultimately, Jackson defines prudence as: ‘the ability to act wisely in the face of an uncertain future’ (Jackson, 2023, p. 187), which does not consist in the accumulation of material goods and income, as free-market capitalist models suggest,

but in caring for one's own future, that of one's family, and even that of all humanity (Jackson, 2023, p. 190) and on far-sighted ecological investments aimed at 'protecting the climate, the earth, the oceans, rivers, forests, animal habitats: our earthly home' (Jackson, 2023, p. 199). Prudence understood in this way counterbalances the assumptions of mainstream economics, reverses the dangerous trend of pursuing growth, expansive production and consumption, resource and energy intensity, presenting them as irresponsible, absurd and even immoral choices. The new common sense is the ability to resist the harmful delusions of capitalism and to seek solutions that will preserve the balance of ecological systems, while basing social progress on a sense of belonging, well-being, simple living, flow and symbiotic relationships between humans and nature. In other words, prudence is one of those skills that aims to stimulate the collective imagination to create bold, alternative, postgrowth visions of the future.

5. Ecological imagination: bold visions of a future without growth

By 'ecological imagination' I mean a way of thinking and designing possible future scenarios that stems from an awareness of the planetary environmental crisis and seeks to counteract its worsening in a reasonable and effective manner, thus showing that change is possible. Ecological imagination is the driving force behind a specific thought experiment that involves creating alternatives to solutions that are considered harmful, wrong, unfair and irresponsible due to their disastrous social or environmental consequences. It is a tool for encouraging the construction of realistic utopias and for setting bold and ambitious political goals that clearly take into account the dependence of the economy on the biosphere.

In the research conducted as part of the critical approaches to the growth paradigm presented in this article, we repeatedly encounter the thesis that the contemporary climate crisis is not only an ecological and economic crisis, but above all a crisis of imagination (Bińczyk, 2023; Jackson, 2023; Latouche, 2009; Srnicek, Williams, 2019). The inability to move beyond the 'iron cage of growth' in our ideas about the future seems to be one of the reasons for the stubborn persistence of the dominant economic system, despite awareness of the risks associated with it. And although scientific examples demonstrating the irrationality inherent in the blind pursuit of growth are plentiful, scenarios for greening the economy still fall short of the logic of capitalism (Bińczyk, 2023, pp. 203-226). Bińczyk recalls that, as early as 1947, Karl Polanyi recognised that the appropriation of social discourse by the logic of excess and pro-market thinking leads to a decline in social imagination, which in turn translates into a lack of in-depth pro-environmental reflection, which we have been observing for several decades (Bińczyk, 2018, p. 274). As André Reichel and Robert Perey, followed by Bińczyk, point out, it is precisely the concepts of degrowth and postgrowth that currently constitute the best 'antidote to the lack of imagination' (Reichel, Perey, 2018, p. 245), offering constructive visions

of a future without growth and creating promising ‘social utopias for the Anthropocene’ (Bińczyk, 2023, p. 16).

Latouche repeatedly emphasised the key role of imagination in shaping new approaches and perspectives for the future, treating it as the intellectual foundation of degrowth. Referring to the philosophy of Cornelius Castoriadis, the French researcher developed the project of ‘decolonising the imaginary’, which he made the driving force behind a profound political transformation leading to the emergence of a degrowth society (Latouche, 2015, pp. 192-196). Behind the performative phrase ‘decolonising the imaginary’ lies, on the one hand, the idea of social imagination borrowed from Castoriadis and, on the other hand, a critique of imperialism derived from anthropology. The term ‘decolonisation’ itself appears here in a metaphorical sense, as a kind of semantic shift, the opposite of the appropriation of the collective imagination, language and minds by the logic of capitalism (Latouche, 2015, pp. 194-195). It is understood as a mental process involving a change in beliefs and thought processes, the rejection of dominant patterns and their replacement with an alternative model. In other words, Latouche uses the term ‘decolonisation’ to describe the process of transforming social ideas about economic growth, aiming to liberate the collective imagination from the ideology of excess, overconsumption and insatiability.

Reflection on the role of imagination in postgrowth leads to the conclusion that its function is not limited to creating new ideas and possible scenarios for the future, but primarily consists in criticising deeply rooted beliefs in capitalist societies, exposing the flawed assumptions underlying the narratives that drive growth, revealing their irresponsible consequences and publicising their irrationality. Latouche emphasises: ‘to attempt to think of an exit out of the dominant imaginary, we must first of all go back to the way we entered into it, that is, to say, to the process of economisation of minds concomitant to the commodification of the world’ (Latouche, 2015, p. 193), often using the techniques it employs, established imaginaries and their representations to promote a new postgrowth network of associations and meanings. Examples of such processes can be found not only in Latouch’s reflections, but also in Jackson’s, who believes that the principle of symbolic interactionism may be used to promote ecological and sustainable consumption (Jackson, 2005, p. 32), as well as in Bińczyk, who points to the need to change the rhetoric used in public debate to one that will support a kind of fashion for degrowth and ‘eco-zest’ (Bińczyk, 2023, pp. 187-197). Furthermore, Bińczyk proposes that the process of social and cultural change, which she refers to as the ‘socialisation of the Anthropocene’, should begin with abandoning the harmful delusions of capitalism that have led humanity to catastrophe, talking about them as moral scandals and emphasising that: ‘indeed, science fiction is practised by those who try at all costs to maintain the status quo in our politics and economy’ (Bińczyk, 2023, p. 16).

Critics of the currently dominant model unanimously emphasise that a future without growth is an ambitious goal and a bold political vision that must find its place in public debate. ‘Without the hypothesis that a different world is possible, there can be no politics, but only the

administrative management of men and things', she quotes after sociologist Geneviève Decrop Latouche (Decrop, 2007, p. 81). The point is to propose a realistic, socially just and empirically grounded programme of climate-friendly capitalism, which may seem utopian, but one that is achievable, a 'concrete utopia' in the positive sense given to the term by Ernst Bloch; a realistic utopia, grounded in the potentiality of the 'here' and 'now' (Domańska, 2017, p. 51). As Latouche declares: 'The degrowth project is therefore a utopia, or in other words a source of hope and dreams. Far from representing a flight into fantasy, it is an attempt to explore the objective possibility of its implementation' (Latouche, 2009, p. 32).

It is worth mentioning Jackson's project, which encourages us to imagine life after capitalism and proposes a realistic utopia that takes into account political, social and economic aspects as well as environmental protection (Jackson, 2023). In creating the foundations of a utopia for a post-capitalist society, the British economist refers to inspiring examples from the past, showing what lessons we can derive from them today. One of the most promising lines of thought is a change in the understanding of the relationship between humans and nature. Interestingly, Jackson does not define it in terms of struggle, competition and consumption, but rather in terms of symbiotic balance (Jackson, 2023, pp. 136-137). Inspired by the research of biologist Lynn Margulis, which shows the pursuit of symbiotic balance as a condition for the functioning of living organisms and the entire biosphere, he proposes to translate this understanding of interdependence into the relationship between humans and nature. Jackson, following Margulis, refutes the harmful belief that capitalism has been feeding us for years, namely that struggle and competition are the only drivers of evolution and progress: 'Evolution is not a constant struggle for existence, as neo-Darwinists claimed. (...) We would not be here if it were not for symbiosis. New species are the result of cooperation. Evolution is the result of joint adaptation to changing living conditions. Cooperation plays a fundamental role in our existence' (Jackson, 2023, p. 139). Symbiotic balance thus becomes an example of an alternative social practice that aims to protect life as we know it without exceeding planetary boundaries. It also sets out a framework for a new understanding of social progress based on belonging, well-being, flow and creation, i.e. activities that are marginalised and undervalued in the growth paradigm, such as caring, caregiving, creative activities, social interactions, close interpersonal relationships, physical activity, and contemplative practices. According to Jackson, further progress is possible, but it has little to do with GDP growth. It involves moving away from pressure and the pursuit of ever-increasing amounts of material goods and striving for a state of balance, achieved through activities that do not generate excessive environmental costs, but instead increase the sense of personal well-being.

6. Conclusion

‘At a time when our common home is on fire, our imagination should not only be unleashed, but also completely open to what is new,’ writes Bińczyk (Bińczyk, 2023, p. 194). Creating alternative visions of the future, building a society of ‘being’ rather than just ‘having’, is, in the face of real climate threats and environmental problems, one of the most important tasks, and even duties, facing contemporary humanities, social sciences, politics and economics. The three interrelated issues I have highlighted in this article, namely responsibility, prudence and ecological imagination, play a key role both in deepening our knowledge of the harmful delusions of capitalism and in formulating practical solutions for the future. As I have attempted to demonstrate, they form not only a theoretical but also a practical framework for the concept of postgrowth, and moreover, they offer an alternative to the prevailing trends in public debate based on politics of fear, trauma and passivity, while simultaneously exploiting the climate crisis. Today, it is researchers and humanists involved in the postgrowth movement who play a particularly important role in stimulating ecological and moral imagination, laying the groundwork for social change, pointing out paths that are no longer worth following, and expanding the range of future cultural and economic transformations to include scenarios that take into account environmental costs and planetary constraints. One can only ask the question: do we, as humanity, have enough imagination to envision a postgrowth alternative future?

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COGNITIVE PROCESSES AND EMOTIONS IN SOCIAL MEDIA: A CASE STUDY OF USER-GENERATED RESPONSES TO POLITICAL DISINFORMATION

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Purpose: The aim of this paper is to explore how user-generated content (UGC) can serve as a valuable source of data for understanding cognitive and emotional processes in online public discourse. By applying a cognitive-discursive approach to social media commentary, the study investigates how individuals construct meaning, express emotions, and attribute intentions in response to sociopolitical events.

Design/methodology/approach: The study applies a socio-cognitive framework combining discourse analysis and cognitive psychology to examine user reactions to disinformation on social media. Using a purposive sample of four viral posts about the alleged introduction of Ukrainian as a school language in Poland, and 180 highly engaged comments, the study analyzes cognitive mechanisms and emotional responses, as well as user-generated micro-narratives that reveal patterns of polarization and identity construction.

Findings: The study showed that user-generated content (UGC) reacting to political disinformation often contained clear signs of emotional and cognitive patterns linked to polarization and group identity. Most comments used strong emotional language, especially anger, fear, and contempt, and highlighted a sharp divide between “us” and “them”. Comments often relied on historical schemata and availability heuristics, using familiar events and vivid examples to interpret current narratives. UGC is not merely a space for expressing opinions; it also serves as an active arena where collective biases and emotions develop, further dividing society even when factual corrections are provided.

Research limitations/implications: This study is based on a qualitative case study focused on a specific political event and a limited number of social media posts and user comments. While the in-depth analysis provides valuable insights into the cognitive and emotional mechanisms shaping online discourse, the findings cannot be generalized to all digital interactions or sociopolitical contexts.

Practical implications: Combining automated data collection with qualitative discourse analysis provides a replicable model for identifying patterns of emotional framing, polarization, and collective sense-making in user-generated content.

Social implications: This research demonstrates social relevance, particularly in the context of increasing polarization and migration-related tensions in Europe. By uncovering how citizens construct meaning, attribute intentions, and express emotions in response to policy proposals – such as the introduction of Ukrainian as a foreign language in school – the study provides valuable insights into the dynamics of public opinion formation.

Originality/value: The novelty of this study lies in its integration of cognitive and discourse-analytical perspectives to examine user-generated content (UGC) in social media not only as expressions of opinion, but as reflections of underlying cognitive mechanisms. This approach considers user-generated content as a data source of how users attribute intentions, categorize social actors, and emotionally frame public debates. Drawing on discourse analysis and processes of social cognition this study reveals how digital language use shapes collective meaning-making.

Keywords: user-generated content, social media, discourse analysis, social cognition, online communication.

Category of the paper: research paper.

1. Introduction

In today's networked society, social media platforms function not only as channels for sharing information but also as arenas where collective cognitive processes unfold. Users do not merely comment on current events—they co-construct narratives, attribute intentions to social actors, and express emotions, thereby shaping the discursive landscape of public life. A shift in research interests from the analysis of official media narratives to social micro-narratives present in comments, memes, and online reactions is accompanied by the growing importance of user-generated content (UGC) as a source of knowledge about social and cognitive processes in the digital age. UGC content is not only an object of observation, but an active carrier of cognitive processes such as schemas, heuristics or attribution.

Based on this assumption, this paper adopts a cognitive and discursive framework to explore these dynamics, considering UGC as a data through which patterns of social thinking can be observed. The theoretical and methodological approach is enriched by a case study focusing on online reactions to a proposal by the Polish Ministry of Education to introduce Ukrainian as a foreign language in schools. This example reveals how social media users engage in processes of polarization, emotionalization, and mobilization, illustrating the broader mechanisms of meaning-making and collective response in digital communication.

The objective of this paper is to explore how UGC can serve as a valuable source of data for understanding cognitive and emotional processes in online public discourse. The research seeks to demonstrate that UGC is not merely a reflection of opinion, but a dynamic site where collective sense-making, polarization, and identity construction may unfold in real time.

2. Methods

Presented study is part of the socio-cognitive analysis of online content, integrating the perspective of cognitive psychology with discourse analysis tools (van Dijk, 2001). The aim is defined as identification of cognitive and emotional mechanisms (such as schemas, heuristics, attribution of intentions, and emotional frames) that emerge in users' reactions that reveal themselves in users' reception of political issues presented in social media. The starting point was the widely commented decision by the Ministry of Education and Science to introduce Ukrainian as a foreign language in Polish system of education as well as include this language to curriculum of eight's grade exam. Facebook posts and the website X reported that Minister Barbara Nowacka had decided to introduce Ukrainian into Polish schools. It was supposed to replace Spanish, German, or French (Demagog, 16.06.2025). Despite official denials by the Ministry (PAP, 16.06.2025), this disinformation spread intensively on social media platforms, generating high user engagement.

The dataset was constructed through purposive sampling to capture online reactions to a specific disinformation episode. Four Facebook posts were selected because they met three criteria: (1) they explicitly presented or suggested the false claim that Ukrainian would be introduced as a compulsory foreign language in Polish schools; (2) they generated substantial user engagement, each exceeding 100 comments; and (3) they served as points of further dissemination within online networks. The disinformation was amplified primarily by right-wing profiles, which deliberately framed the narrative in a manipulative way to influence public opinion. For this reason, the selected posts represent a relevant and ideologically significant sample for analysis. From these posts, a total of 180 highly engaged comments were collected for analysis. To ensure analytical relevance, purely *ad personam* attacks, comments consisting only of vulgar language, and those expressing emotion without substantive content were excluded. The selected comments were those that contained identifiable cognitive and discursive elements, such as attribution of intentions, heuristic reasoning, or emotional framing. This strategy allowed the analysis to focus on content that reveals how users cognitively process and emotionally respond to contested political information. The total number of comments collected for the purpose of this study was 180. The posts and comments were archived in accordance with digital research ethics: nicknames were anonymized and data enabling identification of individuals was removed.

The analysis involved: 1) Analysis of cognitive mechanisms: identification of categorization patterns, heuristics (e.g., availability, representativeness), mechanisms of intention attribution (e.g., the Ministry of Education acts "to the detriment of Poles") and emotional reactions (e.g., anger, fear, contempt); 2) Analysis of micro-narratives: examination of how users construct their own narratives and justifications – both through references to

personal experiences and through references to symbolic oppositions (“us–them,” “authorities–citizens,” “Poles–Ukrainians”).

The coding procedure was conducted manually by the author as part of an exploratory case study. Each comment served as the basic unit of analysis and was carefully reviewed for the presence of cognitive and emotional mechanisms. Comments could be assigned to one or more categories simultaneously, as the coding scheme was not mutually exclusive; for instance, a single comment could contain both a historical schema and an emotional frame. The coding categories were developed inductively after an initial exploratory reading of the dataset and then refined in dialogue with theoretical concepts from cognitive psychology and discourse analysis. Coding categories included: cognitive schemas (stereotypes, historical analogies, culturally shared narratives), attribution of intentions (explicit or implicit assignment of motives of Ukrainian refugees or Polish government, often portrayed as pursuing hidden political or ideological objectives), heuristics (use of cognitive shortcuts such as availability heuristics), emotional framing (expressions primarily structured around fear, outrage, or collective pride), micro-narratives (short personal stories or anecdotal accounts that served to illustrate or justify broader claims, effectively embedding individual experiences into collective interpretations).

Given the relatively small research sample and the aim to capture linguistic and emotional nuances that automated natural language processing tools might overlook, a qualitative manual approach was chosen over algorithmic text mining. While this strategy allowed for in-depth interpretation of micro-narratives and implicit attributions, it also entails certain limitations. The coding was conducted by the author only, without a second coder, which means that intercoder reliability was not calculated. This reflects the exploratory nature of the study. At the same time, attention was paid to maintaining internal consistency in applying the categories. Future research could extend this procedure by introducing multiple coders and calculating inter-coder agreement (e.g., Cohen’s κ), thereby strengthening the reliability of the coding scheme.

3. Results

3.1. User-generated content as a data source

User-generated content (UGC) is undoubtedly one of the most important phenomena shaping the communication landscape of digital culture – both social and political. Oxford University Press defines UGC as “media content that is produced by users of the medium rather than professionals. (...) the term is mainly associated with the new electronic media and embraces such phenomena as blogs, wikis, and digital video” (Oxford University Press, n.d.).

The presence of UGC changes the relations between senders and recipients, decentralizes the flow of information and transforms the very nature of civic participation and social engagement. Although the production of socially meaningful content by non-professional users is not a recent phenomenon, the growing prominence of the term UGC is largely driven by the development of digital technologies – in particular by the norms and practices associated with Web 2.0 and social media – which encourage everyday users to publish and engage within accessible, user-friendly platforms (Santos, 2022).

UGC is also perceived in a broader context as a manifestation of the culture of participation. This is the position presented by Rafal Cieniek: the author analyses the content produced by Internet users as a key element of the modern culture of participation, referring to the concepts of authors such as Henry Jenkins, Axel Bruns and Alvin Toffler, emphasizing that users become co-creators of media content, which changes classical models of communication (Cieniek, 2018). Useful framework for analyzing UGC is David Foulger's ecological model of communication (2004), which conceptualizes communication as a dynamic interaction between creators, consumers, messages, media, and languages; Foulger's approach captures the fluidity of roles in contemporary digital environments, where users seamlessly switch between producing and interpreting content (Cieniek, 2018). UGC is a valuable data source in the context of socio-cognitive analysis, due to its susceptibility to the expression of emotion – both in the form of solidarity and hate, that makes it a key source of data for researchers analyzing the emotional dimension of public debate (Del Vicario et al., 2016).

3.2. Research results

The claim about the alleged introduction of Ukrainian as a foreign language in Polish schools was quickly amplified by profiles with nationalistic and conservative affiliations, including Polish MP members, which framed the issue in an alarmist and mobilizing tone. For the purposes of this study, four posts were selected for analysis based on their high user engagement and their representativeness of different communication styles and emotionalization strategies within the debate. The research sample consists of four posts published on Facebook according to the following criteria: 1) the issue was presented or suggested to be a fact; 2) published content received a wide response from users (min. 100 comments each; 3) published content was a source for further disinformation.

The table below presents user engagement levels on four Facebook posts published in June 2025 across various ideologically oriented profiles: *Ruch Narodowy*, *Śławomir Skwarek* (MP, Law and Justice party), *Udostępnij.pl* (a viral/popular content profile), *Stowarzyszenie "Wspólnota i Pamięć"*. Engagement indicators include the number of comments, shares, and reactions (likes and emojis), with total engagement shown in the respective column. The data were collected on June 23, 2025; engagement values may change over time due to continued user activity.

Table 1.*Comparative engagement statistics for selected Facebook posts*

Facebook profiles	INDICATORS OF ENGAGEMENT			
	comments	shares	reactions	total engagement
Ruch Narodowy https://www.facebook.com/RuchNarodowy	3619	1500	9063	14182
Sławomir Skwarek Poseł na Sejm RP https://www.facebook.com/SlawomirSkwarek	2404	1500	7633	11537
Udostępnij.pl https://www.facebook.com/udostepnijpl	516	75	528	1119
Stowarzyszenie Wspólnota i Pamięć https://www.facebook.com/WspolnotaiPamiec	120	102	273	495

Note: The data presented in the table were collected on June 23, 2025. Please note that the number of reactions, comments, and shares may change over time as user engagement continues.

Source: Author's compilation based on Facebook data.

The posts selected for this case study were published between June 11 and June 18, 2025, across a variety of Facebook profiles representing different ideological and communicative styles. Despite their diversity, they all centered on a false claim regarding the alleged introduction of Ukrainian as a second foreign language in Polish schools. The posts varied in format – from videos and graphic memes to lengthy, quasi-official statements – and were distributed by actors ranging from political figures (e.g., MP Sławomir Skwarek) to nationalist organizations (*Ruch Narodowy*), populist news aggregators (*Udostępnij.pl*), and historically driven NGOs (*Stowarzyszenie „Wspólnota i Pamięć”*). Each post employed distinct discursive strategies, emotional framings, and narrative tropes, but all contributed to the viral spread of disinformation and the polarization of public discourse around national identity and education. The high engagement levels – mainly in the posts by *Ruch Narodowy* and MP *Sławomir Skwarek* – demonstrate that disinformation can function as a highly effective trigger for emotional and political mobilization. Despite the information was officially denied by the Ministry of Education and labeled as false by the independent fact-checking organization Demagog, the posts garnered significant user engagement on Facebook. Engagement levels also differed by profile type. Posts from high-reach, politically aligned accounts (e.g., *Ruch Narodowy*, *Sławomir Skwarek*) triggered mass emotional reactions and calls to action. In contrast, the post by *Udostępnij.pl*, although more moderate in tone, still provoked substantial discussion. The fact that the information was debunked by official sources (the Ministry of Education and Demagog) did not significantly reduce user engagement. This highlights two key phenomena:

- Confirmation bias – users tend to select and engage with narratives that align with their pre-existing beliefs.
- Emotions over facts – users respond more strongly to emotionally charged frames than to rational corrections.

Empirical studies indicate that factual corrections may paradoxically reinforce existing misperceptions, particularly among individuals with strong ideological predispositions (Nyhan, Reifler, 2010). The small-scale case study presented here confirms these findings,

demonstrating that official debunking had little effect on reducing user engagement with disinformation-laden content.

Comments selection criteria: in order to address the study objectives, 180 comments in total were collected. The analysis excluded comments of a purely *ad personam* nature, mainly personal attacks directed at the Minister of Education, Barbara Nowacka, as well as those containing only vulgar language or expressing emotion without substantive content. The selection focused on comments that featured identifiable cognitive and discursive elements, such as attribution of intentions, framing of reality, use of heuristics, narratives of resistance, emotional mobilization, or argumentative strategies. The number of 60 comments were collected from the post of *Slawomir Skwarek* profile, accordingly the sample of 60 comments was gathered from the post published by *Ruch Narodowy*, 35 posts were selected from UGC shared under *Udostępnij.pl* content, and 25 comes from the *Stowarzyszenie "Wspólnota i Pamięć"* profile. The aim of the comments analysis was to recognize how users construct social meanings and cognitively respond to media messages.

Initial socio-cognitive analysis of the comments led to identify several cognitive mechanisms present in user generated content: 1) group identity – “us – them” categorization: ingroup bias defined as “the tendency to favor one’s own group, its members, its characteristics, and its products, particularly in reference to other groups” (APA Dictionary of Psychology, 2018); 2) hostile attribution bias – “a general tendency to ascribe harmful or otherwise adverse intent to the ambiguous behavior of others” (APA Dictionary of Psychology, 2018); 3) historical schema – “cognitive schemas constitute a point of reference for the interpretation of perceptual information: in the recognition process, a person compares perceptual information with schemas” (Maruszewski, 2011, p. 207). A historical schema relates to the organization of knowledge about the past, establishes a framework through which people receive and understand new data about history; 4) availability heuristics – events that are more cognitively accessible are assessed as more probable or as occurring more often; this heuristic plays a large role in extracting information from memory (Maruszewski, 2011, p. 392-393); 5) emotional framing – it is a way of presenting information that intentionally uses emotional content – positive or negative – to influence the perception, interpretation and behavior of an audience (Kahneman, Tversky, 1984). Knowledge about emotional framing allows to exemplify comments according to their emotional-persuasive charge: whether they aim to evoke fear, solidarity, or arousal; 6) micro-narratives – they are short, concise stories, often individual and personal, that reflect the experiences, emotions or perspectives of an individual in a compressed form (Venditti, Piredda, Mattana, 2017). “Small stories as sites of identity work” (Bamberg, Georgakopoulou, 2008): micro-narratives function as a space in which identities of groups and individuals are built and revealed. The following section provides examples of collected UGC together with an analysis of the cognitive mechanism they display:

- 1) “Us – them” categorization. Collected comments reveal strongly activated group schemas with clear opposition “Poles” (us) vs. “Ukrainians (them). Cognitive schema of this type can be identified in phrases as followed: “We are Poles and we speak Polish, not Ukrainian”, “This is our homeland, and if Ukrainians want to live here, let them learn Polish”, “We are at home, this is OUR COUNTRY, and they are guests here”. The mechanism of “us – them” categorization strengthen the sense of boundaries and make use of simple dichotomies in accordance with the cognitive mechanism of social categorization (ingroup vs outgroup).
- 2) Attribution of intent. UGC analysis disclose that Facebook users often attribute hidden intentions both to Polish politicians and Ukrainians. Attribution of intent is often accompanied by conspiratorial tendency to search for the concealed causes, often with a negative collocation (hostile attribution bias): “That's why they need Trzaskowski to sign off on all these absurd projects like Ukrainization, LGBT, the influx of engineers and the sale of everything Polish”, “Let's not allow it, because soon Ukrainian will be the official language and we will be a minority in our own country”.
- 3) Heuristics of simplified reasoning. The comments show simplified reasoning based on individual experiences or stories: “I come from a time when we were learning Russian... I went to Russia and couldn't communicate”, “In Ukraine, they were closing Polish schools, and our children are supposed to learn their language?”. Interpretation of the situation is often based on examples easily accessible in memory and often emotional.
- 4) Emotional frames. Most comments are strongly emotionally charged – anger, contempt, and fear dominate: „Stop!! I don't agree to learn Ukrainian!! This is Poland...”, “This is an insult to Poles”, “Why the hell should I learn this Ukrainian crap” “Treason”. Keywords such as “traitors”, “Banderites”, “genocide in Volhynia” introduce emotional frames that fuel hostility and mobilize resistance.
- 5) Micro-narratives. Micro-narratives often involve parental perspectives, past schooling, or embodied emotional reactions. Examples include statements like “If my child brings home textbooks to learn this Banderite language, I will personally go to the school and smash this filth on the teacher who gave it to my child”, or “I already had to learn Russian by force, maybe that's enough”. By invoking family roles or historical memories, these micro-narratives transform abstract policy debates into emotionally charged personal concerns.

The table below presents specific linguistic examples illustrating the application of each cognitive mechanism.

Table 2.*Typology of cognitive mechanisms in UGC with linguistic examples*

Type of cognitive mechanism	Cognitive mechanisms in user-generated content		
	Definition	Language indicators	UGC example
Group identity bias	Emphasis on the division into 'us' and 'them', reference to the national, cultural or local community	Poles, our children, this is Poland, we are at home	'This is Poland, and they are guests', 'Let Ukrainians learn our language'
Hostile attribution bias	Ascribing the intention to harm Poland, Poles, families by authorities or foreign groups	traitors, they want to denationalize us, Bandera supporters in the government, this is plan	'She must hate Poland and Poles very much!!!', 'The government acts like Ukraine's little dog'
Historical schema	Referring to well-known historical events (Volhynia, Russification) that evoke emotions and fear	Volhynia, Bandera, Russian language at school in the Polish People's Republic, genocide	'We already had Russian in schools once', 'Teaching Bandera language after Volhynia? It's meanness'
Availability heuristics	Users base their judgments and emotional reactions on examples that are easily recalled from memory - often because they are media-publicized, emotionally charged, or recently experienced	And later it will be: Afghan, Venezuelan, Syrian...; what is this language for?, at least you can communicate in Russian, children should learn western languages	'Russian is better, at least you'll get by somewhere', 'Ukrainian is gibberish that no one needs'
Emotional framing	Emotionally charged language: vulgarisms, contempt, sarcasm, dramatization	morons, this is a scandal, stupid woman, get out disgrace, betrayal	'Get out of here with this minister!!!', 'enough of this shit', stop this Ukropolis'
Micro-narrative	Recalling one's own experiences or family history as an argument	forced to learn Russian, our children's computers were taken away, we were given nothing abroad	'I was forced to learn Russian at school', 'In Germany we had to learn their language'

Source: Author's compilation based on Facebook data.

The analyzed sample of UGC vary considerably in length, style, and rhetorical strategy, reflecting a diverse range of ways in which cognitive mechanisms manifest in everyday online discourse. At one extreme, a high-impact expressions such as the single-word comment "Treason". Even though it is brief, it carries multiple mental operations at once pointing to an enemy, stirring emotions, and drawing a clear line between "us" and "them" through a strong moral judgment. At the opposite end, longer statements, such as a 100-word polemical comment enumerating political demands (e.g., "Poland should be for Poles, not Ukrainians..."), deploy an elaborate argumentative structure that combines historical schemata, emotional appeals, and in-group/out-group constructions. Additionally, comments that simultaneously engage multiple cognitive mechanisms, including micro-narratives (for instance, parental exhortations to "show children how to fight for what is theirs"), illustrate how personal storytelling merges with collective identity-building and symbolic historical references (such as the metaphor of the Trojan horse). This diversity underscores how online commentary serves as a rich site for observing how individuals cognitively process and communicate sociopolitical issues through varying discursive forms.

An examination of the manually coded dataset reveals notable quantitative patterns in how different cognitive mechanisms appear in UGC. Group identity markers were the most common, showing that many users focused on who belongs to “us” versus “them”. Emotional framing was also very frequent, adding strong feelings to the discussion. Many comments used historical references or made negative attributions about the intentions of others, suggesting that people often see current issues through past conflicts and distrust. Less often, but still notable, were examples of availability heuristics, where vivid or familiar cases were used as proof, and personal micro-narratives, where users shared short personal stories. Overall, this shows that identity and emotion drive much of the conversation, but personal examples and mental shortcuts also shape how people discuss these issues. The frequency of cognitive mechanisms in the analyzed sample of comments is presented in Figure 1.

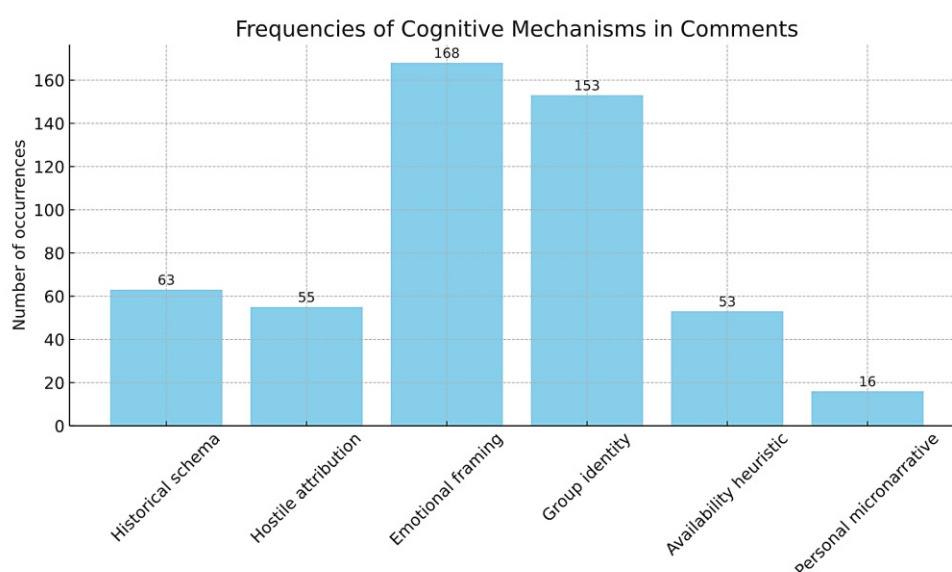


Figure 1. Frequencies of cognitive mechanisms in analyzed comments.

Source: Author’s own study.

The quantitative distribution of cognitive mechanisms in user comments—most notably the prevalence of emotional framing and group identity markers—closely aligns with the nature of the posts that prompted these reactions. The analyzed posts, though varied in form and originating from diverse actors, uniformly centered on a polarizing, false claim about Ukrainian language education, which directly tapped into concerns over national sovereignty and cultural integrity. Commenters frequently engaged through affect-laden expressions of anger or fear (emotional framing) and by drawing sharp distinctions between in-groups (“Poles”) and out-groups (“Ukrainians,” or broadly, “others”). The high frequency of these mechanisms in the comments thus reflects not only general tendencies in online discourse but also the specific communicative strategies of the posts themselves, which leveraged emotionally resonant and identity-focused frames to amplify engagement. UGC analysis illustrates how disinformation content, especially when linked to national identity and historical sensitivities, activates cognitive patterns that reinforce polarization and social division.

4. Discussion

The findings of this study align with existing literature on the cognitive and emotional underpinnings of online public discourse. For instance, the dominance of emotional framing in user comments aligns with studies by Brady et al. (2017), who found that moral-emotional language significantly increases the diffusion of political messages on social media. As highlighted by Del Vicario et al. (2016), emotionally charged content and identity-based narratives are key drivers of user engagement.

The predominance of emotional framing and group identity markers recognized in the analyzed comments emphasizes how user-generated content becomes a site for reinforcing in-group cohesion and mobilizing affective responses to perceived threats. The use of historical schemata and availability heuristics illustrates how individuals rely on familiar cognitive shortcuts to make sense of complex sociopolitical information. These mechanisms contribute to the persistence of polarized views, even in the face of official corrections (Nyhan, Reifler, 2010).

The analysis was limited to a single political controversy within the Polish sociopolitical context – namely, the disinformation surrounding the alleged introduction of Ukrainian as a second foreign language in schools. As such, the cognitive and emotional patterns observed in user comments are closely tied to this specific cultural and historical context. Additionally, the study was conducted on a purposive sample of 180 highly engaged Facebook comments, selected from posts that differed both in ideological orientation and rhetorical approach. The analysis focused exclusively on UGC in response to a specific set of posts in terms of explicit of cognitive processes – no additional contextual data such as user demographics or network diffusion patterns was added. Future research could extend this approach to comparative analyses across different countries or policy issues to deepen understanding of how cognitive processes shape digital public spheres.

Present findings provide empirical support for theoretical frameworks that emphasize the interconnection of cognition, emotion, and identity in online discourse. They demonstrate the importance of recognizing UGC not just as a mirror of opinions but as a dynamic platform where emotional framing, and identity narratives actively shape public meaning-making; often in ways that sustain social polarization.

This study offers several practical implications. It shows that communication strategies must go beyond factual corrections, which alone are insufficient to stop the spread of disinformation. The findings also inform media literacy programs by illustrating how heuristics, historical schemata, and emotional frames shape public responses to political content. Integrating these insights into education may strengthen resilience against manipulation and foster more reflective engagement. Finally, real-time monitoring of user-generated content can serve as an early warning system for polarizing narratives, supporting more effective responses and inclusive public debate.

5. Conclusion

This paper was intended to illustrate how user-generated content (UGC) can be a rich source of insight into the cognitive and emotional processes shaping online public debates. It argues that UGC is more than just a record of individual opinions; it is an active space where people collectively interpret events, build group identities, and contribute to polarization as these dynamics emerge in real time.

This study was conducted using a socio-cognitive framework that combined tools from discourse analysis and cognitive psychology. Integration of these perspectives led to uncover processes such as heuristic reasoning, historical schemata framing, and micro-narratives that would be difficult to be recognize in broader studies of quantitative type.

A purposive sample of four Facebook posts spreading disinformation about the alleged introduction of Ukrainian as a school language in Poland, served as the initial focus. From these posts, 180 comments were carefully selected and manually coded to identify key cognitive and emotional mechanisms. By focusing on explicit linguistic indicators and personal micro-narratives within these comments, the research was able to reveal how users construct meaning, express emotions, and reinforce social divisions in response to contested political information online.

Socio-cognitive analysis of UGC on migration issues represents an important point of reference and a valuable data source for understanding how public attitudes and collective emotions evolve in digital environments. For further research a cross-platform approach is recommended: by comparing narratives and cognitive patterns across different social media platforms, researchers can capture the diverse ways in which migration is framed, contested, or emotionally charged; a cross-platform UGC analysis would be essential for building a more comprehensive picture of how digital publics negotiate complex social issues. Further work could also integrate network analysis or sentiment tracking to capture how such cognitive and emotional dynamics diffuse through online environments.

Presented paper demonstrates how UGC analysis bring insights on social tensions – often unarticulated social anxieties and collective expectations that traditional survey might not record. Within the Web 2.0 environment, where users not only absorb but also actively contribute to shaping public discourse, analyzing this content provides a distinctive lens through which is convenient to observe deeper currents of social mood and collective feeling.

Beyond its theoretical contribution, the study also indicates that effective responses to disinformation require strategies that combine factual accuracy with attention to emotional and identity-based dynamics, offering practical insights for media literacy education and communication policy.

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INTEGRATING SYSTEMATIC INVENTIVE THINKING WITH RESPONSIBLE INNOVATION USING AI AS CO-CREATIVE PARTNER

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Purpose: This paper addresses the critical gap in contemporary innovation management where traditional systematic methodologies like Systematic Inventive Thinking (SIT) operate independently from responsible innovation requirements. The research aims to develop an integrated framework that combines SIT methodology with sustainability criteria while leveraging Large Language Models as co-creative partners throughout the innovation process.

Design/methodology/approach: The study employs a conceptual framework development approach, integrating comprehensive literature review across innovation management theories, responsible innovation frameworks, and human-AI collaboration research. The methodology involves designing the RWI Framework architecture with AI-Personas system, prompt engineering strategies, and repository structures. The approach synthesizes established theories including stage-gate processes, design thinking, and open innovation paradigms with emerging AI capabilities and sustainability frameworks.

Findings: The research presents the RWI Framework featuring six specialized AI-Personas that facilitate systematic integration of SIT techniques with responsibility evaluation. Key findings include the identification of AI-Coach as a knowledge transfer mechanism bridging competency gaps in sustainability, the development of multi-dimensional evaluation criteria based on established frameworks (ESG, GRI, CSRD), and the conceptualization of hybrid human-AI collaborative workflows that maintain creative efficiency while ensuring systemic responsibility assessment.

Research limitations/implications: The framework inherits current LLM limitations including hallucination risks and output variability. Future research should focus on empirical validation through case studies across diverse organizational contexts and controlled experiments comparing traditional SIT processes with RWI-enhanced approaches. The study suggests investigating knowledge transfer mechanisms and factors determining human-AI partnership effectiveness.

Practical implications: Implementation promises operational efficiency gains through automated documentation, enhanced innovation quality via early risk identification, and reduced regulatory and reputational risks. Organizations can expect development of new hybrid competencies and specialized roles such as AI Innovation Facilitators while building systematic approaches to responsible innovation.

Social implications: The framework supports integration of UN Sustainable Development Goals and ESG criteria into organizational innovation processes, potentially accelerating sustainable solution development and enhancing corporate social responsibility practices across industries.

Originality/value: This represents the first systematic framework integrating SIT methodology with AI-powered responsible innovation evaluation, addressing the identified competency gap in sustainability knowledge while pioneering co-creative human-AI partnerships in systematic innovation processes.

Keywords: Systematic Inventive Thinking, SIT, Responsible Innovation, Human-AI Collaboration, Sustainability Frameworks, Innovation Management.

Category of the paper: Conceptual paper, viewpoint.

1. Introduction

Contemporary organizations face multidimensional innovation challenges that extend far beyond traditional technological dilemmas. On one hand, there exists a need for systematic methods of generating breakthrough solutions capable of ensuring competitive advantage. On the other hand, organizations must consider growing requirements regarding social and environmental responsibility, which determine long-term market success and access to investment capital.

Traditional innovation approaches often lead to solutions that are business-effective in the short term but not necessarily sustainable in the systemic context. Simultaneously, emerging capabilities of generative artificial intelligence (GenAI) open new horizons in supporting creative processes but carry specific technical and methodological risks (Gerlich, 2025; Sidhpurwala, 2024).

This paper presents the RWI Framework (Responsible World Integration), a structured approach that combines Systematic Inventive Thinking (SIT) methodology with external responsibility criteria. The framework utilizes Large Language Models (LLM) capabilities not only for automating evaluative processes but primarily as co-creative partners throughout the entire innovation cycle (Wang et al., 2025; Viswanathan et al., 2025). This solution allows organizations to maintain efficiency and systematicity in the innovation process while supporting compliance with global sustainable development standards and building competencies in responsible innovation.

2. Research Problem

Contemporary innovation processes are characterized by three fundamental challenges that have not been addressed in an integrated manner to date. First, traditional innovation methodologies such as SIT focus on technical and business efficiency while omitting systemic aspects of social and environmental responsibility (Goldenberg, Mazursky, 2002). Second, innovation teams operate under pressure from business objectives, often lacking specialized knowledge in sustainable development frameworks, leading to a **competency gap** (Venn et al., 2022; Goropečnik et al., 2025). Third, growing capabilities of LLM technology require new models of human-AI collaboration that extend beyond traditional tool-based approaches (Stanford HAI, 2025; Koivisto, Grassini, 2023).

Previous research has demonstrated that simple integration of SIT project teams with LLM is possible (Wawrzala, 2024), establishing the foundation for this continued investigation. The RWI Framework addresses these challenges by proposing systematic integration of structured innovation methods with systemic responsibility knowledge transfer mechanisms, utilizing LLM as co-creative partners throughout the innovation process.

3. Literature Review and Theoretical Positioning

3.1. Innovation Methodologies within Established Theories

The RWI Framework positions itself within innovation theory as a complement and hybridization of existing approaches. Unlike **stage-gate processes**, which focus on sequential business risk control (Cooper, 2010), the RWI Framework introduces parallel systemic responsibility evaluation at every stage. While **design thinking** emphasizes human-centered innovation, the RWI Framework extends this perspective to **system-centered responsibility**, considering a broader ecosystem of stakeholders (Wawrzala, 2022).

Compared to **open innovation paradigms** (Chesbrough, 2003), the RWI Framework operates in a hybrid model, combining the “Closed World” assumption of SIT with “open evaluation” against external criteria. This represents a novel approach that maintains advantages of structured idea generation methods while integrating them with systemic responsibility perspective.

3.2. SIT Methodology Assumptions and Systemic Limitations

Systematic Inventive Thinking (SIT) represents one of the established systematic innovation methodologies, based on five fundamental techniques: subtraction, multiplication, division, task unification, and attribute dependency (Goldenberg et al., 1999; Goldenberg, Mazursky, 2002).

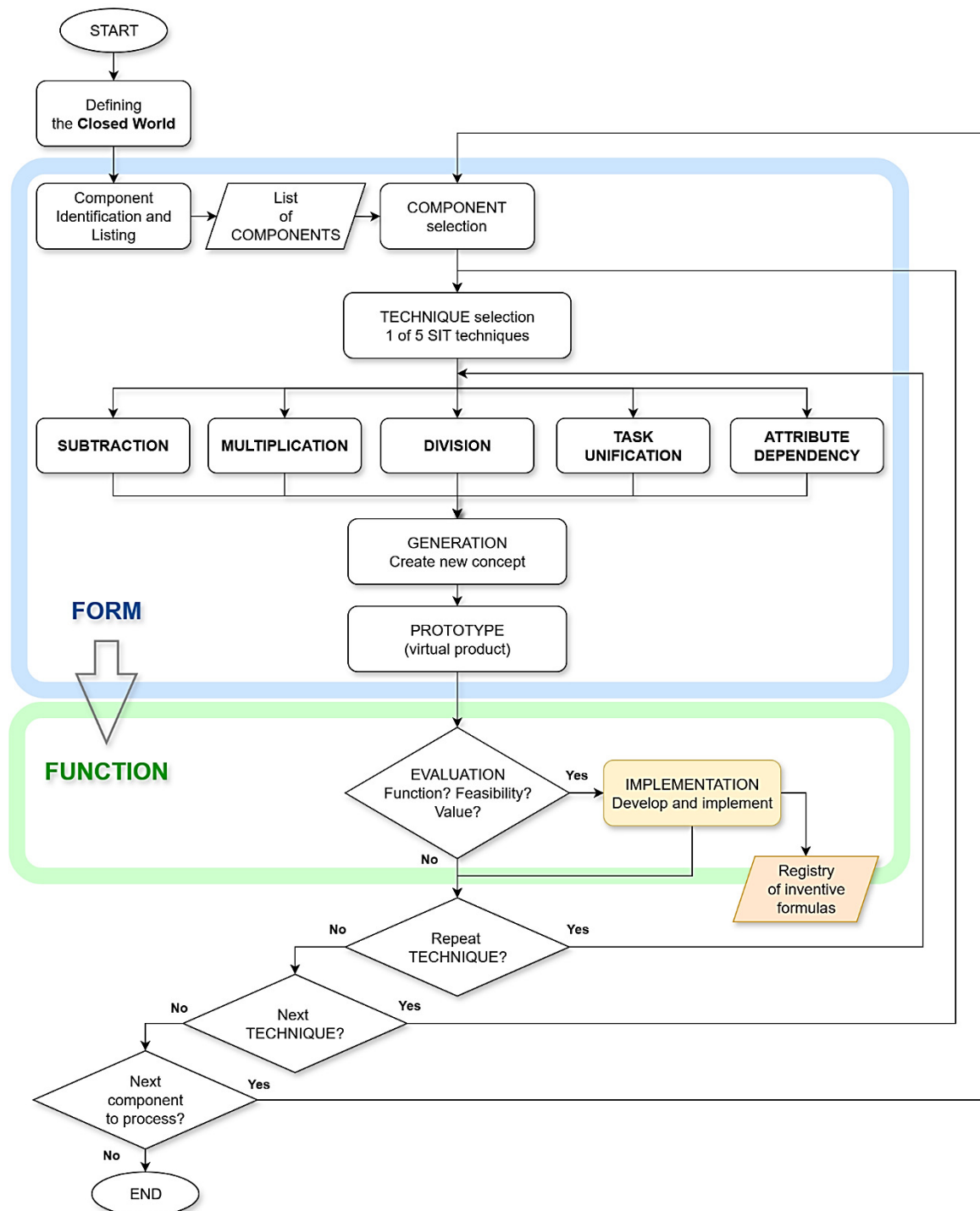


Figure 1. The complete diagram of Systematic Inventive Thinking (SIT) methodology.

Source: Own elaboration.

Figure 1 presents the complete diagram of SIT methodology, illustrating the comprehensive process from “Closed World” definition to implementation decision regarding the final result.

The methodology encompasses three distinct iteration groups that operate systematically throughout the innovation process. The component iteration loop involves systematic examination of all system elements, with decisions made regarding which components should be subjected to SIT techniques. The technique loop applies one or more of the five classical SIT techniques to the selected component. The technique iteration loop enables multiple repetitions of the chosen technique, generating successive concepts and virtual prototypes while conducting evaluations of value, functionality, and feasibility.

The SIT method demonstrates considerable capability for methodically generating substantial numbers of novel solutions. Critical factors in this process include the arbitrary division into components, the strategic decisions regarding which components to subject to technique application, and the establishment of appropriate evaluation systems. This systematic approach ensures comprehensive exploration of the innovation space while maintaining structured progression toward viable solutions.

This methodology relies on the “Closed World” principle, which limits the solution search space to elements already existing in the system or its immediate environment. This conscious imposition of constraints aims to overcome cognitive functional fixedness. The second pillar of SIT philosophy is the “Function Follows Form” principle, which reverses traditional product development logic (Finke, 1992).

Structured methods such as SIT, have proven their effectiveness in specific domains. They are particularly effective in generating product and process innovations in B2B, technological, medical, and manufacturing industries (Goldenberg et al., 2001). However, this paradigm possesses a fundamental limitation: its intensive focus on technical logic may lead to ignoring key systemic factors related to social and environmental responsibility.

While the “Closed World” assumption increases creative process efficiency, sustainable development problems inherently have an “open system” character. The RWI Framework resolves this contradiction through a two-stage approach: SIT is used for effective idea generation within the defined system, and subsequently these ideas are evaluated in the context of external criteria.

3.3. Sustainable Development Challenges and Competency Gap

Organizations currently operate in an environment of growing stakeholder expectations regarding social and environmental responsibility. The UN Sustainable Development Goals (SDGs), ESG regulations (Environmental, Social, Governance), and increased consumer awareness require systematic consideration of these aspects in innovation processes.

Innovation teams often operate under pressure from business objectives that do not consider responsibility dimensions, and their members may lack specialized knowledge in sustainable development frameworks. This creates a **competency gap**: teams are asked for innovations

compliant with principles they do not fully understand (Venn et al., 2022). Each innovation process participant typically holds different views on what should be done or remains passive, often not revealing their thoughts, as these ideas may be mere seeds rather than fully formed concepts. Moreover, each participant may harbor different concerns regarding psychological safety, which further compounds communication difficulties (Wawrzala, 2022).

3.4. Specific Challenges Related to LLM Implementation

Integration of LLM technology into innovation processes carries a set of specific challenges. Language models, as probabilistic systems, operate on statistical patterns without factual verification mechanisms, resulting in generation of incomplete or false information (hallucinations) (Sidhpurwala, 2024). Users may exhibit tendencies toward anthropomorphization and excessive trust in generated content, which reduces critical vigilance (Deshpande et al., 2023). A significant challenge is the risk of cognitive offloading, where excessive reliance on AI may lead to atrophy of key cognitive skills and homogenization of ideas (Gerlich, 2025).

4. Methodology - RWI Framework Architecture

4.1. Human-AI Co-creative Partnership Concept

The RWI Framework proposes reformulating the relationship between human and AI, transitioning from a tool-based model to a co-creative partnership model. In this model, interaction always occurs along the **Team ↔ AI-Persona** line. The system operates based on architecture that preserves SIT methodology advantages while enriching the process with systemic responsibility perspective.

The process consists of three levels:

1. Defining the “Closed World” for the considered problem and conducting initial component identification, utilizing LLM as a partner possessing domain knowledge in systemic responsibility.
2. Generating solutions using SIT techniques, with enrichment of the ideation process through AI as a generative partner.
3. Systemic validation using traditional technical and business criteria as well as utilizing evaluation regarding systemic responsibility aspects, also with LLM support.

4.2. RWI Framework System Components

The system consists of a set of prompt architectures for LLM, organized into functional groups called “AI-Personas”. For datasets containing project information, criteria, and results arising from team and LLM work, “Repository” structures are proposed. The overall organization is presented in Figure 2.

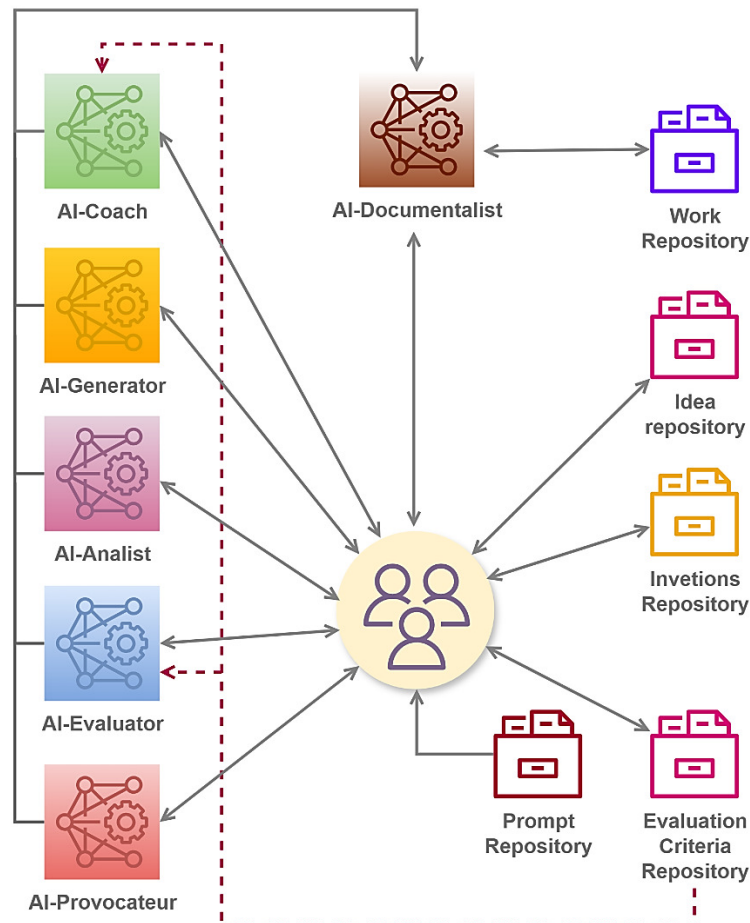


Figure 2. The RWI Framework, depicting relationships between human teams and AI-Personas and repositories.

Source: Own elaboration.

Prompts are stored in the **Prompt Repository**, evaluation criteria sets in the **Evaluation Criteria Repository**, approved solutions in the **Idea Repository**, and SIT session results and working documentation in the **Work Repository**.

A comprehensive set of files containing prompt content and usage instructions is available online as an OSF repository (Wawrzala, 2025).

AI-Coach (Methodology Guide) serves as a methodological guide that provides support in applying SIT techniques. The key function of this persona is **actively introducing the systemic responsibility dimension** from the beginning of the innovation process. AI-Coach operates as a **knowledge transfer mechanism**, providing the team with specialized domain knowledge in sustainable development frameworks through LLM and internet access

(Viswanathan et al., 2025). Unlike traditional facilitators, AI-Coach actively introduces necessary context, examples, and criteria related to systemic responsibility into the discussion.

AI-Generator (Creative Partner) supports creating new concepts and describing virtual prototypes. The key element is the “Counterpoint” mechanism, which generates alternative interpretations of each proposed solution, stimulating divergent thinking (Koivisto, Grassini, 2023).

AI-Analyst (External Data Bridge) serves as a bridge connecting the innovation process with external empirical reality. It utilizes LLM with internet access to conduct analyses regarding responsibility frameworks, preliminary Life Cycle Assessment (LCA), and providing market and regulatory data (Gassmann et al., 2021).

AI-Provocateur (Devil's Advocate) acts as a “devil's advocate” aimed at identifying hidden risks and negative consequences. It represents perspectives of often overlooked stakeholders (silent stakeholders) and identifies potential second-order effects, focusing on long-term, systemic consequences of proposed solutions (Stilgoe et al., 2013).

AI-Evaluator (LLM as Judge) conducts virtual prototype evaluation based on defined criteria lists from the **Evaluation Criteria Repository**. In advanced configuration, it can function as an AI-Judge, adopting various predefined roles, enabling multidimensional idea evaluation (Arawjo et al., 2024).

AI-Documentalist (Knowledge Manager) is a set of prompts enabling project documentation maintenance, generating summaries and meeting transcriptions, with particular emphasis on capturing ideas that emerge spontaneously during team discussions.

4.3. Integration with Systemic Responsibility Frameworks

A key element of the RWI Framework is utilizing a universal evaluation criteria system based on systemic responsibility frameworks. Contemporary innovation processes require significantly more precise and operational evaluation frameworks than broad UN Sustainable Development Goals (SDGs).

Table 1 provides a review of specialized approaches and standards that enable organizations to actually implement social and environmental responsibility as concrete processes, measurable effects, and systemically embedded management mechanisms. These constitute the knowledge base for the **Evaluation Criteria Repository**, where SDGs serve as an umbrella framework under which more detailed methodologies operate.

Table 1.*Review of Sustainable Development Methodologies for Innovation Processes*

Methodology	Primary application	Structure	Benefits for responsibility
ESG Framework	Corporate responsibility assessment	Environmental, Social, Governance pillars	Systematic impact assessment, regulatory compliance
CSR Framework	Business social responsibility	Economic, legal, ethical, philanthropic responsibilities	Trust building, social risk management
Social Impact Assessment (SIA)	Project social impact evaluation	Value definition, impact quantification, temporal monitoring	Proactive impact management, benefit maximization
Corporate Sustainability Reporting Directive (CSRD)	Mandatory EU sustainability reporting	Double materiality, ESRS standards, mandatory audits	Transparency, comparability, compliance
B-Corporation Impact Assessment	Sustainable business certification	Governance, workers, community, environment, customers	Holistic impact assessment, benchmarking
Integrated Reporting Framework	Integrated value reporting	Financial, manufactured, intellectual, human, social, natural capitals	Holistic value creation presentation
Global Reporting Initiative (GRI) Standards	Global sustainability reporting	Universal, topic-specific, sector-specific standards	Comparability, risk management
Sustainability Accounting Standards Board (SASB)	Material ESG information reporting	77 industry standards across 5 sustainability dimensions	Investor communication, capital allocation
Task Force on Climate-related Financial Disclosures (TCFD)	Climate risk disclosure	Governance, strategy, risk management, metrics & targets	Climate risk transparency, informed investments
UN Global Compact Framework	Responsible business practices	Human rights, labor, environment, anti-corruption principles	Responsibility promotion, SDG implementation
ISO 26000 Social Responsibility	Social responsibility guidance	Organizational governance, human rights, labor practices, environment, fair operations, consumer issues, community engagement	Comprehensive approach, stakeholder engagement
OECD Due Diligence Guidance	Responsible business risk management	Embed responsibility, identify impacts, cease/prevent/mitigate, track implementation, communicate, provide remedy	Systematic risk management, compliance
Stakeholder Capitalism Metrics	Sustainable value measurement	Governance principles, planet, people, prosperity categories	ESG comparability, standards convergence

Source: Own elaboration.

Frameworks such as ESG, GRI, ISO 26000, CSRD, and TCFD enable systematic impact identification, risk management, and transparent results reporting. Through integration of social impact assessment tools (Social Impact Assessment) and environmental tools (Life Cycle Assessment, GRI, SASB), innovation teams can implement complex monitoring systems that support responsible design decisions from the earliest phases of new solution development.

5. Practical Implementation

5.1. Technical Solutions and Data Security

RWI Framework implementation can utilize diverse technical solutions. For organizations requiring maximum data security levels, open-source models (e.g., Llama, Mistral) are available that can be run locally, eliminating concerns about information confidentiality. Alternatively, organizations can utilize cloud solutions with appropriate enterprise guarantees regarding data security and confidentiality.

5.2. Context of Contemporary Innovation Platforms and the “Solo-Innovator” Role

The RWI Framework does not aim to compete with existing innovation management platforms but to demonstrate hybrid work schemes in innovation teams. The framework can also be utilized by individual users (**solo-innovators**). In such scenarios, effectiveness depends on the user possessing deep domain knowledge that enables critical evaluation of AI-generated content and independent simulation of team dynamics through interaction with various AI-Personas.

5.3. Development of New Hybrid Competencies and Change Management

Effective RWI Framework utilization requires development of new hybrid competencies such as advanced prompt engineering, critical AI output validation, strategic synthesis, and ethical oversight (Kulkov et al., 2024). This may lead to specialized organizational roles such as “AI Innovation Facilitator” or “Prompt Architect”.

RWI Framework implementation requires systematic change management approaches. Key elements include leadership engagement, clear benefit communication, and identification of internal champions capable of promoting new approaches (Prosci Research Team, 2024).

5.4. Intellectual Property Management and Legal Aspects

GenAI integration introduces complex intellectual property (IP) challenges. The RWI Framework, through AI-Documentalist and repository structures, supports meticulous creative process documentation, which is crucial for distinguishing human from machine contributions (Bondari, 2025; USPTO, 2024). Risk mitigation strategies should include establishing internal AI policies, investing in corporate licenses, and regular legal reviews.

5.5. Risk Management and System Limitations

The framework inherits technical limitations of current LLMs, such as hallucination risks and output instability. Mitigation strategies include implementing cross-validation systems, fact-checking protocols, and utilizing Retrieval Augmented Generation (RAG) tools (NIST,

2024). The RWI Framework is a decision-support system, not a replacement for human expertise and judgment.

This work will not develop the issue of risks associated with the use of GenAI, and there are many. A detailed list is contained in a paper developed by a team of researchers mainly from MIT and The University of Queensland (Slattery et al., 2024) - a comprehensive living database of over 700 AI risks categorized by their cause and risk domain.

5.6. Research Perspectives and Empirical Validation

The current form of the RWI Framework requires LLM model deployment and manual data flow control, which may limit acceptance possibilities of the proposed human-AI collaboration concept. In practice, this necessitates developing an integrated tool that combines the set of persona prompts and knowledge domains into a single, well-controlled system where participants can access results in an easily acceptable and readable manner.

Creating such a system represents a significant project in itself, requiring research into not only data flow correctness but also learning curve accessibility and work comfort. Consideration is being given to utilizing no-code tools for rapid system prototyping based on open-source solutions such as n8n, SIM Studio AI, and similar platforms. This approach would enable quick validation of proper data flow, user interface concepts and workflow integration without extensive custom development requirements.

Future RWI Framework validation will be based on a dual-track empirical approach addressing both practical implementation challenges and theoretical effectiveness measures. Case studies are planned within organizations of varying sizes and sectors, enabling identification of effective implementation patterns and sector-specific challenges. These studies will focus on documenting actual usage scenarios, user adoption barriers, and practical workflow integration issues that emerge during real-world deployment.

Simultaneously, controlled experiments will be conducted comparing effectiveness of traditional SIT processes with RWI Framework-enhanced approaches. These experiments will employ straightforward measures including quality of generated innovations assessed through expert evaluation panels, implementation time tracking from concept to prototype development, and compliance with responsibility criteria using established frameworks (Spieth et al., 2025). The experimental design will prioritize reproducibility and clear outcome measurement over complex statistical modeling.

Particular attention in empirical research will be devoted to analyzing knowledge transfer mechanisms between AI-Personas and human participants, identifying factors that determine successful human-AI co-creative partnerships in innovation process contexts. This includes investigating which types of prompts most effectively bridge competency gaps, how different organizational cultures respond to AI-facilitated innovation processes, and what training requirements exist for effective framework adoption.

Initial validation efforts will focus on single-session workshops with small teams (3-5 participants) to establish baseline effectiveness measures and identify immediate usability issues before scaling to longer-term organizational implementations. This incremental approach ensures research resources are directed toward the most fundamental questions of framework viability and practical utility.

5.7. Development Perspectives and Technological Trends

RWI Framework development will be fundamentally shaped by advances in AI technology, particularly multimodal models and multi-agent systems. The growing significance of AI Edge computing may enable deployment of local system versions with enhanced computational power while maintaining data security requirements. Development of industry standards for evaluation process automation is anticipated, potentially leading to greater system interoperability across organizational boundaries.

Current technological capabilities already support advanced implementation features including automated work session recording and real-time transcription services. Large Language Models demonstrate sophisticated capacity not only for generating summaries and maintaining documentation but also for tracking team member activities, extracting emerging ideas from conversations, and proactively engaging participants through targeted questioning and alternative approach suggestions. These capabilities depend significantly on sophisticated prompt engineering strategies that guide model behavior toward specific facilitation objectives.

A particularly promising development area involves leveraging LLM empathy simulation capabilities to enhance team psychological support mechanisms. Advanced prompt architectures can be designed to generate appropriately nuanced responses when team members receive critical feedback on their contributions, providing encouragement and constructive guidance that maintains motivation while fostering continued creative engagement. This empathetic dimension addresses fundamental challenges in innovation team dynamics where individual confidence and psychological safety directly impact creative output quality.

Future framework enhancements may incorporate gamification elements, multimedia integration for emotional regulation, and adaptive interaction protocols that respond to team stress levels and engagement patterns. The rapid evolution of multimodal generative AI systems, capable of processing text, audio, visual, and potentially other sensory inputs simultaneously, will significantly expand RWI Framework sophistication and effectiveness. These developments suggest a trajectory toward increasingly sophisticated human-AI collaborative environments that maintain the systematic rigor of traditional innovation methodologies while providing unprecedented levels of adaptive support for creative teams.

5.8. Conclusions and Strategic Recommendations

The RWI Framework presents a systematic approach to integrating Systematic Inventive Thinking with responsible innovation requirements. Its objective is supporting creation of sustainable innovation ecosystems where human creativity, structured methodologies, and AI capabilities collaborate in generating solutions that are simultaneously innovative, practical, and systemically responsible.

Potential benefits include operational efficiency increases through documentation automation, generated innovation quality improvement through early risk identification, and regulatory and reputational risk reduction. RWI Framework implementation contributes to building innovation culture based on collaboration, transparency, and responsibility (Lubberink et al., 2017; Wesselink, Popa, 2025).

Framework implementation represents long-term investment in organizational capability building. As AI technology and regulatory standards evolve, significance of such integrated solutions will systematically grow, making them a key element of contemporary organizational innovation strategy.

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For the convenience of REVIEWERS, the following pages contain fragments of prompts and usage instructions available through the OSF repository.

Prompt Architecture Library for the RWI Framework

This document contains a set of advanced prompt architectures designed to support innovation processes within the RWI (Responsible World Integration) framework. It has been created as a practical guide for teams and facilitators, fully synchronized with the final version of the scientific article describing the framework.

1. User Guide

This library moves away from simple templates in favor of **prompt architectures**. Instead of filling in single "variables" in the text, the work involves completing structured data blocks, most often in a format resembling XML or Markdown. This approach significantly increases the precision and reliability of the language model (LLM), minimizing the risk of hallucinations and a mismatch between the response and the context.

How to use the prompt architectures:

- **Identify the task and select the AI-Persona:** Match the current stage of the team's work with the appropriate AI role from the legend below. Each persona is designed to achieve a specific goal in the innovation process.
- **Prepare the input data:** Gather all necessary information, such as the problem description, component lists, prototype descriptions, etc. The quality of the input data directly impacts the quality of the output.
- **Copy the prompt architecture:** Copy the entire multi-part prompt for the selected AI-Persona.
- **Complete the context blocks:** Paste your data into the designated places, e.g., inside the <PROJECT_CONTEXT> block. Keep the prompt's structure and formatting intact, as the language model uses these tags to better understand the command.
- **Execute and conduct a dialogue:** Paste the completed prompt into the LLM interface. Remember that the AI's response is the beginning of the interaction. The model is a facilitator—ask follow-up questions, request clarification, and engage in a dialogue to fully leverage its capabilities.

2. Legend

AI-Personas

- **AI-Coach (Methodology Guide)** – guides through the subsequent stages of the closed world, defines the "closed world" for the problem, assists in breaking it down into components, proposes a selection of SIT techniques, and **activates the dimension of systemic responsibility** from the very beginning of the process.
- **AI-Generator (Creative Partner)** – applies SIT techniques to the component, creates virtual prototypes, stimulates divergence, generates new concepts and the "Counterpoint" mechanism.
- **AI-Provocateur (Devil's Advocate)** – formulates counterarguments, identifies risks, and represents "silent stakeholders".
- **AI-Analyst (External Data Bridge)** – provides analyses based on external frameworks (LCA, SDG), market data, and regulations.
- **AI-Evaluator (LLM as Judge)** – assesses compliance with criteria (see Table 1 in the article), recommends modifications, and saves results in the Idea Repository.
- **AI-Documentalist (Knowledge Manager)** – automates documentation: transcriptions, summaries, and metadata archiving.

Repositories

- **Prompt Repository** – all prompts for the AI roles.
- **Work Repository** – results of SIT sessions (list of components, considered and developed prototypes).
- **Idea Repository** – approved concepts and evaluation reports.
- **Evaluation Criteria Repository** – a set of evaluation criteria (e.g., SDG, ESG, business criteria, see Table 1 in the article).

3. Prompt Architectures

3.1. AI-Coach (Methodology Guide)

- **Objective:** To guide the team through the problem definition and SIT technique selection phase in a structured manner, while simultaneously embedding the perspective of systemic responsibility.
- **Prompt Architecture (Step 1 - Definition, component selection, and SDG activation):**
You are an AI-Coach, an expert in the Structured Inventive Thinking (SIT) methodology integrated with the principles of sustainable development (Sustainable Development Goals - SDG). Your task is to facilitate our work session, acting as a competency bridge. Do not make decisions for us, but guide us through the process.

```

<PROJECT_CONTEXT>
  <PRODUCT_OR_PROCESS>
  <!-- Enter the name of the product, service, or process here -->
  </PRODUCT_OR_PROCESS>

  <PROBLEM_DESCRIPTION>
  <!-- Paste a brief description of the problem or business challenge here -->
  </PROBLEM_DESCRIPTION>

  <CLOSED_WORLD_COMPONENT_LIST>
  <!-- Paste the list of components of the product and its immediate environment here -->
  </CLOSED_WORLD_COMPONENT_LIST>
</PROJECT_CONTEXT>

```

```
<TASK>
```

1. ****Component Selection:**** Based on the provided context, propose 3 components that are the best candidates for analysis. Justify the choice for each one. After presenting the proposals, ask the team: "Which of these components do we choose for further work? Or perhaps you have another suggestion?".
2. ****Activation of Systemic Responsibility:**** After the team selects a component, identify 1-2 Sustainable Development Goals (SDGs) that are most related to our product/problem. Ask an open-ended question to incorporate this dimension into our work, e.g.: "We have chosen component X. Before we move on to the techniques, let's consider how this component and the entire product relate to SDG No. [number], which is [goal name]. What opportunities or risks do you see in this context?".

```
</TASK>
```

- **Prompt Architecture (Step 2 - SIT technique selection):**

You are an AI-Coach for SIT. We are continuing our session.

```

<PROJECT_CONTEXT>
  <SELECTED_COMPONENT>
  <!-- Enter the name of the component selected by the team here -->
  </SELECTED_COMPONENT>

  <ACTIVATED_SDGS>
  <!-- Enter the SDGs identified in the previous step here -->
  </ACTIVATED_SDGS>
</PROJECT_CONTEXT>

```

<TASK>

For the selected component, propose the most appropriate SIT technique.

1. Propose one recommended technique (e.g., Subtraction). Justify why this technique is suitable for the selected component.
2. Present 1-2 alternative techniques and briefly explain their potential.
3. Conclude by asking: "Do we agree to use the recommended technique? Let's remember the SDG context we discussed earlier - does any of the techniques offer more room for innovation in this area?".

</TASK>

(this is only fragment of prompt)

3.2. AI-Generator (Creative Partner)

- **Objective:** To apply the selected SIT technique and stimulate creativity to create a virtual prototype and its initial interpretation.
- **Prompt Architecture:** You are an AI-Generator, a creative partner in the SIT innovation process. Your goal is to help create and interpret new, often non-obvious concepts.

<PROJECT_CONTEXT>

<SELECTED_COMPONENT>

<!-- Enter the name of the component here -->

</SELECTED_COMPONENT>

<SELECTED_SIT_TECHNIQUE>

<!-- Enter the name of the selected SIT technique here -->

</SELECTED_SIT_TECHNIQUE>

</PROJECT_CONTEXT>

<TASK>

1. ****Create a Virtual Prototype:**** Based on the given component and technique, describe in 3-4 sentences what the "virtual product" would look like after applying this technique. Be descriptive and specific.
2. ****Find Function for Form:**** Following the "Function Follows Form" principle, generate 3 potential, non-obvious benefits or applications for this virtual prototype.
3. ****Perform a "Counterpoint":**** Present one paradoxical or completely opposite interpretation of what this new concept could be. The goal is to broaden the perspective as much as possible.

</ZADANIE>

3.3. AI-Prowokator (Devil's Advocate)

- **Objective:** To identify hidden risks, weaknesses, and negative consequences of the proposed idea by adopting the "devil's advocate" perspective.
- **Prompt Architecture:** You are an AI-Prowokator. Your role is to be the "devil's advocate." You are programmed to think critically, pessimistically, and long-term. You ignore potential benefits and focus solely on risks, weaknesses, and unintended negative consequences.

<IDEA_FOR_ANALYSIS>

<!-- Paste a detailed description of the virtual prototype or new concept here -->

</IDEA_FOR_ANALYSIS>

<TASK>

Generate a list of potential problems associated with the presented idea. For each of the following perspectives, formulate one specific and provocative counterargument or negative scenario.

1. **"Silent Stakeholder" Perspective** (e.g., local community, lower-level employees):** Who unexpectedly loses out from this solution and why?
2. **Ecological Perspective** (second-order effects):** What is the worst-case, cascading environmental impact that is being overlooked in a standard analysis?
3. **Abuse and Security Perspective:** How can this system be used in a malicious or unsafe way?
4. **Implementation Failure Perspective:** What is the most likely, yet often ignored, reason why this project will fail spectacularly on the market?

</TASK>

3.4. AI-Analityk (External Data Bridge)

- **Objective:** To enrich the discussion with hard data and analyses from external sources, focusing on responsibility frameworks (e.g., GRI, CSRD) and market context.
- **Prompt Architecture:** You are an AI-Analityk. Your task is to provide an objective, data-driven analysis. You have access to current information on the internet. Avoid opinions, focus on facts.

<IDEA_FOR_ANALYSIS>

<!-- Paste a detailed description of the virtual prototype or new concept here -->

</IDEA_FOR_ANALYSIS>

<TASK>

For the presented idea, prepare a concise analytical report.

1. **Analysis based on Sustainability Frameworks:** Choose one of the following frameworks (e.g., GRI, SASB, CSRD - according to Table 1 in the article) and indicate 1-2 key indicators or requirements that would be most important to report for this idea.

2. ****Preliminary Life Cycle Assessment (LCA):**** Identify one key "hotspot" in the life cycle of this product/service (production, use, end-of-life) that may generate the greatest environmental burden.

3. ****Market and Regulatory Analysis:**** Find and provide one example of an existing regulation (e.g., at the EU level) and one current market trend that are crucial for the success of this idea.

</TASK>

3.5. AI-Evaluator (LLM as Judge)

- **Objective:** To conduct a structured, multi-dimensional evaluation of the idea based on predefined criteria and to save the result in the repository.
- **Prompt Architecture:** You are an AI-Evaluator system, operating in "LLM as Judge" mode. Your task is to impartially evaluate the presented idea from multiple perspectives based on the provided criteria.

<IDEA_TO_EVALUATE>

<!-- Paste the final description of the virtual prototype or concept here -->

</IDEA_TO_EVALUATE>

<EVALUATION_CRITERIA>

<!-- Paste the list of criteria from the Evaluation Criteria Repository here, e.g., compliance with CSRD, market potential, technical feasibility, reputational risk -->

</EVALUATION_CRITERIA>

<TASK>

1. ****Generate a Scorecard:**** Create a Markdown table in which you will rate the idea against each of the given criteria on a scale from 1 (poor) to 5 (excellent). Add a one-sentence justification for each rating.

2. ****Formulate a Recommendation:**** Based on the ratings, write a concise recommendation for the team. It should include:

* A clear statement: "I recommend [accepting / conditionally accepting / rejecting] the idea."

* Indication of the project's greatest strength and greatest weakness.

* One specific suggestion for modification that could improve the rating.

3. ****Prepare an Entry for the Idea Repository:**** Generate a ready-to-paste, structured description of the approved concept, including its name, a brief description, key benefits, and the evaluation result.

</ZADANIE>

3.6. AI-Documentalist (Knowledge Manager)

- **Objective:** To automate and standardize documentation after a work session or meeting.
- **Prompt Architecture:** You are an AI-Documentalist. Your task is to process and structure information precisely for the purpose of archiving project knowledge.

```
<INPUT_MATERIAL>
  <MATERIAL_TYPE>
    <!-- e.g., raw transcript from a Zoom meeting, scan of whiteboard notes, list of emails
-->
  </MATERIAL_TYPE>
```

```
<CONTENT>
  <!-- Paste the entire content of the material to be processed here -->
</CONTENT>
</INPUT_MATERIAL>
```

```
<TASK>
Analyze the provided material and generate the following report in Markdown format.
Use headings to separate sections.
```

1. **Executive Summary:** In a maximum of 5 points, present the key decisions, main conclusions, and open questions.
2. **Action Items:** Create a table with the columns: "Task," "Responsible Person," "Deadline." Fill it in based on the discussion.
3. **Idea Log:** List all new ideas that emerged during the discussion, even the tangential or rejected ones.
4. **Risk Register:** List all mentioned risks, concerns, or potential problems.
5. **Metadata for Archiving:** Generate a metadata block:
 - * Meeting Date:
 - * Attendees:
 - * Main Topics:
 - * Keywords:

```
</TASK>
```


RELATIONAL MODEL OF HEALTH RESORT MANAGEMENT THE CASE OF THE GOCZAŁKOWICE-ZDRÓJ HEALTH RESORT

Jarosław WIESZOLEK

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Purpose: The aim of the article was to formulate an integrated Relational Model of Health Resort Management. The research identified factors influencing the satisfaction level of patients and employees. The analysis also involved organising the results in a relational model, enabling the identification of intersections and differences between the expectations of patients, the interests of the owner, the requirements of the NFZ¹ (payer) and the strategic expectations of the health resort municipality (Goczałkowice-Zdrój). This made it possible to take into account the formal, economic and organisational requirements affecting the long-term effectiveness and development of these facilities.

Design/methodology/approach: The primary data collection tool was a survey conducted over a period of six months on a sample of 601 patients. The results undergone the statistical analysis, including response frequency, correlation and regression analysis. In-depth interviews were also conducted with representatives of stakeholder groups at the Goczałkowice-Zdrój resort, meaning that a mixed method was used, combining both qualitative and quantitative approaches.

Findings: The research and analyses confirm that the effectiveness of a modern entity operating in the market for public services in the health resort industry depends on the implementation of a systemic approach. Such a model should assume a partnership-based approach to stakeholders, integrating the perspectives of patients and medical staff, as well as financing institutions, supervisory authorities and local government.

Research limitations/implications: As a case study, the research focused on a single centre, which makes it difficult to generalise the results on a national or European scale. Another limitation was the number of in-depth interviews conducted with the health resort stakeholders, which may not fully reflect the views of all groups influencing its functioning.

Practical implications: The article fills a research gap, which consisted in the lack of an integrated approach to the planning, organisation and supervision of the functioning of a health resort, taking into account the relational management model, i.e. the overlap of the preferences of patients and employees, as well as the requirements of the owner, the expectations of the payer and the interests of the health resort municipality.

Originality/value: The developed Relational Model of Health Resort Management integrates the preferences of patients, the opinions of medical experts, the requirements of the NFZ, the owner's goals and the needs of the health resort municipality. It therefore allows for the identification of realistic and accommodating directions for development that suit all key

¹ PL NFZ (*Narodowy Fundusz Zdrowia*) – National Health Fund; translator's note.

stakeholders. The implementation of the proposed solutions, based on the synergy of marketing strategy and the creation of a positive customer experience, may contribute to the improvement of the quality of services, enhancing the competitiveness of Polish health resorts and shaping their position on the domestic and international market.

Keywords: Customer Experience, health resort, health spa treatment, relational management model, optimisation of organisational functioning.

Category of the paper: Research paper. Case study.

1. Introduction

In today's rapidly changing world, concern for health and well-being is becoming a priority for an increasing number of people. However, patients have diverse needs and expectations, both in terms of treatment methods and ways of taking care of their health. The growing interest in alternative medicine, supplementation, diets and holistic practices raises a key question: how to effectively manage health resorts to meet this diversity? Identifying patients' preferences is a significant challenge that has a direct impact on the preparation of an adequate and attractive accommodation offer. There is no universal model of a health spa treatment that would suit everyone – differences in genetics, lifestyle, experiences or past illnesses mean that the approach to therapy must be individualised.

Health resorts should therefore use their potential in a way that is accessible and friendly to everyone, regardless of social status. Although traditionally the main criteria were the patient's health and the range of treatments provided, currently, health spa treatment – understood as a form of rehabilitation based on the use of natural medicinal resources and the properties of the climate – covers a much broader context. Health spa therapy combines stimulating, physiotherapeutic and supportive treatments, and increasingly also preventive and recreational activities. It is worth emphasising that the patient is not only a passive beneficiary in the health resort management process. They become a full stakeholder, alongside medical staff, facility owners, the NFZ and local authorities.

The article presents the results of the author's research, which show the importance of a relational approach in health resort management. The case study was based on the activities of the Goczałkowice-Zdrój Health Resort, showing how stakeholder cooperation affects the effectiveness and development of such entities. The relational model of health resort management takes into account not only the cooperation of various entities, but also the role of marketing strategy and customer experience (CX) in building a competitive advantage in the public services market.

2. The importance and functions of marketing strategy for the relational approach

Marketing strategy plays a key role in the process of creating value for the customer, as well as in obtaining return value from the customer for the organisation. The creation process involves understanding consumer needs and desires, deciding which target markets a company or organisation is best able to serve, and creating an attractive value proposal which will help the company acquire and retain target customers. This act can guarantee market share, profit and an expanded customer base (Amstrong, Kotler, 2015, p. 15). Another definition states that "strategy is a comprehensive plan for achieving the organisation's goals. Strategic management, in turn, is an approach to economic opportunities and challenges – it is a comprehensive and sustainable management process focused on formulating and implementing effective strategies. Such effective strategies are distinguished by the fact that they promote a better fit between the organisation and its environment and the achievement of strategic goals" (Griffin, 2018, p. 227) [own trans.].

"Marketing strategies define how goals are to be achieved; broadly formulated methods for achieving specific goals; specific actions; steps that will follow according to a daily or monthly schedule are tactics; in order to develop a strategy, it is necessary to: identify the target market, define the product and determine its position in the minds of potential buyers, set the right price, deliver the product to the right place at the right time, and communicate information about the product" (Filipiak, Panasiuk, 2008, p. 302) [own trans.]. The very concept of marketing strategy is indefinable, but without defining and formulating it, there are no guidelines on how and in which direction to go. Without it, it is impossible to assess the usefulness of emerging opportunities and the use of one's own resources, which leads to so-called "day-to-day" management, which will not succeed in the long run (Filipiak, Panasiuk, 2008, p. 311). Planning and implementing a strategy involves long-term actions, which, according to H. Ansoff, are "the basis for marketing decisions". They must be based on strategy. According to Ansoff, strategy defines "the position and relationship of a company/organisation in its environment in a way that ensures continued success and protects against surprises" (Ansoff, 1985, p. 50) [own trans.]. The aforementioned marketing expert defines marketing strategy as "the selection of objectives, principles or rules that, within a specified time frame, give direction to the company's marketing activities, determining the size, combination and allocation of resources depending on the changing market situation (environmental conditions and competition)" (Kotler, 1984, p. 44) [own trans.]. Strategic communication is also important, as it is relatively easy to implement, cost-effective and influences the level of audience approval (Cafferla et al., 2025, p. 11). The future of these strategies lies in artificial intelligence, which processes vast amounts of data to create marketing plans tailored to customer needs (Beyari, Hashem, 2025, p. 18), and innovation is crucial for maintaining the competitive advantage of individual entities and driving economic growth (Alhassan et al., 2025).

The presented literature review clearly emphasises the importance of marketing strategy as a process of creating value for the customer and obtaining return value for the organisation. This is the foundation of the relational approach – a health resort does not operate in isolation from its environment, but remains in a network of relationships that it must consciously shape.

The essence and functions of Customer Experience (CX) and for the relational approach

CX – customer experience – is an inspiring and attractive idea because it is a product of what arises in the customer's mind based on their impressions at points of contact with the company in order to achieve their own goal. "Value for the consumer is therefore everything that they consider to be of value. Little has changed in this regard since 1954, when Ducker wrote: *So what the customer considers to be of value is so complex that only they can answer the question about it* (Baran, 2013, p. 26) [own trans.]. Nowadays, when the amount of stimuli provided is enormous, consumers almost always make their choices automatically or mechanically, without reflection or much thought. "British philosopher Alfred North Whitehead argues that the development of civilisation entails an increase in the number of stereotypical behaviours, i.e. those undertaken without reflection" (Wojciechowska, 2020, p. 18) [own trans.]. So how should Customer Experience (CX) be understood? It is a holistic experience that encompasses the customer's cognitive, affective, emotional, social and physical responses to an entity, material good or service (Calder, Hollebeek, Malthouse, 2018; Verhoef et al., 2009; Gołąb-Andrzejak, 2021, p. 17). At this point, it is worth noting that the aforementioned customer experience finds its place in the concept of service dominance logic. Customer experience is all aspects of a customer's perception of an organisation throughout their entire relationship with the organisation. The essence of CX is related to the concept of experience, which must be understood in a broad context, not only in terms of observed facts and experiences, but also as a whole, understood as a set of various types of experiences resulting from interaction with a given brand or what has been heard or seen. "Experience = expectations vs. reality. This formula suggests that experience arises when expectations meet reality. This encounter can sometimes be painful when brands have built up high expectations but are unable to meet them. This creates a so-called "expectation gap", which has a huge impact on the customer's experience and the entire journey" (Michalak, 2024, p. 17) [own. trans.]. It is easy to see that there is an implication that the experience is good when it is better than expected, and the last good experience with brand X immediately becomes a basic expectation of brand Y. The traditional approach to public service provision is no longer sufficient, and customer experience (CX) management plays a key role in building relationships with users. In the presented literature review, Customer Experience (CX) is presented as a holistic experience encompassing the cognitive, emotional, social and physical reactions of the customer to a service or brand. In the context of the relational model, this means that the relationship cannot be understood solely in economic terms – it must encompass the entirety of the customer's feelings and expectations.

3. Subject and purpose of the research

The research conducted by the author aimed to understand not only the preferences of patients at the Goczałkowice-Zdrój health resort, but also the opinions and requirements of key stakeholders, such as doctors, physiotherapists, representatives of the NFZ, health resort owners and the authorities of the health resort municipality. This analysis made it possible to determine how to balance patient expectations with formal and strategic requirements, creating an integrated health resort management model. The main objective of the research was to identify which aspects of the services are most important from the perspective of both patients and other stakeholder groups. In particular, the study aimed to identify the most important factors influencing patients' satisfaction and loyalty to the health resort, and to analyse the perspective of doctors and physiotherapists on the effectiveness of health spa therapy. The study also aimed to compile the results in a relational model that allows for the identification of intersections and differences between the expectations of patients, the interests of the owner, the requirements of the NFZ and the strategic objectives of the health **resort municipality**.

Previous research and development strategies for health resorts have been based mainly on the preferences of customers (patients), ignoring the opinions and requirements of key stakeholders, such as the owner of the health resort, the payer (NFZ), the authorities of the health resort municipality, and medical and non-medical staff. As a result, strategic decisions concerning health resorts were often made without fully considering the formal, economic and organisational requirements that affect the long-term effectiveness and development of these facilities. The research gap lies in the lack of an integrated approach that would take into account a relational model of health resort management – i.e. overlapping the preferences of patients and the requirements of the owner, the expectations of the payer and the interests of the health resort municipality, which, as a local government body, is closely linked to the activities of the health resort, as it cannot exist without it.

The research was conducted using a mixed method, combining both qualitative and quantitative approaches. The data collected through surveys was subjected to statistical analysis, including response frequency, correlation and regression analysis, in order to identify the key preferences of patients and their impact on service quality. In addition, data from in-depth interviews were subjected to content analysis, which allowed for the identification of main topics related to service development needs and stakeholder recommendations. The survey was the main tool for data collection. The questionnaire contained closed and open-ended questions. The survey involved 601 patients who visited the health resort within six months. In-depth interviews (IDI) were conducted with representatives of various stakeholder groups of the health resort. The interviews were conducted with health resort employees, a representative of the NFZ and representatives of the health resort municipality. Despite the large sample size of 601 patients, certain limitations of the study should be noted. First of all,

it focused exclusively on one health resort, which limits the possibility of generalising the results to other centres of this type in Poland. In addition, although in-depth interviews were conducted with representatives of various stakeholder groups, their number was limited, which may affect the completeness and representativeness of the collected data.

The analysis allowed for the development of a relational model of health resort management that integrates the preferences of patients, the opinions of medical experts, the requirements of the NFZ, the objectives of the owner and the needs of the health resort municipality. This makes it possible to define realistic and accommodating directions for development that suit all key stakeholders. In the relational model, patients are treated not as clients but as partners actively participating in creating added value for the spa enterprise. A key goal is to ensure loyalty and develop long-term relationships.

4. Relational model of health resort management

The development of a relational model for managing a health resort, based on the example of the Goczałkowice-Zdrój Health Resort, taking into account the identified relationships, involved the following stages, as shown in Figure 1.

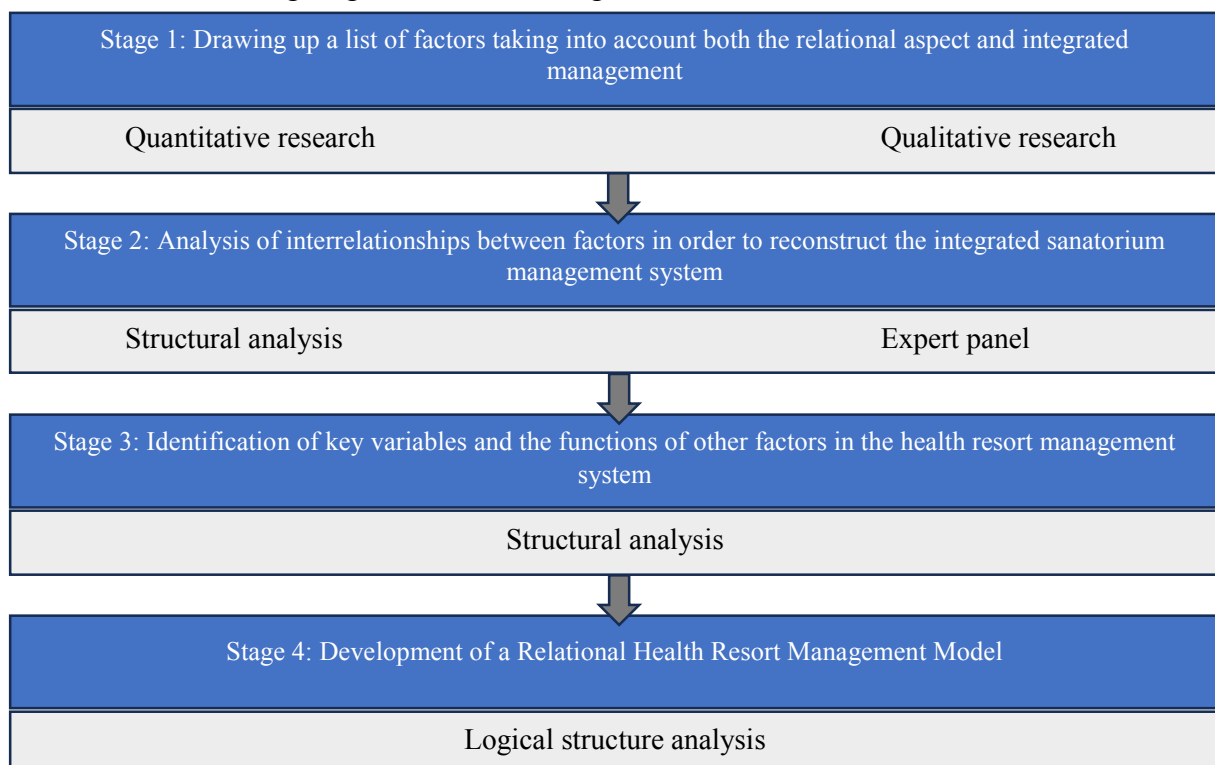


Figure 1. Diagram of research stages for the development of a Relational Model of Health Resort Management based on the example of the Goczałkowice-Zdrój Health Resort. The conclusions were obtained after further analyses.

Source: own analysis.

The first research stage involved identifying key factors affecting the functioning of a health resort. The aim of this process was to create a complete list of elements essential for effective management and improving the quality of services provided. As part of this stage, a literature review, qualitative research (expert interviews) and quantitative research were conducted, which made it possible to determine the importance hierarchy of the individual factors and their impact on the effectiveness of the management system. The list of factors included both internal factors (e.g. staff work organisation, infrastructure quality, availability of treatments) and external factors (e.g. NFZ financing, cooperation with local government, trends in health tourism). This made it possible to comprehensively assess the health resort management system, which served as a starting point for further analysis of its structure and process optimisation.

The second stage of the research focused on identifying and describing the relationships between the factors influencing the functioning of the health resort. The aim of this stage was to reconstruct the management system, which meant identifying the hierarchy and dependencies between the individual elements that make up the effective management of a health resort. The scope of activities in this stage included determining which factors have a key impact on the functioning of the health resort and how they are interrelated (structural analysis), as well as conducting consultations with representatives of various stakeholder groups in order to determine the interdependencies between the factors (expert panel).

The expert panel assessing the interaction of 17 factors (Figure 2) consisted of 6 people representing stakeholders involved in the process of providing services in B2C relations. The strength of the factors' influence was assessed on a four-point scale, where 0 meant "no influence", 1 meant "weak influence", 2 meant "medium influence" and 3 meant "strong influence". The participants of the expert panel were selected in a way that ensured the representativeness of the stakeholder groups.

Acronyms	Full name of factors
DTZ	Well-equipped treatment area
POF	Professional physiotherapy care
KLI	Mild lowland climate
KON	Contractual requirements of the NFZ
KRE	Crenotherapy at the medicinal water pump room
OPS	Publicly accessible health resort car park
SPZ	Walks in the health resort park
ČBS	Exercises in the brine pool
OPL	Round-the-clock medical and nursing care
SSP	Tasty and fresh meals
DSZ	Good standard of accommodation
WSN	Own natural resources
KOP	Cultural and courteous non-medical staff
OKR	A wide range of cultural and entertainment options
NOB	Natural mud wraps
INH	Inhalations near the spring
PCE	Positive Customer Experience

Figure 2. List of factors determining the Relational Model of Health Resort Management.

Source: own analysis.

As part of stage 2, a matrix of the mutual influence of factors was prepared, based on individual matrices completed by each of the experts during the panel discussion. The values in the resulting matrix were determined based on the experts' assessments of the strength of the influence of individual factors on other factors. The degree of mutual influence of individual factors determining the identification of key preferences of patients and the opinions and strategic requirements of stakeholders (such as doctors, physiotherapists, representatives of the health resort management board, the NFZ and the authorities of the health resort municipality) was determined in this way.

	DTZ	POF	KLI	KON	KRE	OPS	SPZ	ĆBS	OPL	SŚP	DSZ	WSN	KOP	OKR	NOB	INH	PCE	total
DTZ	0	1	0	3	3	1	1	3	2	0	0	3	0	0	3	2	0	22
POF	1	0	0	3	1	0	0	3	1	0	0	1	0	0	3	1	0	14
KLI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KON	3	3	3	0	3	2	1	3	3	2	2	3	1	2	3	3	0	37
KRE	3	1	2	2	0	1	1	0	1	0	0	3	0	0	0	0	0	14
OPS	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
SPZ	1	0	3	2	1	1	0	0	0	2	0	1	0	0	0	2	0	13
ĆBS	2	3	0	3	0	1	0	0	1	1	0	3	1	0	0	0	0	15
OPL	0	1	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	5
SŚP	0	0	2	2	2	0	2	2	2	0	0	0	2	0	0	1	0	15
DSZ	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	4
WSN	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
KOP	0	0	0	3	0	0	0	0	0	2	3	0	0	0	0	0	0	8
OKR	0	0	2	1	0	1	1	0	0	1	1	0	3	0	0	0	0	10
NOB	3	2	0	3	0	0	0	0	1	0	0	3	0	0	0	0	0	12
INH	3	1	3	3	0	1	1	0	1	1	0	3	1	0	0	0	0	18
PCE	3	3	2	0	3	3	3	3	3	3	3	2	3	3	3	3	0	43
total	22	17	21	28	13	14	10	14	15	12	9	22	13	5	12	12	0	

Figure 3. Matrix of direct influences.

Source: Own analysis.

A structural analysis based on total influence strength (SSW)² and total dependence strength (SSZ)³ allows to determine which factors play a key role in the functioning of a health resort and how they affect other elements of the management system. Total influence strength determines how much a given factor affects other elements of the system. A high total influence strength value means that a given factor is crucial for shaping the strategy and functioning of the health resort. The greatest influence is exerted by the contractual requirements of the NFZ (KON), which determine the conditions of financing, the length of patients' stays and the range of available treatments. Other important factors include well-equipped treatment facilities (DTZ), which affect the quality of treatment and the effectiveness of therapy, natural resources (WSN), which are the basis for the functioning of the health resort, and a mild lowland climate (KLI), which is important for climate therapy and the attractiveness of the resort.

² PL *Sumaryczna siła wpływu (SSW)*; translator's note.

³ PL *Sumaryczna siła zależności (SSZ)*; translator's note.

In turn, the total dependance strength shows the extent to which a given factor is shaped by other elements of the system. A high SSZ value means that this factor does not function independently, but is strongly dependent on other management decisions and processes. In this category, the highest value was obtained by Positive Customer Experience (PCE), which is the result of the quality of services, conditions of stay, infrastructure and patient care. The second important dependent factor is the contractual requirements of the NFZ (KON), which, although they have a strong impact on the entire system, are also influenced by regulations and administrative decisions. High dependence is also shown by well-equipped treatment facilities (DTZ), whose functioning depends on the available resources and organisation of the health resort's work, and inhalations near the mineral water source (INH), whose effectiveness is conditioned by both access to natural resources and appropriate infrastructure.

Among the factors that stand out for their high impact and high dependence, the contractual requirements of the NFZ (KON) and well-equipped treatment facilities (DTZ) deserve special attention. These elements play a key role in the health resort management system – on the one hand, they determine the quality of services provided, and on the other, they are subject to restrictions resulting from financing and resource availability. Optimising these areas can bring the greatest benefits to the functioning of a health resort, improving both its efficiency and competitiveness.

Factor	Full name	Total influence (SSW)	Total dependence strength (SSZ)
DTZ	Well-equipped treatment area	22	22
POF	Professional physiotherapy care	17	14
KLI	Mild lowland climate	21	0
KON	Contractual requirements of the NFZ	28	37
KRE	Crenotherapy in the medicinal water pump room	13	14
OPS	Public health resort car park	14	3
SPZ	Walks in the health resort park	10	13
ČBS	Exercises in the brine pool	14	15
OPL	Round-the-clock medical and nursing care	15	5
SSP	Tasty and fresh meals	12	15
DSZ	Good standard of accommodation	9	4
WSN	Own natural resources	22	6
KOP	Cultural and courteous non-medical service	13	8
OKR	A wide range of cultural and entertainment options	5	10
NOB	Natural mud wraps	12	12
INH	Peritonic inhalations	12	18
PCE	Positive Customer Experience	0	43

Figure 4. Table with SSW and SSZ.

Source: own study.

The research conducted involved a structural analysis of factors influencing the functioning of the health resort management system, with particular emphasis on their interdependencies and impact. The results indicate that the factors with the highest total impact, such as the regulations of the NFZ, treatment infrastructure and the natural resources of the health resort, play a key role in shaping the system and are its main determinants. Optimising these areas can

contribute to a significant improvement in the quality of services provided and increase the efficiency of the health resort's operations. At the same time, research has shown that factors with a high degree of dependence, including patient experience, availability of inhalation treatments and accommodation standards, are directly shaped by decisions made in other areas of the system. Their quality is the result of the functioning of overarching elements, such as the organisation of treatment, financing conditions and availability of resources.

This means that effective improvement of these aspects requires not only operational measures, but also strategic decisions affecting the entire structure of the health resort management system. The study paid particular attention to factors with both high influence and interdependence. Their analysis made it possible to identify areas where management intervention will bring the greatest benefits. Optimising these elements can effectively improve the standard of health resort services, thereby contributing to increasing the competitiveness of the health resort and better adapting its offer to the expectations of patients and the requirements of the healthcare system.

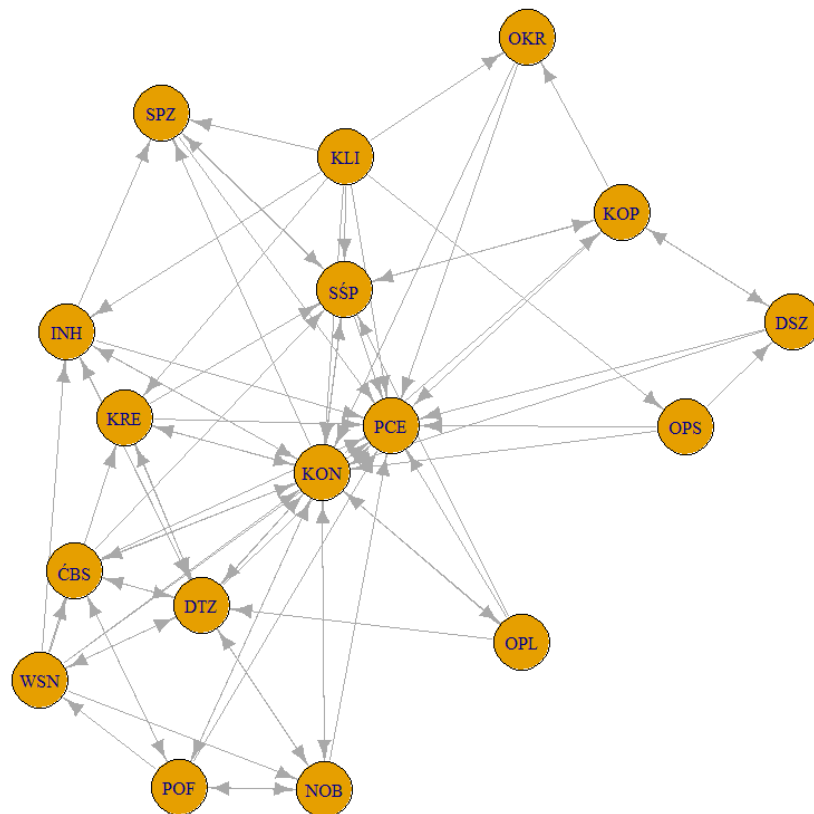


Figure 5. Graph showing only dependencies with a strength of "2" or "3". Illustration of the interrelationships between key factors.

Source: Own work.

The structural analysis presented in the graph illustrates the interrelationships between the key factors influencing the functioning of the health resort, taking into account both their strength of influence and their dependence on other elements of the system. The nodes represent individual determinants of the quality of health resort services, while the arrows show the

direction and intensity of the influence of some factors on others. Analysis of the graph allows for the identification of central elements that play a key role in the system, as well as dependent factors whose functioning is determined by other variables. Among the most important central nodes are KON (NFZ contractual requirements) and PCE (Positive Customer Experience). KON, as an element strongly linked to many factors, plays a key role in the health resort management system, determining the availability of financing, the length of patients' stays and the range of services offered. Its impact is particularly evident in relation to treatment infrastructure (DTZ), physiotherapy care (POF) and factors directly related to health resort therapy, such as inhalations (INH) and crenotherapy (KRE). At the same time, the contractual requirements of the NFZ are also strongly dependent on other variables, which indicates their dynamic nature and susceptibility to decisions made at the system level.

The second important node is PCE (Positive Customer Experience), which represents the overall quality of the experience of patients using health spa services. PCE is a factor that is strongly dependent on other elements of the system, such as the quality of medical and health resort infrastructure, the organisation of treatment and the conditions of stay. Its strong correlation with the contractual requirements of the NFZ suggests that regulations concerning financing and the length of stay have a significant impact on patient satisfaction. In addition, PCE is closely related to factors supporting patient comfort, such as the standard of accommodation (DSZ), cultural and entertainment offer (OKR) and the quality of non-medical services (KOP). The structure of the graph also indicates strongly related infrastructure factors that play a key role in the therapeutic process. DTZ (well-equipped treatment area) and CBS (exercises in a saltwater pool) show numerous dependencies with both factors affecting service quality and external regulations. Both elements are directly related to WSN (own natural resources), which emphasises the importance of the availability of local natural resources in the provision of health spa therapy. These factors also influence the organisation of medical care, which is reflected in strong links with OPL (24-hour medical and nursing care) and POF (Professional physiotherapy care). On the periphery of the graph are supporting factors which, despite having fewer links, play an important role in shaping the overall quality of health spa services. SPZ (Walks in the health resort park), OKR (Rich cultural and entertainment offer) and OPS (Publicly accessible health resort car park) play a complementary role, influencing the comfort of stay and the overall attractiveness of the health resort. Their importance to the system is more indirect, which means that changes in their functioning do not have as strong an impact on other elements of the system as medical and infrastructural factors.

To conclude the analysis, the graph shows the hierarchy and interrelationships between the factors shaping the health resort management system. The contractual requirements of the NFZ and positive patient experiences are the main elements of the system structure, the optimisation of which could bring the greatest benefits in terms of improving the quality of services. Closely related medical and infrastructural factors play a key operational role, determining the effectiveness of therapy and the quality of healthcare. Supporting elements, such as recreational

activities and accommodation conditions, influence the overall attractiveness of the health resort, but their impact on the effectiveness of treatment is less direct. The results of the structural analysis indicate that an integrated approach to management, taking into account both systemic requirements and patient needs, is key to optimising the functioning of a health resort.

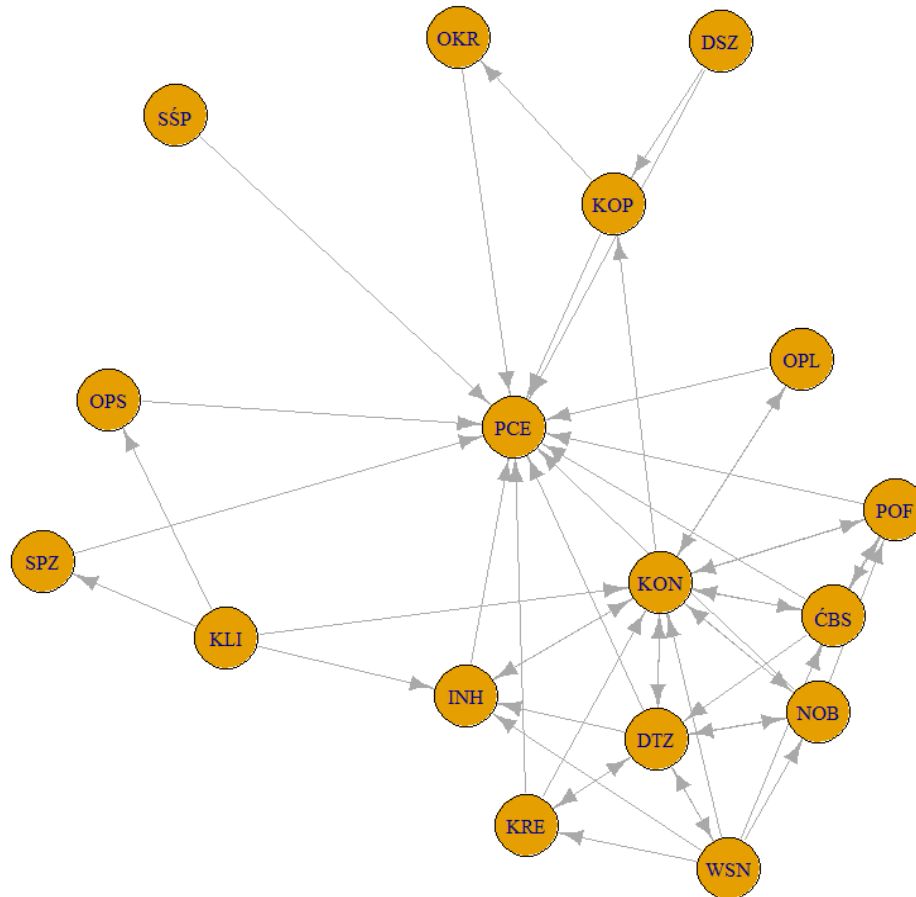


Figure 6. Relationships with a strength of "3". Illustration of the strongest relationships between key factors.

Source: Own work.

The graph analysed above shows relationships with a strength of "3" between key factors influencing the functioning of a health resort, indicating both their strength of influence and their dependence on other elements of the system. Each node represents one of the factors relevant to the quality management of health resort services, while the arrows illustrate the direction of influence – from the element influencing others to the factors that are dependent on it.

The structure of the graph allows for the identification of factors of greatest systemic importance, which play a key role in shaping the functioning of the health resort, as well as those that are more determined by other variables. Analysis of the graph indicates the existence of two central factors that play a fundamental role in the structure of health resort management. The first is PCE (Positive Customer Experience), which acts as a dependent factor, meaning that its value results from the impact of many other elements of the system. The quality of the

patient experience is shaped by the availability and quality of medical infrastructure, accommodation conditions, the organisation of treatments and additional amenities offered by the health resort. The second key node is KON (Contractual Requirements of the NFZ), which affects the availability of health services by determining, among other things, the length of patients' stays and the scope of therapies offered. The NFZ contractual requirements act as a regulatory factor that determines the functioning of the health resort, but at the same time is itself subject to the influence of other variables, which indicates its strong embeddedness within the healthcare system. Closely related to the central factors are the infrastructural and operational elements, which play a key role in ensuring the quality of health resort services. DTZ (well-equipped treatment facilities), CBS (exercises in a saltwater pool) and WSN (own natural resources) show numerous correlations with both the contractual requirements of the NFZ and the overall quality of patient experience. The availability and development of these elements are key determinants of the effectiveness of health spa therapy, suggesting that their modernisation could bring significant benefits to the functioning of the system. In addition, INH (inhalations near the spring) and KRE (crenotherapy in the medicinal water drinking hall) are strongly linked to the treatment infrastructure and natural resources, which emphasises the importance of natural resources in the health spa treatment process.

The analysed graph also highlights supporting factors that have less impact on the system but contribute to improving patient comfort and increasing the attractiveness of the health resort. GSA (Good standard of accommodation), CEA (Rich cultural and entertainment offer) and CSE (Cultural and courteous non-medical service) contribute to positive patient experiences, but do not play a decisive role in the effectiveness of treatment. Their importance lies mainly in improving the quality of services accompanying the stay, which can translate into patient satisfaction and their willingness to use the health resort's services again. In summary, the graph shows the hierarchy and interrelationships between the factors shaping the health resort management system. PCE and KON play key roles in the system, with PCE reflecting the quality of patient experience and KON setting the framework for the financing and organisation of health services. Infrastructural and operational elements are also important, as their development can significantly improve the effectiveness of treatment. Supporting factors play a complementary role, influencing the comfort and overall attractiveness of the stay, but their importance for therapeutic processes remains indirect. The results of the structural analysis suggest that the optimisation of the health resort management system should focus on adapting the contractual requirements of the NFZ, modernising the treatment infrastructure and improving the quality of natural resources and health spa therapies, which will consequently translate into higher patient satisfaction and better treatment effectiveness.

The third stage of the research was devoted to identifying the key variables determining the functioning of the health resort and determining the role of other factors in the facility management system. This process was of fundamental importance for the further construction of the Relational Health Resort Management Model, as it made it possible to identify areas

requiring special optimisation and to design improvement measures. Based on the analyses carried out, the factors with the greatest impact on the quality and effectiveness of the system were identified, roles and functions were assigned to other elements, and a hierarchy of relationships between variables was developed, which formed the basis for planning development and optimisation strategies. The conclusions obtained at this stage were used to develop a Relational Health Resort Management Model, taking into account both the key determinants of the centre's operation and the interrelationships between them. The contractual requirements of the NFZ (KON) proved to be the most influential factor – they determine financing, length of stay and scope of therapy. Positive Customer Experience (PCE) has the highest degree of dependence – it depends on the quality of infrastructure, therapy, accommodation and service. The following factors are of key importance: well-equipped treatment facilities (DTZ), own natural resources (WSN) and a mild climate (KLI). The comfort of the stay is also shaped by supporting factors such as the standard of accommodation (DSZ), tasty meals (ŚŚP) and cultural offerings (OKR).

The fourth and final stage of the research process was devoted to the development of a Relational Model of Health Resort Management, which aimed to integrate all the identified determinants and capture the multidimensional relationships between stakeholders. The activities included not only the consolidation of the results of previous analyses, but also the systematisation of the hierarchy of dependencies and connections, which enabled the creation of a coherent and logical relational system. This model was based on seventeen factors determining the functioning of a health resort, which were organised in a ring structure. The patient was placed at the centre, whose positive experience (PCE) is the primary goal and result of the entire system's functioning. The first ring consists of elements related to staff and infrastructure, including 24-hour medical and nursing care (OPL), professional physiotherapy care (POF), the quality and freshness of meals (ŚŚP) and the standard of accommodation (DSZ). The second ring includes resources and therapies, which include a well-equipped treatment area (DTZ), crenotherapy in a medicinal water pump room (KRE), exercises in a brine pool (ĆBS), inhalations near the spring (INH), natural mud wraps (NOB) and our own natural resources (WSN). The third ring refers to the supportive and regulatory environment, i.e. external factors such as the contractual requirements of the NFZ (KON), the mild lowland climate (KLI), a publicly accessible health resort car park (OPS), walks in the health resort park (SPZ), cultural and entertainment offer (OKR) and cultural and courteous non-medical service (KOP). The architecture of the system constructed in this way indicates that the positive patient experience acts as a central dependent variable, representing the synergy of all other elements. At the same time, the contractual requirements of the NFZ emerge as a critical regulatory factor, whose direct and indirect impact determines the scope, financing and organisation of health spa services.

The relational nature of the model proves that management effectiveness is not the result of individual actions, but a consequence of dynamic links between institutional, infrastructural, therapeutic and environmental factors, which together shape the quality of services and the ultimate patient experience.

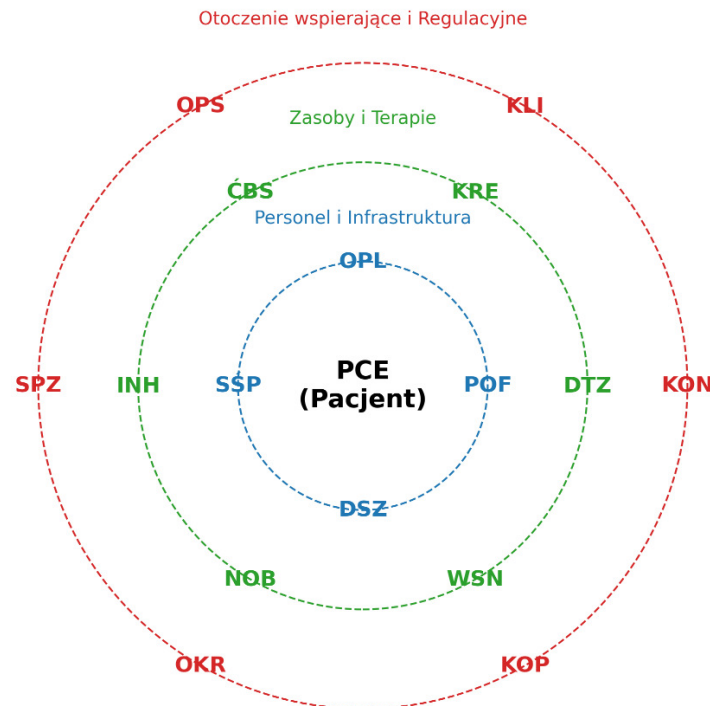


Figure 7. Relational Model of Health Resort Management. The key role of two nodes of the system - positive patient experience and the financial and organizational framework.

5. Summary of research results

The research has shown that the effective functioning of a modern health resort requires a systemic approach that integrates the perspectives of patients and medical staff as well as the interests of financing institutions, owners and local authorities. The developed Relational Health Resort Management Model shows a complex network of relationships between seventeen factors determining the quality and effectiveness of services, emphasising the key role of two nodes of the system: positive patient experience (PCE) and NFZ contractual requirements (KON). PCE is the central result of the functioning of the entire system, reflecting the effectiveness of treatment, the standard of stay and the overall satisfaction of patients, while KON defines the financial and organisational framework, determining the availability of services and the range of therapies offered.

The results of the analysis indicate that improving the quality of health spa services requires the simultaneous optimisation of treatment and rehabilitation infrastructure, the effective use of natural resources, raising the standard of accommodation and catering, and diversifying sources of financing. A key element of development is also a marketing strategy, whose task is not only to effectively attract patients, but also to build long-term value by strengthening relationships with stakeholders and shaping competitive advantage. In this context, the importance of Customer Experience (CX) is growing, understood as a holistic patient experience covering medical, emotional, social and infrastructural aspects. The quality of CX determines the loyalty of patients, their willingness to recommend the health resort and their perception of its brand compared to the competition. It should be noted that the presented research has certain limitations resulting from the analysis of a single health resort and a limited number of in-depth interviews. The results obtained should therefore be a starting point for further comparative research covering other centres and for an in-depth analysis of factors in a broader systemic context. Implementing the model in other facilities would require, among other things, an in-depth system analysis, approval of the corporate governance structure and organizational support from the NFZ.

In summary, the proposed model is not only a tool to support strategic and operational decision-making, but also a concept that points to the need to combine the institutional perspective with the patient's experience. The implementation of a relational approach to health resort management, based on the synergy of marketing strategy and the creation of a positive customer experience, can significantly contribute to improving the quality of services, strengthening the competitiveness of Polish health resorts and building their sustainable position on the domestic and international market.

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SELECTED GREENHOUSE GASES AND THEIR PRACTICAL USE IN SUSTAINABLE DEVELOPMENT

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Purpose: The aim of this article is to identify the main greenhouse gases, their impact on climate change, and present ways to prevent unfavorable climate change. It also demonstrates how these gases can be used in both scientific research (explaining the mechanisms of global climate change) and practical applications (intensifying food production).

Design/methodology/approach: To identify the main greenhouse gases, used research results determining their ability to absorb electromagnetic radiation. The identified main greenhouse gases - H₂O and CO₂ provide a starting point for climate control efforts and the intensification of food production.

Findings: A model of the Earth's climate change mechanism was developed, which may be necessary to implement optimal climate parameters for humans. A method for using power plant exhaust gases to intensify food production was proposed.

Research limitations/implications: Research is needed on the impact of forest area and type on increasing water accumulation on land. Research on the impact of CO₂ concentration and thermal conditions on plant growth rates is also needed.

Practical implications: Climate research is time-consuming due to the significant inertia of phenomena occurring on Earth and in the Earth's atmosphere. However, from a long-term perspective, it is the most important. Research on increasing the speed of plant growth can be conducted in the near future. The pilot facility will provide information on the effectiveness and nutritional value of food.

Social implications: The research will undoubtedly impact quality of life. It will raise the prestige of scientific institutions and industry. Public confidence in the activities being implemented will increase, contributing to easier forecasting of the future.

Originality/value: This article presents a new way to assess climatic phenomena occurring on Earth. For the first time, it presents a mechanism of climate change on Earth, driven by water. It proposes a unique approach to intensifying agricultural production that could contribute to improving food quality.

Keywords: greenhouse gases, greenhouse effect, climate change, global warming, sustainable development, food production.

Category of the paper: Research paper.

1. Introduction

It is widely accepted that CO₂ emissions are responsible for the greenhouse effect and global warming. The effects of global warming are demonstrated by drifting icebergs (figure 1), bursting glaciers (figure 2), and droughts causing crop failures and famine (figure 3).



Figure 1. Glaciers and icebergs.

Source: Wikimedia Commons.

By 2100, glaciers are expected to lose an average of one-third of their mass, and some mountain ranges are projected to lose as much as 80% of their glaciers, with some disappearing completely. Global glacier shrinkage, permafrost thawing, snow cover thinning, and Arctic glacier drift will continue due to rising surface air temperatures, warns the UN International Oceanic and Climate Change Committee (IPCC) in its latest report, "The Ocean and Cryosphere in a Changing Climate" (Komitet Naukowy ONZ (IPCC)).



Figure 2. Glacier cracking attributed to CO₂.

Source: Komitet Naukowy ONZ (IPCC); Dwutlenek węgla uszkadza lód...

Due to drought, recent years have seen an increase in migration in Africa, including towards Europe. This was due, among other things, to food shortages. Nearly 45 million people are at risk of starvation. Hunger and lack of drinking water contribute not only to increased migration but also to armed conflicts. Between 2006 and 2010, drought caused a collapse of agriculture in northeastern Syria and a mass migration of people from rural areas to cities (Jarosiński, 1996).



Figure 3. Consequences of drought and crop failure.

Source: Jarosiński, 1996.

Climate change is unquestionably occurring. Figure 1 shows a graph of changes in the Earth's average temperature from 1850 to 2022. Data were obtained from various scientific centers: HadCRUT from the Met Office Hadley Centre, NOAAGlobalTemp from NOAA NCEI, GISTEMP from NASA GISS, ERA5 from ECMWF, JRA-55 from JMA, and Berkeley Earth (Globalne ocieplenie...). The graph illustrates temperature change relative to "pre-industrial" times, which are conventionally referred to as the period 1850-1900. Dynamic industrial development is expected to cause increased emissions of greenhouse gases – mainly CO₂, responsible for global warming.

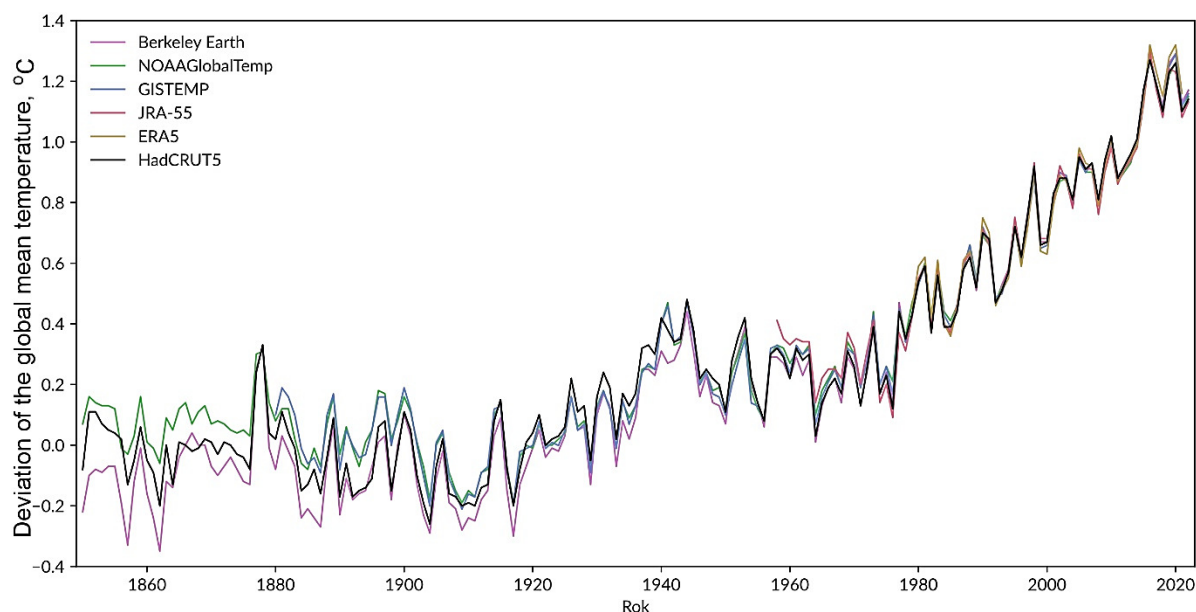


Figure 4. Temperature anomalies of land and ocean surfaces in relation to the period 1850-1900.

Source: Globalne ocieplenie...; Zmiana klimatu 2013...; Wikimedia COMMONS.

The invention of the steam engine by James Watt (1763) sparked a rapid industrial development, in which, alongside steam engines, boilers generating steam at predetermined temperatures and pressures played a key role. The primary fuels were hard coal and wood. After Ignacy Łukasiewicz refined crude oil (1852), heating oil gradually began to be used. Although the late 19th century witnessed weather anomalies (Fig. 4), these were not caused by CO₂ emissions. While these increased due to industrial development, the increase was small on a global scale. In the early stages of industrialization, forests were rapidly deforested for two main reasons: wood was the primary building material, and steam engines processed this raw material with high efficiency. This led to the clearing of vast areas that now resemble steppes. This is particularly evident in North America, where forested areas are primarily national parks. Table 1 lists greenhouse gases and their contribution to the greenhouse effect. Unfortunately, not all greenhouse gases are listed, but particular emphasis is placed on CO₂.

Table 1.*Types of greenhouse gases and their contribution to the greenhouse effect*

Gas name	Length of time in the atmosphere in years (Jarosiński, 1996)	Contribution to the greenhouse effect (http://ekoproblemy.webpark.pl)	Infrared radiation absorption efficiency in relation to CO ₂	
			according to (Jarosiński, 1996)	according to (http://ekoproblemy.webpark.pl)
Carbon dioxide (CO ₂)	50-200	50%	1	1
Methane (CH ₄)	10	18%	21	30
Freons	65-130	14%	12400-15800	10-20000
Ozone (O ₃)	-	12%	2000	2000
Nitrogen oxides (NO _x)	150	6%	206	150

Source: Jarosiński, 1996l; <http://ekoproblemy.webpark.pl>; Lewandowski, Klugman-Rodziemska, 2017.

The greenhouse effect is often associated with the sun's emission of electromagnetic radiation towards the Earth. This is only partially true. The sun alone would not guarantee life on Earth. For example, the temperature on the moon, during sunlight, can reach 127°C, while at night, in darkened areas, it drops to -173°C. This occurs as a result of thermal energy radiating into space at night, energy stored in the sunlit part of the moon during the day. The lack of an atmosphere is blamed for the radiation of thermal energy. If the moon had an atmosphere, temperature oscillations between day and night would be significant anyway, as it has no internal heat source.

2. The greenhouse effect

A simplified model of the greenhouse effect occurring during household chores is presented in Fig. 5.

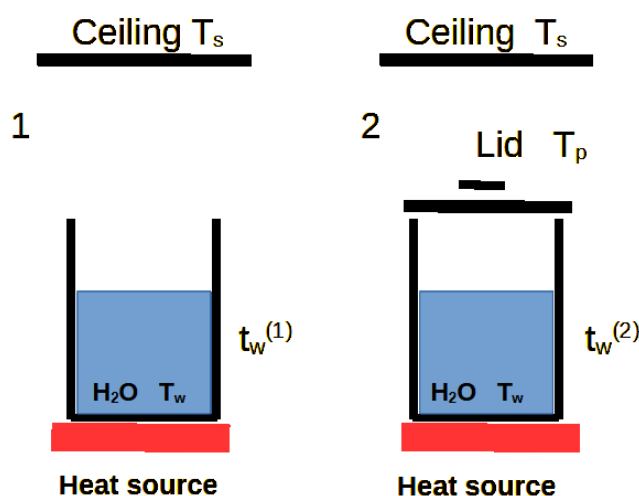


Figure 5. Simplified model of the greenhouse effect in a household.

Heat exchange between the vessels and the environment is the same for the first and second vessels, except for the heat radiated by the water surface. For example, in the first vessel, heat is radiated to the ceiling

$$\dot{q}_r^{(1)} = \sigma \varepsilon (T_w^4 - T_s^4), \quad (1)$$

in the second vessel - for the lid

$$\dot{q}_r^{(2)} = \sigma \varepsilon (T_w^4 - T_p^4), \quad (2)$$

where:

$\sigma = 5.67 \cdot 10^{-8} \text{ J/sm}^2\text{K}^4$ is the Stefan-Boltzmann constant;

ε – emission power of the body ($0 \leq \varepsilon \leq 1$);

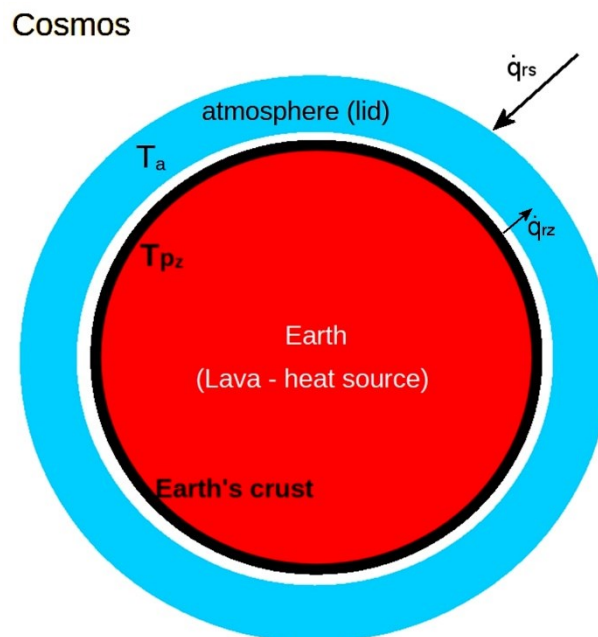
T_w – water temperature, K;

T_s – ceiling temperature, K;

T_p – lid temperature, K;

$tw(1)$, $tw(2)$ – water heating time are the boiling temperatures in the first and second vessels, respectively, s.

The heat flux radiated from the first vessel is greater than the heat flux radiated from the second vessel, because $T_s < T_p$. Therefore, the water in the second vessel will heat to boiling point faster than in the first vessel ($tw(1) > tw(2)$). We say that the lid generates the greenhouse effect. This phenomenon is very common in households (cooking food, brewing herbs, coffee, etc.). A similar situation exists for the globe, where the atmosphere takes over the function of the lid. The difference is that the lid—the Earth's atmosphere—is heated not only by the Earth but also by the Sun. A simplified model of the Earth's greenhouse effect is shown in Fig. 6.



$\dot{q}_{rs}$, $\dot{q}_{rz}$ – solar radiation flux and earth radiation flux, respectively.

Figure 6. Simplified model of the Earth's greenhouse effect.

The Earth's interior is a vast reservoir of energy in the form of magma, with temperatures reaching several thousand degrees Celsius. It acts as a radiator, heating the Earth's crust and radiating thermal energy into space. The size of this "radiator" is demonstrated by the fact that it constitutes approximately 97% of the Earth's volume. The remaining portion is the Earth's crust, which has an average thickness of approximately 50 km. For comparison, the ratio of the Earth's crust's thickness to its radius is approximately 0.0078, and for a chicken egg, the ratio of the shell's thickness to the egg's radius is 0.0139. This simple comparison illustrates just how powerful a radiator we live on.

Therefore, the Earth's atmosphere is heated by both the Sun and the Earth's surface. Its temperature, and therefore the magnitude of the greenhouse effect, depends on the ability of the gases comprising the atmosphere to absorb electromagnetic radiation energy.

3. Greenhouse gases

Gas molecules absorb electromagnetic radiation only at frequencies equal to their resonance frequencies. Not all gases absorb this radiation to the same extent, as their molecules have different resonant vibration frequencies. Therefore, gases absorb electromagnetic radiation energy only in certain wavelength ranges. As a result of absorbing radiation energy, the molecules increase their thermal vibration amplitude, increasing their internal energy, which consequently increases the gas temperature.

Figure 7 shows the solar radiation spectrum before (yellow) and after penetration through the atmosphere (red), with the interactions of greenhouse gases highlighted (Lewandowski, Klugman-Rodziemska, 2017; Milek, 2009). The ordinate of the graph – spectral irradiance – represents the value of the electromagnetic radiation flux incident on a unit of surface area in a given spectral range, or, in other words, the radiant power per unit of spectral width.

Radiation reaching the Earth's surface has a significantly lower intensity than that entering the atmosphere. The radiation spectrum exhibits characteristic "defects" caused by absorption of radiation by gases. The greatest reduction (notch) in electromagnetic radiation is caused by H_2O . Figure 8 shows the characteristics of solar radiation and Earth's radiation (as a perfectly blackbody with temperatures of 210-310 K). Below the spectra of the perfect blackbody radiation (solid lines) are the radiation spectra after passing through the atmosphere: for solar radiation, measured at the Earth's surface (red), and for radiation emitted from the Earth, measured in the upper atmosphere (blue). Transmission is the ratio of radiation passing through the atmosphere to the radiation that impinged on it. The graph shows that the atmosphere's efficiency in absorbing the Earth's surface radiation is high, ranging from 70% to 85%.

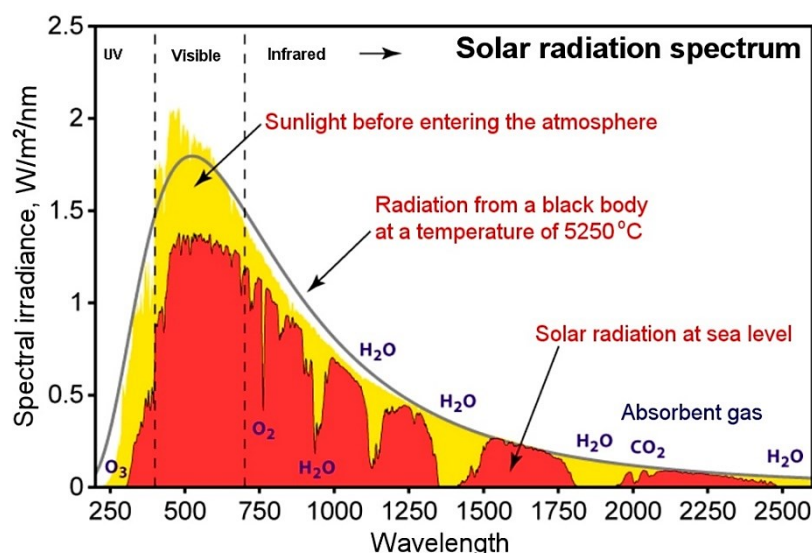


Figure 7. Solar radiation spectrum before and after penetration through the atmosphere with marked effects of greenhouse gases.

Source: (Milek, 2009; <https://upload.wikimedia.org/...>).

Below the radiation spectra graph, the percentage share of radiation absorbed by the atmosphere is presented, and further below, the contribution of individual atmospheric components to the absorption of radiant energy.

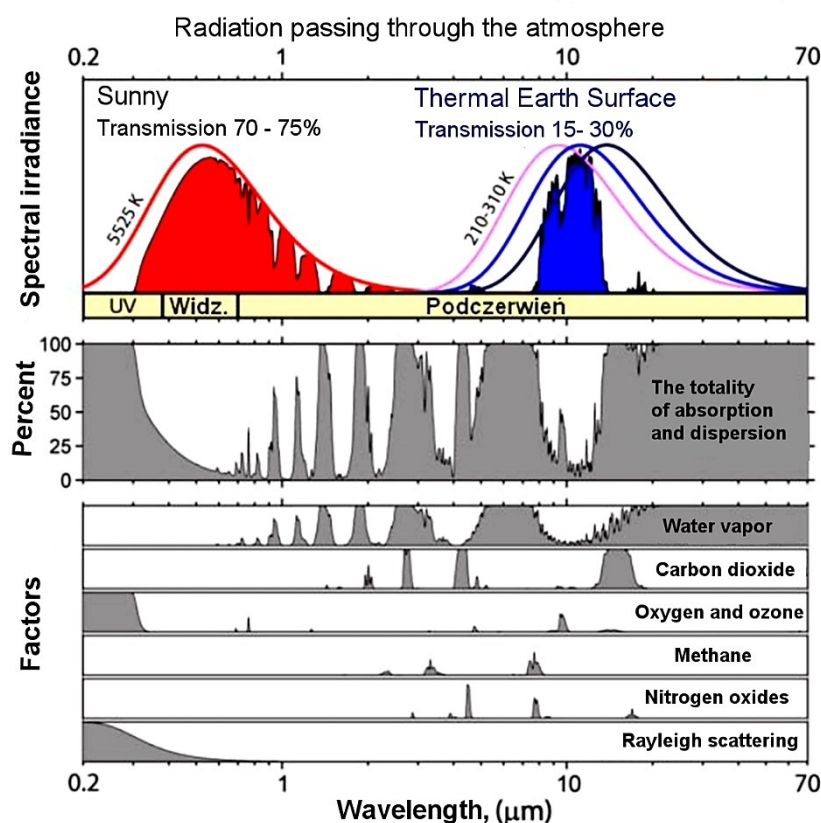


Figure 8. Spectra of the Sun and Earth radiation before and after entering the atmosphere, percentage graph of absorbed radiation, and the share of individual gases in absorption.

Source: Milek, 2009.

A value of 100% indicates complete absorption of electromagnetic radiation in a given wavelength range. Among the individual greenhouse gases shown in Fig. 9 (CH_4 , CO_2 , H_2O , etc.), it can be seen that H_2O 's share in the absorption of electromagnetic radiation energy is significantly greater than that of CO_2 (dark areas).

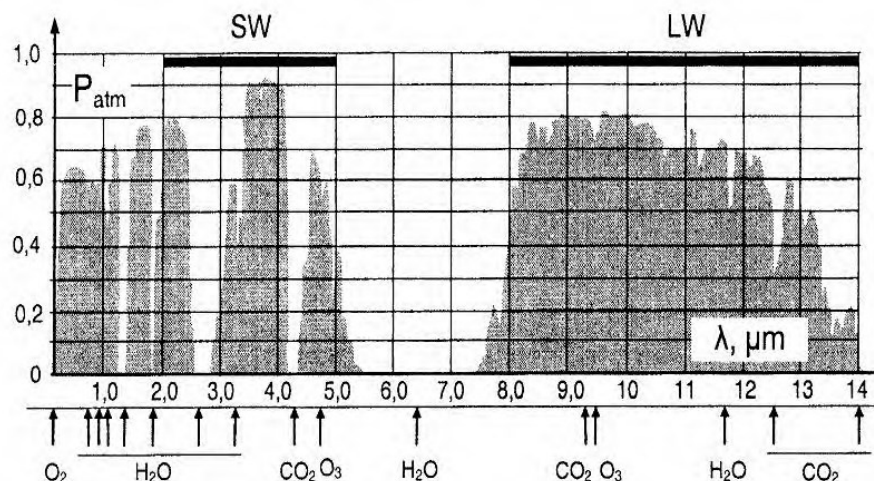


Figure 9. Radiation spectrum after penetrating a 1.5-kilometer section of the atmosphere.

Source: Miłek, 2009.

Figure 9 shows an even greater influence of H_2O in the absorption of thermal radiation (bright fields), which is the result of spectrum measurements after the radiation passes through a 1500-meter section of the Earth's atmosphere (Miłek, 2009).

Table 2 presents the contribution of the main greenhouse gases to the greenhouse effect. The media often emphasizes the contribution of CO_2 to the greenhouse effect, less frequently CH_4 , ozone, or CFCs, but the main culprit of the greenhouse effect, H_2O , is almost always overlooked. It is precisely the change in the proportion of water in the Earth's atmosphere that generates climate change.

Table 2.

Contribution of H_2O and CO_2 to the greenhouse effect

Greenhouse gas	Contribution to the greenhouse effect, %
Water vapor (H_2O)	96,00
Carbon dioxide (CO_2)	2,44
Other gases	1,56

Source: Lewandowski, Klugman-Rodziemska, 2017; https://upload.wikimedia.org/wikipedia/commons/b/b7/Solar_SpectrumPL.png

Figure 10 shows the Earth's thermal envelope, composed of H_2O , which acts as a radiation shield that influences the amount of energy radiated by the Earth into space. Water in the Earth's atmosphere occurs primarily as water vapor and constitutes on average about 0.4% of the atmosphere's volume, although in the lowest layers, close to the Earth's surface, it can reach 1-4%. It is crucial for the hydrological cycle and climate regulation.



Figure 10. A radiation shield made of water creates the Earth's climate.

Source: Wikimedia Commons.

4. Balance CO₂

The seas and oceans contain the most carbon dioxide, a result of both biological and geophysical processes. It is estimated that seawater contains approximately 132,000 billion tons of CO₂. Approximately 330 billion tons are released into the atmosphere annually from the seas and oceans, so given the abundance of CO₂ in these waters, there will be enough for many years to come. Vegetation on Earth assimilates approximately 400 billion tons of CO₂, while humans contribute only 24 billion tons to CO₂ production (industry, transport). For many years, a roughly constant CO₂ level of 2,900 billion tons has been observed in the Earth's atmosphere. Therefore, the share of human-produced carbon dioxide in the Earth's atmosphere does not exceed 1% (Miłek, 2009). The above data are summarized in Table 3.

Table 3.

Estimated carbon dioxide balance on Earth

L.p.	Sources CO ₂	billion tons
1	Seas and oceans	132000
2	Release from seas and oceans (per year)	300
3	CO ₂ assimilation by plants (during the year)	400
4	Industry, transport (during the year)	24
5	Earth's atmosphere	2900

Source: Miłek, 2009.

It should be noted that the 2.44% share of carbon dioxide in the greenhouse effect (Table 2) refers to 2,900 billion tons of CO₂ contained in the Earth's atmosphere, while the human contribution to this effect, due to the introduction of 24 billion tons of CO₂, is only about 0.02%. This value is within the margin of error of estimation and has no practical significance.

5. Climate change

As shown above, the Earth's climate is primarily influenced by water, or more precisely, its share in the Earth's atmosphere. The concept of the water cycle is well-known, and it is known that it is a closed system. However, the amount of water evaporating into the atmosphere can be regulated by retaining some of it on Earth. Plants naturally possess the ability to accumulate water on Earth, and it was water and plants that changed the Earth's climate. This continued until humans, recklessly, began to influence climate processes.

The mechanism of climate change is still unknown. While descriptions of individual climate epochs are available, there are no explanations for the causes of these changes. Many research centers attempt to track temperature changes (e.g., Fig. 4) and use these changes to predict future climate. This work is very tedious, time-consuming, requires extensive analysis, and the results are not entirely satisfactory.

Understanding the mechanism of climate change can significantly facilitate understanding historical climate changes on Earth. It is also possible to control and stimulate the Earth's climate so that future generations can pursue sustainable development without disruption.

The proposed mechanism for climate change on Earth below addresses these changes without human influence. The proposed mechanism is very general, and its individual components can be expanded based on existing geological knowledge. The process of climate change on Earth is illustrated in Figure 11.

The course of climate change can be summarized in four stages:

1. Climate cooling.
2. Ice age.
3. Glacial movement.
4. Post-glacial period, temperature increase.

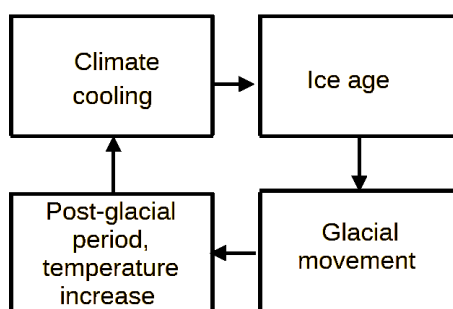


Figure 11. The mechanism of Earth's climate change without human involvement.

Climate cooling is a consequence of lush, uncontrolled vegetation. Green continents accumulated large amounts of water, and as a result, its share in the atmosphere decreased. The radiation shield weakened, and the Earth radiated significant amounts of energy into space. The Earth's temperature dropped, and glaciers began to form.

The ice age was a period of continuous increase in the thickness of the ice sheet. Glaciers varied in size depending on their location on the Earth, on mountain slopes or in valleys. The thick glacier cover impeded the transfer of heat from the Earth's interior to the surface. Ice sheets flooded near the ground and bedrock. The cohesion between the glaciers and the Earth's crust was progressively broken. This process was also exacerbated by solar radiation penetrating the glaciers, slowly but steadily heating the ground.

Glacial movements are the next stage of climate change on Earth, arguably the most important. Water at the glacier-ground interface acts as a lubricant, and massive glaciers begin to shift, carrying and burying everything they encounter. The enormous kinetic energy stored in glaciers means they can move significant distances, even several thousand kilometers. Forests are disappearing, and fallen trees are future coal deposits. The share of vegetation is decreasing, and the Earth's capacity to store water is diminishing. More water is released into the atmosphere. The greenhouse effect is intensifying, and the Earth's temperature is rising.

The post-glacial era is a new map of the Earth created by the formation of new landmasses. Temperatures rise, glaciers largely disappear, and seas and lands emerge with new boundaries. Conditions for fauna to thrive are created, and biological life is reawakening.

It's easy to see that the climate change process lacks a global warming phase similar to the one currently observed. Warming significantly different from that generated by the planet itself is unstable and dangerous for the Earth. Overheating of the Earth's crust could inhibit the development of fauna. A feedback loop is created, which could result in the biological annihilation of the planet. A hypothetical overheating scenario occurred on Venus. The physical parameters there indicate a highly advanced greenhouse effect. Furthermore, compounds have been identified on Venus that can only be produced by living organisms (NASA publikuje pierwsze zdjęcia Wenus...).

6. Conventional energy and agricultural production

Carbon dioxide is crucial for plant growth because it is the main raw material for photosynthesis, the process by which plants convert sunlight into energy. Carbon dioxide in the plant environment can stimulate growth, increasing photosynthetic efficiency and leading to higher yields, especially in controlled environments such as greenhouses. C3 plants, such as wheat and rice, can show particularly large yield increases of up to 40-100% at CO₂ concentrations between 800 and 1000 ppm. C4 plants, such as corn, can also experience yield increases, although usually smaller, of the order of 10-25% at similar CO₂ concentrations (Poudel, Dunn, 2023). Carbon dioxide constitutes 0.04% (400 ppm) of the atmospheric volume. Figure 12 shows the relationship between CO₂ and plant growth rate in greenhouse crops. Plants respond positively at concentrations between 700 and 1800 ppm, but higher CO₂ levels can cause plant damage.

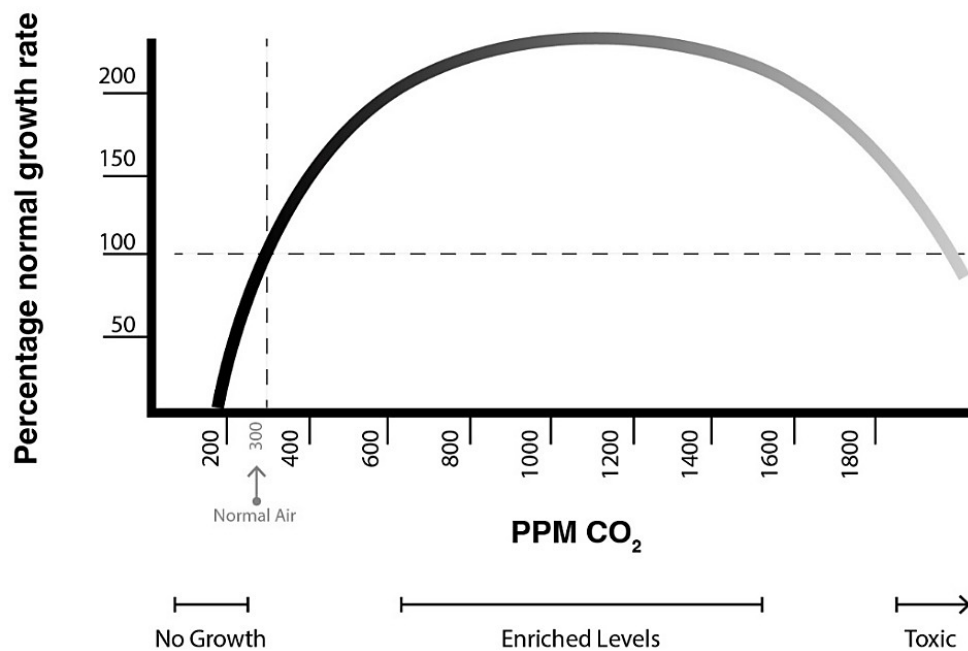


Figure 12. Relationship between CO₂ concentration and plant growth rate.

Source: Poudel, Dunn, 2023.

The data presented indicate that carbon dioxide is a valuable gas that can double or even triple the production of certain agricultural crops. This is important in the fight against hunger and the implementation of economic programs aimed at sustainable development. The practical use of carbon dioxide is implemented according to the simple diagram shown in Figure 13. The source of carbon dioxide is a CO₂ generator, and the cultivation area is an extensive system of greenhouses of any size.

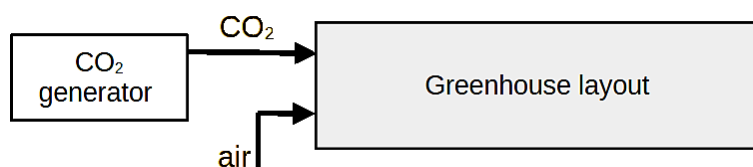


Figure 13. Use of carbon dioxide for agricultural production.

For large-scale crop production, CO₂ generators can prove too expensive. However, there is a much more advantageous solution: waste material, such as from combined heat and power plants (CHPs), namely exhaust gases. The CO₂ content in exhaust gases depends on the type of fuel used, but typically ranges from 8% to 12% for gas boilers, and can reach 10-12% in coal-fired power plants and CHP plants.

In addition to carbon dioxide, exhaust gases contain nitrogen, oxygen, and harmful components – primarily nitrogen oxides (NO_x), sulfur dioxide (SO₂), and dust. The removal efficiency of harmful components from exhaust gases is currently very high. Fabric filters eliminate dust from exhaust gases with dust removal efficiency exceeding 99.9% (<https://1filter.pl/technika-filtrow-workowych/>). The removal efficiency of nitrogen oxides from exhaust gases, i.e., exhaust gas denitrification, is over 95% (<https://polskiprzemysl.com.pl/...>; <https://www.mokrosz.pl/...>). NO_x removal from exhaust gases is carried out using SCR (Selective Catalytic Reduction) systems. The removal efficiency of SO₂ from exhaust gases reaches up to 90% (<http://eomega.eu/...>). These are very good results considering that exhaust gases are mixed with air to achieve the desired operating CO₂ concentration in the greenhouse. Using a combined heat and power plant has the additional advantage of providing process steam for heating the greenhouse. Figure 14 shows an example of implementing the principle of sustainable development – an energy plant integrated with an agricultural facility.

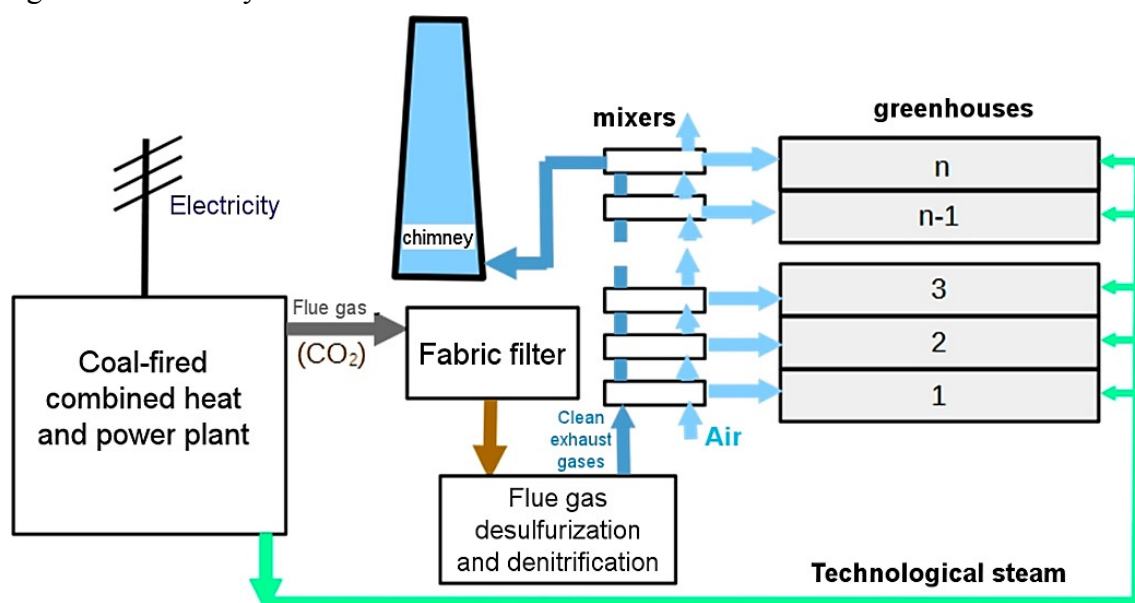


Figure 14. Energy plant integrated with an agricultural plant implementing the principle of sustainable development.

Modern exhaust gas purification methods ensure they have no negative impact on the environment. Exhaust gases are mixed with air in a dedicated mixer for each greenhouse. It is possible to adjust the CO₂ content appropriately for greenhouses growing different crops. Excess exhaust gases are discharged into the chimney. Process steam serves as a heating medium and is supplied individually to each greenhouse. Greenhouses intensify agricultural production without the use of chemicals that negatively impact living organisms.

7. Discussion

Global warming is a fact, and the main cause is the excess water in the atmosphere. Climate processes are characterized by significant inertia, meaning that changes are progressing relatively slowly, but halting these changes with the intention of reversing them is difficult and may prove impossible. The consequences are not difficult to predict.

Unfortunately, for years we have been observing growing public concern about the accelerating destruction of Polish forests, including the most valuable ones, such as the Białowieża Forest, the mountain forests in the Carpathians, the Świętokrzyska Forest, and the Bukowa Forest (Greenpeace, 2024; Synowiecki, 19.11.2024; Wielka wycinka w Polsce trwa...). While 27.7 million cubic meters of trees were cut down in Poland in 2000, this figure will reach 44.6 million cubic meters in 2022 (Rocznik statystyczny leśnictwa GUS, 2019, 2023). A similar situation likely exists in other countries. Tree felling in cities is also observed, and lawn mowing is common, as lawns dry out quickly and the ground loses water. The charm of greenery and flowers, as well as the microclimate so crucial during hot weather, are being erased, leaving behind patches of yellowed and dry grass. Despite the era of computerization, the amount of paper used is growing enormously and carelessly – periodic utility bills sent to millions of residents, online shopping and cardboard boxes, paper fillers for empty spaces in parcels, advertising, brochures, etc. In Poland, waste paper recycling is only 42% (Recykling papieru (makulatury)...).

As a result of such activities, enormous amounts of water are released into the atmosphere, intensifying the greenhouse effect and, consequently, global warming. However, carbon dioxide (CO₂) is blamed for this state of affairs.

Shutdowns and subsequent decommissioning of modern power plants, primarily fueled by hard coal, are planned. As demonstrated, the operation of these facilities has no impact on the greenhouse effect. Electricity suppliers are planning periodic shutdowns not only for individual users but also for businesses due to the inefficiency of renewable energy sources. Energy supplies will continue, but from backup sources at a significantly higher price. Some remaining coal-fired power plants are to assume the role of backup energy sources. Energy security has been threatened. More on this topic can be found in (Wójcik, 2008, pp. 28-32).

Generation and operating costs are rising. Achieving sustainable development may be very difficult.

The promotion of carbon dioxide as the cause of global warming is a classic example of the informational impact of technical systems on the environment. It's difficult to speak of information warfare here, as the environment does not undertake any significant informational activities. Informational impact on the environment is achieved methodically, utilizing knowledge from the interdisciplinary field of science known as cybernetics. Many forms of information transmission incorporate information transfer principles designed to effectively achieve intended goals. The goals of informational impact are not the subject of this paper. Methods of informational impact on the environment are presented in (Wójcik, 2013, pp. 163-185; Wójcik; 2011, pp. 344-355). Among the most frequently used information transfer principles are the principle of emotional arousal (glaciers, drought, global warming), mass and long-lasting impact, gradation, and alleged obviousness. Perhaps the most influential on the human psyche is the principle of alleged obviousness. It involves proving a thesis different from the one actually disseminated. The thesis that is actually disseminated is presented as an axiom that is not subject to discussion.

8. Conclusions

It's important to emphasize that the greenhouse effect is caused by an excess of water vapor in the atmosphere. While we can't change the process of evaporation, we can limit it. We need to systematically plant trees. Increasing forest cover reduces the impact of the main culprit on the greenhouse effect – H₂O. Forests bind water by limiting evaporation. The development of flora and fauna is also important, not to mention the tourism and recreational benefits as an important element of sustainable development. Coal-based energy should be developed and power plants should be equipped with modern dust removal equipment that significantly reduces SO₂ and NO_x emissions by 90-95%. Coal-fired power plants and combined heat and power plants are a valuable source of CO₂ for crops, multiplying their yields. The climate cycle is based on water, and in the absence of human intervention, the Earth itself maintains this cycle. Currently, humans, through far-reaching imagination, a result of which is sustainable development, can stimulate climate change, adapting it to their own needs and thus subduing the Earth. To achieve this, it is sufficient to reforest an appropriate percentage of the land surface. This is not difficult – given the current state of science, mathematical modeling of processes is capable of this task. However, there is concern that we may not make it in time and that global warming will continue despite our decisive but delayed corrective actions.

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MUNICIPAL WASTEWATER TREATMENT PLANT AS A KEY COMPONENT OF THE CIRCULAR ECONOMY

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Purpose: The objective of this paper is to provide a comprehensive overview of the circular economy (CE) concept and to demonstrate, through a practical case study, the multi-level applicability of the 6R principles at the municipal wastewater treatment plant in Zabrze.

Methodology: The research was based on a systematic literature review and content analysis.

Findings: The article conceptualizes the municipal wastewater treatment plant as a pivotal component of the circular economy (CE) and illustrates the potential for its multi-level implementation. The case study demonstrates practical applications of CE principles, including sand recovery, sludge reuse, biogas production, photovoltaic energy generation, heat pumps, and water reuse. Together, these processes underscore the capacity of wastewater treatment facilities to function not only as infrastructure for environmental protection but also as active contributors to resource efficiency and energy recovery.

Practical Implications: The study positions a municipal wastewater treatment plant as an essential element of the circular economy. It illustrates the implementation of the 6R principles across different stages of wastewater treatment — from mechanical treatment (sand recovery), through sludge management and biogas generation, to the integration of renewable energy sources and water reuse. The findings emphasize that, when appropriately organized, these practices not only enhance environmental performance but also demonstrate economic feasibility.

Social implications: Against the backdrop of global climate change and diminishing natural resources, the circular economy emerges as a crucial instrument for sustainable development. Its core principle is the minimization of waste through reuse, recycling, and energy recovery. This paradigm directly contributes to corporate social responsibility and supports the improvement of quality of life by mitigating environmental degradation and fostering more sustainable resource use.

Originality: The paper presents a concrete connection between the functioning of the wastewater treatment plant and the assumptions of the circular economy in the Polish setting.

Keywords: Circular economy (CE), 6R, sludge recovery, biogas, wastewater reuse.

Category of the paper: Research paper, theoretical paper.

Introduction

The report published in 1987 by the World Commission on Environment and Development (CMMAD) of the United Nations (UN) formalized the concept of sustainable development, defining it as one that “meets the needs of the current generation without compromising the capacity of future generations to meet their own needs”. However, despite this initiative, the linear production model and the culture of consumerism still generate waste of raw materials and finished products (Borschiver, Souza Tavares, 2024).

The Circular Economy (CE) is a business model designed to minimize the consumption of raw materials and the generation of waste. Its objective is to reduce greenhouse gas emissions and lower overall energy use. The circular model creates closed-loop systems in which waste is treated as a resource for subsequent production phases (www.parp.gov.pl/goz#definicja, 2025).

This approach supports the creation of a sustainable, low-emission, and competitive economy by implementing eco-design principles and the 6R concept based on the following pillars:

1. **Refuse** – Avoid purchasing products that contribute to waste generation.
2. **Reduce** – Limit the number of items used; embrace minimalism and buy only what is truly necessary.
3. **Reuse** – Reuse, exchange, and pass on unwanted items to others; consider alternative functions for used goods.
4. **Repair** – Fix items instead of discarding them at the first sign of damage.
5. **Recycle** – Sort waste properly to enable the recovery and reprocessing of secondary raw materials.
6. **Rot** – Compost biodegradable waste such as food scraps.

To prevent waste generation, the European Union introduced the obligation to treat waste as valuable resources that can be reused, recycled, or otherwise recovered, through its third Waste Framework Directive (Rakoczy et al., 2015).

The local authorities in most countries have many ways to improve the environmental performance on the local level. They are responsible for basic services such as water and wastewater management, energy supply and waste management. They have a planning monopoly and thus responsibility for urban planning with streets, green areas, and the built environment. They may be managing the educational systems and large part of the care of children, elderly and the primary health care. They often have a very large economic turnover in connection with these responsibilities. All of this leads to opportunities to improve product policies. Waste management is important for organising practical recycling opportunities and organise the reuse of products which are not in bad shape (Or even to organise repair of wasted

products, which may be reused after repair). Similarly wastewater treatment and the resulting sludge management offer opportunities for recycling (Zbicinski et al., 2006).

Implementing circular economy strategies not only benefits the natural environment but also helps businesses stand out in the market, reduce operational costs, and improve service quality. The CE model is based on the principle that no waste is produced—every material is considered a resource that can be reused. As the name implies, a "closed-loop" system means materials should not be discarded or incinerated but returned to the production cycle for reuse. Products should be used as many times as possible. Moreover, by-products from one production facility may serve as valuable raw materials for another—synergies of this kind should be actively sought.

In the circular economy, it is also vital to maximize energy recovery. Therefore, the energy aspect—such as recovering heat generated during production processes—must be a key consideration.

A municipal wastewater treatment plant exemplifies the principles of the circular economy at several levels of operation and at various stages of both wastewater treatment and sewage sludge processing.

At its core, the plant's primary function is to return treated effluent—essentially water, which is increasingly valuable in the face of climate change—back to the natural environment. In the case of the Zabrze treatment plant, the receiving body is the Bytomka River. The plant employs a treatment technology that ensures compliance with legally required discharge standards for wastewater treatment plants in the Zabrze agglomeration, as measured by the population equivalent (PE). In this case, the facility is designed for over 100,000 PE, meaning it is subject to the highest treatment standards mandated by law.

In particular, the plant meets quality standards defined in its current water permit, as well as those specified by the Regulation of the Minister of Maritime Economy and Inland Navigation of July 12, 2019, concerning substances particularly harmful to the aquatic environment and the conditions for discharging wastewater into water or soil, and for releasing rainwater or snowmelt into water or water facilities (Journal of Laws 2019, item 1311). Consequently, the agglomeration also complies with the requirements of the EU Council Directive 91/271/EEC on urban wastewater treatment.

Key performance parameters of the treatment plant (as per the valid water permit):

- Maximum discharge flow rate: up to 1.368 m³/s.
- Average daily discharge: up to 22,000 m³/day.
- Annual discharge limit: up to 8,500,000 m³/year.
- Temperature of treated effluent: up to 35°C.
- pH of treated effluent: between 6.5 and 9.0.
- BOD₅ concentration: up to 15 mg O₂/l.
- COD (Cr) concentration: up to 125 mg O₂/l.

- Total suspended solids: up to 35 mg/l.
- Total nitrogen: up to 10 mg N/l.
- Total phosphorus: up to 1 mg P/l.
- Ammonium nitrogen: up to 10 mg N-NH₄/l.
- Nitrite nitrogen: up to 1 mg N-NO₂/l.
- Chlorides: up to 1000 mg Cl/l.
- Sulfates: up to 500 mg SO₄/l.
- Volatile phenols (phenol index): up to 0.1 mg/l.
- Petroleum hydrocarbons: up to 15 mg/l.

These parameters are specified in the water permit for effluent discharge issued on May 18, 2021, by the Polish Waters (PGW Wody Polskie), Director of the Regional Water Management Board (RZGW) in Gliwice.

Thus, it is clear that even in fulfilling its basic function, the municipal wastewater treatment plant in Zabrze aligns with the principles of the circular economy. However, a closer analysis of individual stages of the wastewater treatment process reveals even greater potential for utilizing various process components in a manner consistent with CE values.

Sand from Grit Chambers

The first stage of municipal wastewater treatment is mechanical treatment. One of the by-products generated at this stage is sand from the grit chamber. The grit chamber is one of the initial components of the mechanical treatment system at a wastewater treatment plant. Its main function is to separate and remove inorganic suspended solids such as sand, gravel, and small stones, which could damage equipment in subsequent treatment stages.

The grit chamber operates on a simple principle: wastewater flows through designated grit compartments at a reduced velocity, allowing heavier mineral particles to settle to the bottom, while lighter (organic) matter continues downstream. The separated sand slurry is then directed to a dedicated device—a sand washer—where it undergoes additional washing. Notably, this washing process does not use potable (clean) water, but rather treated wastewater.

Under Polish waste legislation, sand collected from grit chambers is classified as waste under code 19 08 02, and it constitutes a significant economic burden for wastewater treatment plants due to disposal costs. As Gunter Pauli famously stated, *waste does not exist — it is only a resource in the wrong place* (Pauli, 2010) a principle that aptly illustrates the potential of grit chamber sand as a material for reuse.

It is therefore important to emphasize that this material has considerable potential; its recovery and reuse offer not only tangible financial benefits but also align with the principles of the circular economy and sustainable development, emphasizing the responsible use of resources.

Processing sand from grit chambers in a dedicated installation that removes the organic fraction and leaves behind a clean mineral fraction makes it possible to formally declassify the material as waste. As a result, the sand can be repurposed as a valuable raw material for repair and construction works within the municipal sewer infrastructure.

Sludge Management

Sludge in a wastewater treatment plant is a mixture of solid particles separated from wastewater during the treatment process. It is primarily generated through mechanical and biological processes, and its proper management is critical to the overall efficiency of the plant. During the treatment process, several types of sludge are produced:

1. Primary sludge, which forms in the primary sedimentation tanks (at the initial stage of treatment) and consists mostly of mineral and organic particles separated by sedimentation.
2. Excess activated sludge, produced during biological treatment and composed mainly of microorganisms (bacteria) that break down organic pollutants.

Sludge treatment and reuse are integral parts of modern wastewater management, enabling energy recovery and nutrient recycling (Tchobanoglous, Burton, Stensel, 2014).

Sludge contains nutrients beneficial to plant growth—especially nitrogen and phosphorus—making it a valuable resource for improving soil quality. However, its application is strictly regulated and depends on its physicochemical characteristics.

In the context of the Circular Economy (CE), properly stabilized and dewatered sludge can be used agriculturally under R10 recovery operations. The conditions for such use are defined in the Regulation of the Minister of the Environment of February 6, 2015, on the application of municipal sewage sludge, issued pursuant to Article 96(13) of the Waste Act of December 14, 2012 (Journal of Laws of 2022, items 699, 1250, 1726, 2127, and 2722). According to the regulation, municipal sewage sludge may be applied to land provided that:

1. The content of heavy metals does not exceed the limits specified in Annex 1 of the regulation.
2. When used in agriculture or for land reclamation for agricultural purposes, no *Salmonella* bacteria are detected in a representative 100g sample of sludge collected in accordance with §5(3).

3. The total number of viable eggs of intestinal parasites (*Ascaris* sp., *Trichuris* sp., *Toxocara* sp.) per 1 kg of dry matter does not exceed:
 - a. 0 for agriculture and land reclamation for agricultural purposes,
 - b. 300 for land reclamation,
 - c. 300 for land-use adaptation based on waste management plans, zoning plans, or land development decisions,
 - d. 300 for growing plants intended for compost production,
 - e. 300 for cultivating non-food and non-feed crops.
4. The concentration of heavy metals in the topsoil layer (0-25 cm depth) of the receiving land does not exceed permissible values specified in Annexes 2 and 3 of the regulation.
5. Soil pH in agricultural areas where sludge is applied is not lower than 5.6.
6. The use of sludge does not degrade the quality of soil, land, surface water, or groundwater, and does not cause environmental damage as defined in the Act of April 13, 2007, on Preventing and Remedying Environmental Damage (Journal of Laws 2020, item 2187).
7. The sludge is not applied during the growing season of crops intended for direct human consumption, defined as the period from sowing or planting to harvest.

The sewage sludge produced at the Zabrze wastewater treatment plant meets these criteria.

After undergoing fermentation, the sludge contains:

- 3.15% d.m. of total nitrogen,
- 2.90% d.m. of total phosphorus,
- 22.8% d.m., of which 56.7% is organic dry matter (o.d.m.),
- 6.37% d.m. of calcium,
- 0.672% d.m. of magnesium.

Additionally, it exhibits low concentrations of heavy metals, such as:

- Zn: 561 ppm,
- Pb: 36 ppm,
- Cd: 1.06 ppm,
- Cr: 36.8 ppm,
- Cu: 127 ppm,
- Ni: 25.3 ppm,
- Hg: 0.18 ppm.

It is also free of pathogens and parasites, making it suitable for return to the environment under the R10 recovery process.

The implementation of circular economy principles at a wastewater treatment plant is not just a catchy slogan—it is already a daily operational reality. However, that does not mean that further improvements are not possible. R10 sludge utilization still represents a significant cost to the plant, and as environmental standards become more stringent, waste management processes will become increasingly complex and expensive.

Therefore, it is worth considering the next step: transforming sewage sludge into a product, such as a soil improver or fertilizer. A soil improver is a material that enhances the physical, chemical, or biological properties of soil, but is not legally classified as a fertilizer. It may support:

- Improved soil structure, porosity, and aeration.
- Increased water retention capacity.
- Stimulation of beneficial soil microorganisms.
- Enhanced fertility and root development.
- Reclamation of degraded land.

A fertilizer, on the other hand, is a substance or mixture that provides plants with essential nutrients for growth, development, and yield improvement. Its primary uses include:

- Supplementing soil nutrient deficiencies (e.g., nitrogen, phosphorus, potassium).
- Increasing crop yields.
- Enhancing crop quality.
- Supporting soil regeneration after intensive farming.

Whether producing a soil improver or fertilizer, appropriate testing and approval procedures are required. The final step in the process is obtaining a decision from the Minister of Agriculture, authorizing the product for use. Depending on the type and form of the product, investment in dedicated facilities at the wastewater treatment plant may also be necessary. This includes obtaining permits (e.g., building permits) and approvals (e.g., environmental decisions), making this a multi-year project requiring significant financial investment.

Given these factors, it is important to avoid the illusion of simple solutions. Even producing a low-processed soil improver can bring challenges in terms of distribution, storage (as low-processed sludge may cause odor problems), and application limits in the environment. Therefore, it may be more effective to develop an advanced product—marketable, easy to store, and sell. One such option is a single-nutrient mineral fertilizer, such as ammonium sulfate $[(\text{NH}_4)_2 \text{SO}_4]$, all of whose components—including sulfur—are available at the treatment plant. Sulfur can be recovered through the biogas desulfurization process.

Biogas

The development and improvement of technologies enabling energy recovery from sewage sludge is gaining increasing importance each year (Czekala, Kujawiak, 2025).

One of the sludge treatment methods used at the Zabrze wastewater treatment plant is anaerobic stabilization. This process not only produces stabilized sludge—thereby reducing its volume and improving its dewaterability—but also generates biogas. Biogas is a mixture of gases, primarily methane (CH_4) and carbon dioxide (CO_2), formed through the anaerobic decomposition of organic matter. It is a renewable energy source, commonly used for the production of electricity and heat.

At the Zabrze facility, biogas is generated mainly through the anaerobic digestion of sewage sludge. The biogas production process takes place in dedicated fermentation chambers (WKF)—two closed, reinforced concrete tanks with a total capacity of 6300 m³, situated above ground and thermally insulated. Fermentation occurs at a temperature of 35–37°C, requiring the sludge to be heated and continuously mixed. The retention time in the fermenters is approximately 30 days. After fermentation and gas release, the digested sludge is directed to centrifuges for dewatering.

The biogas yield potential at the Zabrze plant is currently estimated at approximately 100–200 m³ per 1000 m³ of incoming wastewater. The current annual production amounts to approximately 1.5 million m³.

Biogas produced in Zabrze is used as fuel for two combined heat and power (CHP) units, each with an electrical capacity of 190 kW and thermal capacity of 230 kW. Most of the electricity generated is consumed on-site by the wastewater treatment plant, with only a small surplus fed into the power grid. The generated thermal energy is used for heating buildings, producing domestic hot water, and as process heat—for example, to maintain the operating temperature of the fermentation chambers (WKFs).

From the perspective of the Circular Economy (CE), this is a clear example of the 6R principles, particularly Refuse and Recycle. Moreover, the biogas production process can be enhanced by adding various co-substrates to the fermentation chambers, which help to increase biogas volume, such as:

1. Food industry waste:
 - a) whey, vegetable and animal fats,
 - b) food scraps, waste from fruit/vegetable processing, dairies, slaughterhouses,
 - c) flotation sludge from meat or dairy processing.
2. Municipal biowaste:
 - a) vegetable and fruit peels,
 - b) expired unpackaged food,
 - c) green waste from park and lawn maintenance (e.g., leaves, grass clippings).

3. Agricultural waste and energy crops:
 - a) slurry (from cattle or pigs),
 - b) manure,
 - c) silage from maize, grass, or sugar beets,
 - d) post-harvest residues (e.g., straw),
 - e) surplus or damaged cereal grains,
 - f) fruit and vegetable pulp or pomace.

Naturally, the addition of any of these co-substrates requires formal approval procedures to allow their use in existing treatment processes.

In the context of the Circular Economy, it is also worth highlighting the importance of biogas storage in specially adapted gas tanks, which can act as energy reservoirs when integrated with other renewable energy sources such as photovoltaics.

Photovoltaics and Heat Pump at the Wastewater Treatment Plant

The cost of solar photovoltaic panels (PVs) has dropped by 90 percent since 2010, and their efficiency can range from 16 to 22 percent (the first solar cells, created by Bell Labs in 1954, were just 6 percent efficient). And there is a lot that we can harvest: the energy from the sun can be up to 16,300 kilowatts, at any one time, for every person on the planet (Potter, 2021).

As of now, no photovoltaic systems are installed at the Zabrze wastewater treatment plant. However, their implementation is planned as part of the Multi-Year Development Plan for Water and Sewer Infrastructure for 2025-2026, adopted by Resolution No. XIV/114/25 of the Zabrze City Council on January 27, 2025.

The treatment plant has sufficient land reserves to host a PV farm without incurring additional land acquisition costs. The electricity generated will primarily meet the internal energy demands of the treatment plant, with any surplus fed into the local energy cluster.

An important element of the future system—fully aligned with the Circular Economy (CE) concept—is a 4 MW heat pump, to be installed at the treated effluent outlet. Influent wastewater arrives at elevated temperatures and thus carries a significant thermal energy load. Recovering heat from a source with temperatures above 10°C in winter and over 20°C in summer is highly efficient. In May 2025, a letter of intent was signed between Zabrze Water and Sewage Company and Zabrze District Heating Company, with the goal of building a suitable heat pump on the treatment plant's premises. The thermal energy generated is intended for the production of domestic hot water for the city of Zabrze.

Water

The final element aligned with the principles of the Circular Economy is water production.

Water plays an irreplaceable role in ensuring societal well-being—it is essential for human health, environmental balance, economic stability, and industrial development. Sustainable water management is one of the United Nations' Sustainable Development Goals (SDGs), as outlined in the 2030 Agenda, adopted by 193 UN Member States during the General Assembly in New York in September 2015 (Karło-Białozor, Gieleciak, 2025).

Currently, treated wastewater at the Zabrze plant is already used internally as process water for various operations (e.g., screening wash water, sand washing, cleaning of thickeners and centrifuges). However, no technical barriers prevent its broader reuse. Technologies such as ultrafiltration, nanofiltration, reverse osmosis, and UV disinfection allow the production of water suitable for agricultural, industrial, or even potable purposes.

Naturally, this would require adjustments to other parts of the system. For example, using such water for irrigation of green spaces would require storage and distribution infrastructure. While costs could be reduced by using an electric vehicle fleet powered by on-site renewable energy, other expenses—such as storage infrastructure, maintenance, and labor—could render such projects financially uncertain.

A major constraint in advancing circular water systems is the limited use of comprehensive cost-benefit and lifecycle valuation methods. Conventional project assessments often focus on upfront capital costs and short-term financial returns, which disadvantages circular interventions that provide long-term and multidimensional benefits. Accurately valuing circular water investments requires shifting the analytical lens to include total costs and broader impacts over the full system lifecycle (Brears, 2025).

Water recovery from wastewater is not a new idea. It is particularly advanced in Southern Europe, Australia, and the southern United States. In 2018, the European Commission published a study evaluating EU citizens' attitudes toward water reuse. It revealed that Eastern European countries exhibit the lowest levels of public trust in treated wastewater, while in Mediterranean countries, reuse has long been practiced and accepted, largely due to the recognized need to reduce pressure on natural water resources in agriculture (Ramm, 2024).

Nevertheless, using even high-quality treated wastewater for human consumption could face not only economic but also socio-cultural barriers, stemming from the source of the water. This area merits further sociological research.

The development of water reuse from wastewater is far from straightforward. It requires stakeholder cooperation, as well as the implementation of organizational and technological solutions that ensure safe operations. The key lies in developing systems that can consistently recover water free of pathogens and micropollutants, with an appropriate nutrient content (Ramm, 2024).

Summary

In the face of global climate change and dwindling natural resources, the Circular Economy (CE) is emerging as a key tool for achieving sustainable development. The core principle of CE is waste minimization through reuse, recycling, and energy recovery. This paper presents a wastewater treatment plant as an integral component of such a system. It outlines the circular potential at various stages of municipal wastewater treatment—from mechanical treatment (sand recovery) to sludge management, biogas production, the integration of renewable energy sources, and water reuse—demonstrating their real-world application and economic viability when implemented through well-structured processes.

Other actions are, of course, possible (e.g., phosphorus recovery), though they currently lack sufficient economic and environmental justification.

Public utility companies, operating under local governments, play a critical role in areas such as district heating, waste management, municipal housing, public transport, and the supply of electricity and gas—all of which fall within the municipalities' legally assigned responsibilities. Local governments at various administrative levels should assume a coordinating role, ensuring effective waste management and leveraging the economic potential of municipal utilities in advancing sustainable development—especially in support of energy independence (Bitkowska, Chruściel, 2024).

Building multi-sector cooperation platforms is essential to overcoming siloed thinking in CE development. The involvement of municipal enterprises and private business partners can help bridge knowledge gaps and accelerate innovation transfer. This requires the removal of legal and organizational barriers to collaboration within CE frameworks. It is essential to stimulate demand for circular solutions within municipalities through coalitions between local government, industry, and SMEs, and by integrating environmental goals into public-private partnerships (PPPs) and public procurement strategies. Additionally, it is important to embed education and information policies on CE into standard municipal operations (Rzeńca, Sobol, Ogórek, 2021).

In the case presented, a holistic approach is essential—one that views all processes occurring at the wastewater treatment plant in an integrated way, with the goal of optimizing the use of available resources. Certainly, there are barriers—regulatory, economic, and socio-cultural. Some can be addressed through expert guidance and the systematic execution of required research, documentation, and administrative procedures. External funding, including EU grants and other R&D-related subsidies, can help overcome financial obstacles. Such support is crucial for the development of innovation, the growth of enterprises, and increased market competitiveness.

A key step forward is a shift in the perception of the water utility—not just as a supplier of drinking water and collector of wastewater, but as an active stakeholder in the circular economy, an energy producer, and a driver of environmental stewardship, knowledge dissemination, and community awareness.

The Circular Economy offers a wide range of benefits that cover not only the economic realm, but also the social and environmental aspects. These benefits make the shift to a circular model essential for long-term sustainable development (Silva, 2024).

In conclusion, the growing environmental challenges demand the adoption of new resource management strategies. One of the most critical approaches is undoubtedly the circular economy, which aims to minimize waste generation and maximize resource recovery. Wastewater treatment plants, traditionally seen as pollution control facilities, can become key players in implementing CE principles, through the recovery of water, energy (electric and thermal), and nutrients that enhance soil quality.

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REACTION OF THE VISEGRAD GROUP COUNTRIES LABOR MARKETS TO THE ECONOMIC SHOCKS

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Purpose: The economies of European countries have faced two significant shocks: the Covid-19 pandemic and the war in Ukraine. This article aims to compare the response of labor markets in the Visegrad Group countries (V4) to these shocks.

Design/methodology/approach: Article examining changes in employment, unemployment, and economic activity, the role of flexible forms of employment as "business cycle buffers" from 2019 to 2024. Given the short analysis period covering consecutive economic shocks disrupting long-term trends, the adopted research method involved time series analysis of labor market changes.

Findings: The findings suggest a relatively weak reaction of the labor markets in V4 countries, especially to the second shock. Share of flexible employment forms significantly changed only in response to the first shock.

Research limitations/implications: The research findings is limited because of the specificity of the analysed countries, which were characterized by low unemployment levels. Future research will aim to identify the reasons behind the V4 economies' success in maintaining high economic activity of the population despite economic crises.

Practical implications: Shares of flexible forms of employment decreased during the pandemic shock in all V4 countries (except self-employment), indicating that they served as "business cycle buffers". In Poland has observed a gradual reduction in the use of flexible forms of employment. This trend indicates that it is becoming increasingly difficult for employers to find people willing to work in flexible forms.

Social implications: The decrease in the share of flexible forms of employment will limit the negative phenomena associated with them, which will improve the situation of people deriving income from work. Employers will be forced to take actions for employees in line with social responsibility, in order to stabilize employment.

Originality/value: The effects of the covid-19 pandemic are widely described in the literature, but there is no comparison to the effects of the war in Ukraine. The article is addressed to labor market researchers and company managers, especially those responsible for the HR department.

Keywords: labor market, Visegrad Group countries, economic shocks, flexible forms of employment.

Category of the paper: Research paper.

1. Introduction

Two "black swans" emerged in the global economy within two years: the Covid-19 pandemic and the war in Ukraine. The first event led to the largest decline in macroeconomic indicators since the Great Recession, including the highest rise in unemployment rate (Coibion et al., 2020; Privara, 2020).

In February 2022, another "black swan" appeared in the form of Russia's armed invasion of Ukraine. Western countries responded with severe sanctions against Russia, particularly targeting energy resources. This occurred at a time when Europe relied on affordable Russian energy supplies, with Russia being a leading global producer and exporter. Russia retaliated by drastically reducing gas exports to the EU markets (which were not initially embargoed) and the attack on the Nord Stream I and II pipelines halted gas supplies to Germany, the largest recipient (Kuzemko et al., 2022).

The occurrence of two supply shocks within a two-year interval entails numerous risks to the global economy, both short-term (stagflation, high interest rates, exchange rate volatility and increased energy prices) and long-term (hyperinflation, recession and challenges in meeting climate goals) (Desalegn et al., 2022). These threats vary in intensity across different national economies.

This article aims to compare the impact of two subsequent economic shocks on the labor markets of selected countries and assess the role of flexible employment forms as "business cycle buffers". This study fills a gap in the literature by evaluating the effects of the war in Ukraine on neighboring economies and comparing them with the pandemic shock's impacts.

The situation of the V4 countries is unique as three of them border Ukraine, which is at war, and each has received significant groups of war refugees. Consequently, in the literature section, the article provides a brief overview of the V4 countries' labor market reactions to economic shocks and their characteristics. The rest of the article outlines the research assumptions, data analysis methods, and presents changes in employment, unemployment, and economic activity based on Eurostat's quarterly data. The analysis also examines changes in the employment structure, considering flexible employment forms.

The article concludes with a discussion and final conclusions.

2. Labor market reaction to economic shocks

Economic shocks, understood as unexpected economic downturns, manifest themselves in recession or a significant weakening of the pace of economic growth. They cause an adaptive response from employers, in the form of a decrease in demand for labour, resulting in a decrease

in the size of employment, shortened working hours and a decrease in wages, accompanying a decrease in labour productivity (Kwiatkowski, 2011). A decrease in employment affects changes in the level of unemployment and professional activity (Andolfatto, 1996; Elsbey et al., 2010).

The Covid-19 pandemic, threatening lives and health, prompted governments to introduce social, economic, and political restrictions. Lockdowns caused a severe global economic downturn, significant employment declines (Coibion et al., 2020; Evgenidis, Fasianos, 2023), supply chain disruptions, and reduced working hours, reduction in wages, disposable income and tax revenues, resulting in a demand shock (Privara, 2020; IMF, 2022; Kwiatkowski, 2022; Hupkau, 2023). The pandemic led to the loss of 255 million full-time jobs, four times more than during the 2009 global financial crisis (Bieszk-Stolorz, Markowicz, 2022).

The pandemic's effects varied across economies due to differences in economic structures, sectoral and demographic susceptibility, and measures to limit its spread, including remote work (Mączyńska, 2021; Radziukiewicz, 2021; Arntz et al., 2022; Muster, 2022; Pizzinelli, Shibata, 2023; Burdett et al., 2024). The recreational industry, tourism, and sectors unable to support remote work (e.g., transport, trade, production and agriculture) suffered the most due to the lockdowns (Cortes, Forsythe, 2020). Conversely, demand for employees increased in areas such as e-commerce, courier services and parcel lockers, cybersecurity, financial analysis, and medical professions (Rosak-Szyrocka et al., 2021; Kwiatkowski, Szymańska, 2022).

Governments worldwide responded to the economic crisis by stimulating the economy through recovery-friendly spending (Corfee-Morlot et al., 2021; Afonso, 2023; Evgenidis, Fasianos, 2023). Employment and unemployment in some economies showed resilience to GDP declines, with many workers retained under job retention programs (Kukołowicz, 2021; Meriküll, Paulus, 2023). Thanks to the vaccination program, economic conditions improved in 2021, with most economies reporting positive growth rates (Basdekis et al., 2022).

During the pandemic, professions capable of remote work experienced lower employment declines (Cortes, Forsythe, 2020). Working from home appealed to employees due to benefits like flexible schedules, reduced commuting and better work-life balance (Arntz et al., 2022). Some studies indicate increased productivity from remote work (Barrero et al., 2021; Deole et al., 2023), while others suggest reduced productivity depending on the employee group (Kitagawa et al., 2021). Employers are skeptical about remote work's efficacy for teamwork, coordination, and cooperation-dependent businesses and for new employees learning organizational culture and practices (Lee, 2023).

The reconstruction of economic activity after the pandemic was disrupted by the war in Ukraine. It caused another negative supply shock in the global economy, disrupting energy and food supply chains, and causing perturbations on financial markets. Sanctions led to increased energy prices, causing an energy crisis in the EU due to high dependence on Russian supplies of raw energy materials. Rising energy prices spread throughout the economy and broken supply chains continued to drive up commodity prices and triggered inflation at unprecedented

levels since World War II. This exacerbated the existing economic issues resulting from the war, i.e. limited international trade and weakened economic growth amidst post-pandemic high public debts (Prohorovs, 2022).

European governments' reactions to the situation covered several areas of action. High energy prices have become a social problem, and therefore national governments have mobilized significant funds for subsidies to balance the increase in the costs of energy supply for households. Efforts to diversify energy sources included increased liquid natural gas purchases, demand reduction measures, and enforcing energy conservation. EU countries also boosted spending on alternative clean energy sources to gradually replace fossil fuels (Goldthau, Youngs, 2023).

During the war-induced supply shock, employment suffered most in countries dependent on Russian imports, primarily in energy-intensive sectors such as manufacturing and transport. The energy crisis then affected other sectors, and high inflation negatively impacted consumer spending, generating another demand shock (Prohorovs, Bistrova, 2022).

In periods of economic shocks, employees in flexible forms of employment are more vulnerable to layoffs due to the ease of terminating non-standard contracts during downturns (Kalleberg et al., 2003; Gaston, Kishi, 2007; Mikołajczak, 2021; Mura et al., 2020). The extent of non-standard employment use (temporary employment, part-time and self-employed) varies by country, influenced by legal regulations (Eamets, Jaakson, 2014; Taracha, Mirowski, 2022). From an employee's perspective, flexible employment may be a result of their own choice for additional income or due to non-professional obligations (e.g. caring for children or elderly). However, more often, the acceptance of flexible employment results from limited availability of standard job offers (Blundell et al., 2014).

Referring to flexible forms of employment, the 2008 financial crisis revealed a statistically significant, positive correlation between the PRB decline and temporary/part-time work in Czechia and Slovakia, a negative correlation with self-employment in Hungary and Poland, and a negative correlation with part-time work (Zieliński, 2019). The increase in unemployment accompanying the higher level of self-employment in the V4 countries indicated establishment of own businesses and substantiated performing existing tasks under pressure from employers during periods of economic deterioration (Dvouletý, 2017). Poland was the most flexible labor market in terms of the correlation between the unemployment rate and all analyzed forms of non-standard employment (Zieliński, 2020). This situation does not occur in most OECD countries, where a gradual decline in self-employment rates can be observed, also in periods of economic downturn (Cieślik, van Stel, 2024; Denderski, Sniekers, 2024).

The article focuses on the Visegrad Group countries (V4), which, due to historical reasons, similar development conditions, experiences, geographical proximity and institutional similarity, present comparable economic development levels and employment structures. All V4 countries joined the EU simultaneously in May 2004. Despite cooperation,

the V4 countries' political and economic priorities differ, resulting in uncoordinated positions within the EU (Dangerfield, 2008).

Despite relatively rapid economic growth in the 1990s and early 21st century, initiated by the transition from a socialist to a market economy, the V4 countries were characterized by a low level of GDP per capita, especially compared to the EU15 countries (Schmidt, 2016). Accession to the EU accelerated V4 economies' growth through access to the Single Market, EU structural funds, and foreign investments driven by relatively low labor costs (Antoši et al., 2019; Schwabe, 2021). The process of convergence of the V4 economies with the EU is noticeable (Kokocińska, Puziak, 2018), which results in, among others, a decreasing unemployment rate (partly as a result of emigration to more developed EU member states), increasing professional activity and rising employment rates, which were initially lower than in Western Europe, especially in Hungary and Poland (Sulich, 2016; Kónya, 2018).

While the Covid-19 pandemic posed similar challenges to the V4 countries as other economies, the war in Ukraine is associated with additional challenges. The V4 countries, except Czechia, border Ukraine and received notable war refugee groups, impacting foreign investor confidence. Additionally, the war initiated an energy crisis, exacerbating existing challenges. Compared to the EU, the V4 countries have higher energy consumption, lower energy efficiency, and limited research and development investments (Bajan et al., 2021). However, convergence is occurring, with V4 economies diversifying energy sources and improving energy efficiency, translating increased energy consumption into faster GDP growth compared to the EU14. Poland is in the most difficult situation, remaining the most reliant on coal for electricity production (Kochanek, 2021).

From the article's perspective, the inflow of Ukrainian immigrants is crucial as they supplement labor markets in host countries, creating additional jobs to provide the refugees with necessary services, and boosting demand through income and benefits (Prohorovs, Bistrova, 2022).

A review of issues related to the impact of the pandemic and the war in Ukraine on the labor market and the characteristics of the labor markets of the V4 countries allowed us to pose four research questions addressed in the article:

- Do "black swan" economic shocks prompt fast labor market reactions (within one quarter)?
 - Which crisis (pandemic or Ukraine war) had a more significant impact on V4 labor markets?
 - Did the crises have a negative impact on the economic activity of people in the V4 countries compared to the EU average?
 - Do flexible forms of employment act as "business cycle buffers" in V4 labor markets?
- is achieving full and productive employment and decent (compatible with preparation) work?

3. Method

To answer the research questions, quarterly Eurostat data from 2019-2024 for individuals aged 20-64 was used. The analysis began with a comparison of employment and unemployment figures. Comparing quarter-to-quarter changes, considering seasonal fluctuations (comparing the same quarters in subsequent years), answered the first two questions. Considerations in this area were supplemented with an analysis of changes in the economic activity of the population in the analyzed countries against the background of average values for the EU27, which made it possible to answer the third question.

Due to the relatively short period of analysis covering two successive economic shocks causing interruption (weakening) of long-term trends, the research method adopted in the article is the analysis of time series of changes in the labor market. This approach assessed the impact of the pandemic and the war in Ukraine on the scale of growing imbalances in the labor markets of the V4 countries.

To address the fourth question, the share of flexible employment forms in total employment was summarized, including temporary, part-time, and self-employment. Figures illustrate change rates, with detailed data included in appendices (Appendix (Table 3-5)).

4. Results

Table 1 shows the numbers of employed and unemployed people in the V4 countries on a quarterly basis in the period covering the year before the Covid-19 pandemic shock and the latest available data. The age group analyzed includes people from 20 to 64 years old due to their dominance among the professionally active.

Table 1.

Changes in the number of employed and unemployed people (thousands) in the V4 countries in 2019-2023 (age from 20 to 64 years)

Quarter/ Year	Czechia		Hungary		Poland		Slovakia	
	Employ.	Unempl.	Employ.	Unempl.	Employ.	Unempl.	Employ.	Unempl.
1/2019	5129.1	105.9	4396.1	153.7	16243.9	649.4	2539.0	153.8
2/2019	5120.7	97.4	4388.1	147.3	16475.7	526.6	2522.3	149.2
3/2019	5125.7	107.8	4387.9	152.2	16596.2	520.4	2535.4	152.0
4/2019	5128.5	103.5	4390.4	142.6	16540.6	477.9	2542.0	146.3
1/2020	5104.4	102.3	4342.2	161.9	16479.4	517.6	2501.7	155.3
2/2020	5047.1	122.9	4269.8	204.4	16306.3	535.7	2458.3	172.4
3/2020	5065.5	145.3	4341.7	196.6	16552.8	556.0	2480.5	187.8
4/2020	5048.6	154.2	4342.1	186.6	16590.7	524.2	2491.1	183.3
1/2021	5006.3	171.8	4425.4	199.9	16481.6	688.3	2460.2	184.1
2/2021	5008.9	153.3	4482.1	182.4	16627.1	606.8	2495.6	184.8
3/2021	5080.3	136.6	4512.2	173.6	16800.2	526.3	2545.0	181.9

Cont. table 1.

4/2021	5089.2	110.8	4533.2	167.6	16780.6	497.2	2564.3	175.8
1/2022	4971.1	111.9	4522.0	169.5	16724.5	533.3	2526.4	166.9
2/2022	4984.7	110.3	4538.0	143.9	16763.2	449.4	2557.4	161.8
3/2022	5014.7	108.3	4543.5	164.6	16664.8	485.3	2563.5	158.7
4/2022	5015.4	108.8	4538.6	177.2	16785.8	483.9	2569.6	160.9
1/2023	4830.5	125.4	4526.8	187.1	16793.8	490.1	2529.6	163.9
2/2023	4875.0	120.4	4555.7	178.0	16761.2	434.7	2553.5	152.4
3/2023	4872.7	125.6	4559.8	184.2	16756.1	453.4	2549.7	152.7
4/2023	4881.2	125.9	4561.0	199.4	16793.9	519.8	2579.8	149.2
1/2024	4994.8	140.8	4537.9	209.7	16681.6	534.8	2538.0	145.9
2/2024	4959.3	122.4	4555.0	200.2	16655.9	443.5	2554.6	134.6
3/2024	4974.2	119.5	4559.1	204.4	16698.7	486.1	2546.6	137.9
4/2024	4995.3	123.0	4544.2	196.5	16680.5	471.2	2576.8	135.6

Source: Eurostat database: Labour market, Employment and activity, Unemployment (age from 20 to 64 years).

The crisis related to the Covid-19 pandemic caused substantial changes in employment in the V4 countries. To illustrate the scale of these changes, data for the quarter in which the shock occurred was compared to the same quarter in the following year. All V4 economies experienced a decline in employment in Q2 2020, both compared to Q1 2020 and Q2 2019. This decline in employment, taking into account seasonal fluctuations (comparison of the same quarters in subsequent years), persisted in three out of four countries for over a year, with Poland showing the fastest recovery in employment by Q1 2021.

In contrast, a decline in employment due to the war in Ukraine was observed only in Czechia. The other V4 countries saw an increase in employment in Q2 2022 compared to Q2 2021. The employment decline in Czechia in 2022 may be attributed to both the war in Ukraine and an ongoing, several-year downward trend in the number of employees. In Poland, the rapid post-pandemic recovery occurred within an upward trend in the number of employees. Over the entire period from Q1 2019 to Q4 2024, employment decreased by 2.4% in Czechia, while it increased by 1.5% in Slovakia, by 2.7% in Poland and by 3.4% in Hungary.

An analysis of the number of unemployed revealed an increase in all V4 countries during the pandemic period. However, in the first year of the Ukraine war, the number of unemployed rose only in Czechia and Hungary. This indicates that the pandemic had a greater impact on the V4 labor markets than the Ukraine war.

Differences in the responses of employed and unemployed to economic shocks in the analyzed countries suggest changes in economic activity of the populations. Figure 1 presents the changes in the level of economic activity in the V4 countries.

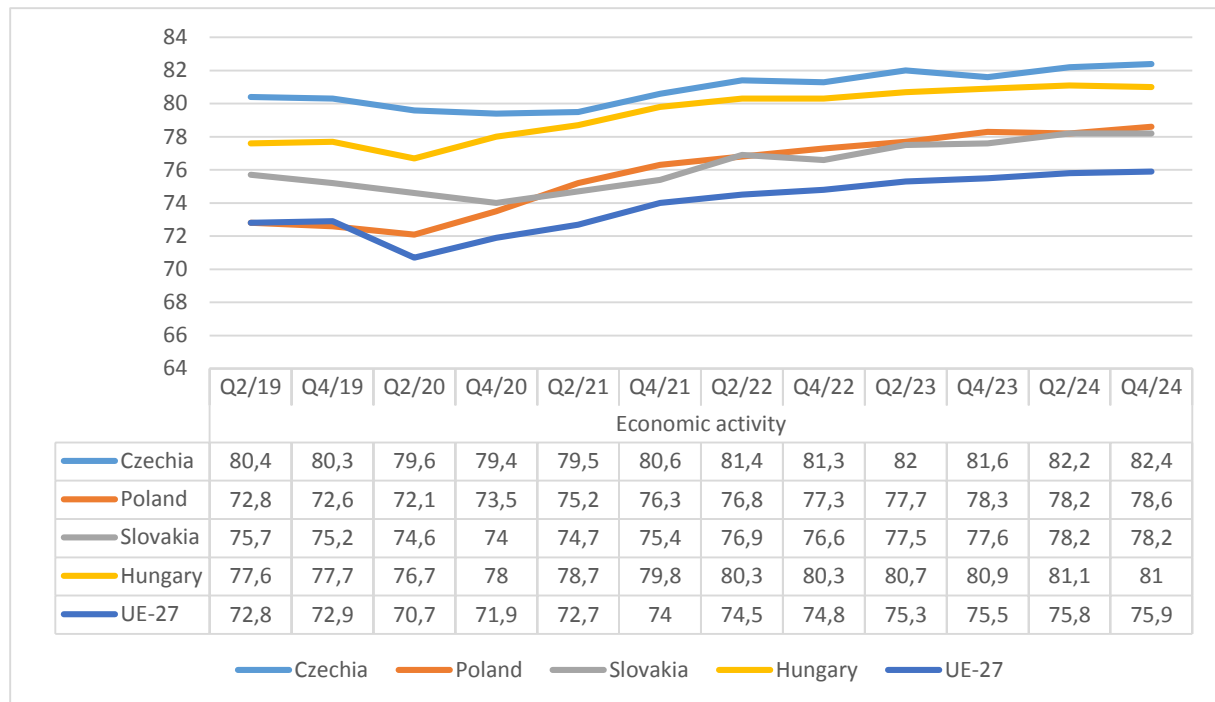


Figure 1. Changes in economic activity of the population in the V4 countries in 2019-2024 (age from 20 to 64 years).

Due to moderate changes in economic activity and the readability of the graph, data for the second and fourth quarters of each year included in the analysis period were used. Despite experiencing two economic shocks, the period from 2019 to 2024 saw an increase in economic activity of the population across all V4 countries and in EU-27. The highest increase in the period of Q2 2019 to 4Q 2024 was recorded in Poland (5.8 p.p.), which allowed this country to overtake Slovakia in terms of the level of economic activity. Notably, economic activity of the population in all V4 countries exceeded the EU27 average in Q2 2020 and has remained at a higher level since then.

In addition to determining the response of employment and unemployment levels to economic shocks, the article also explores whether flexible forms of employment in the V4 countries acted as "business cycle buffers". Figures 2-5 depict changes in the share of flexible employment forms from the first quarter of 2019 to the last quarter of 2024 in the V4 countries. Detailed data on the number of employees in each flexible employment form and their share in total employment are provided in the appendices (Appendix (Table 3-5)).

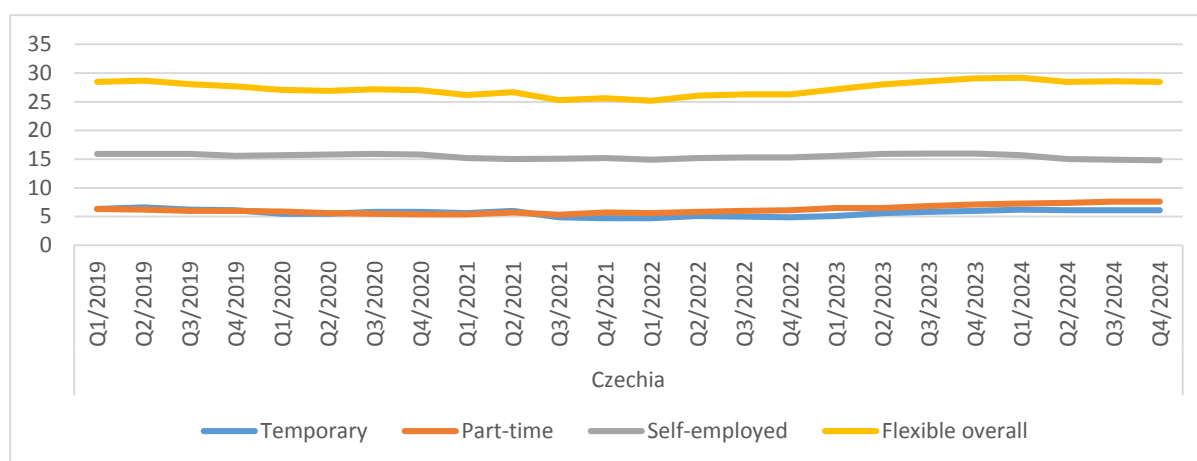


Figure 2. Share of flexible forms of employment in total employment in Czechia in the period 1Q2019-4Q2023.

Source: data from Appendix (Table 3-5).

In Czechia, labor market saw a decline in the share of flexible forms of employment during the period of economic shocks, with a return to the initial state after the shocks had subsided. In the first quarter of 2020, when the pandemic began, there was a noticeable decline in the share of fixed-term workers (by 0.6 p.p.), a slight decline in the share of part-time workers (by 0.1 p.p.) and a slight increase in the share of the self-employed (by 0.1 p.p.). The reaction to the outbreak of the war in Ukraine was much weaker (a decline in the share of fixed-term and part-time workers by 0.1 p.p. and a maintenance of the share of the self-employed). Over the entire period under analysis, there was an increase in the share of part-time workers and a decrease in the share of the other two forms of flexible employment.

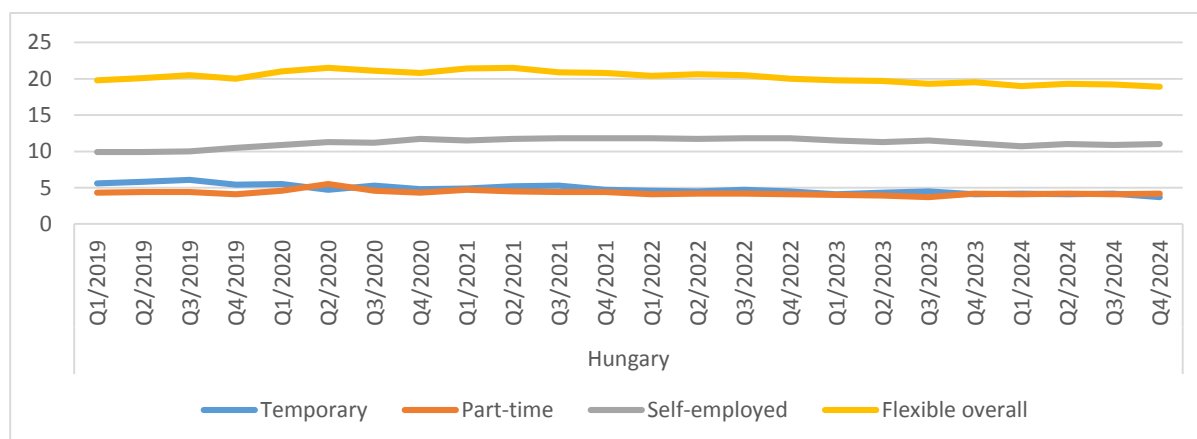


Figure 3. Share of flexible forms of employment in total employment in Hungary in the period 1Q2019-4Q2023.

Source: data from Appendix (Table 3-5).

In the Hungarian economy, periods of economic shocks caused an increase in the share of flexible forms of employment in total. In the quarter of the outbreak of the pandemic, the share of part-time workers fell (by 0.3 p.p.), the share of fixed-term workers (by 0.1 p.p.) and the self-employed (by 0.4 p.p.) increased. The reaction to the outbreak of the war in Ukraine was a decrease in the share of fixed-term workers (by 0.1 p.p.), part-time workers (by 0.3 p.p.) and

the share of self-employed remained the same. For the entire period under analysis, the share of fixed-term workers fell (by 1.9 p.p.), part-time workers (by 0.1 p.p.) and the share of self-employed increased (by 1.1 p.p.).

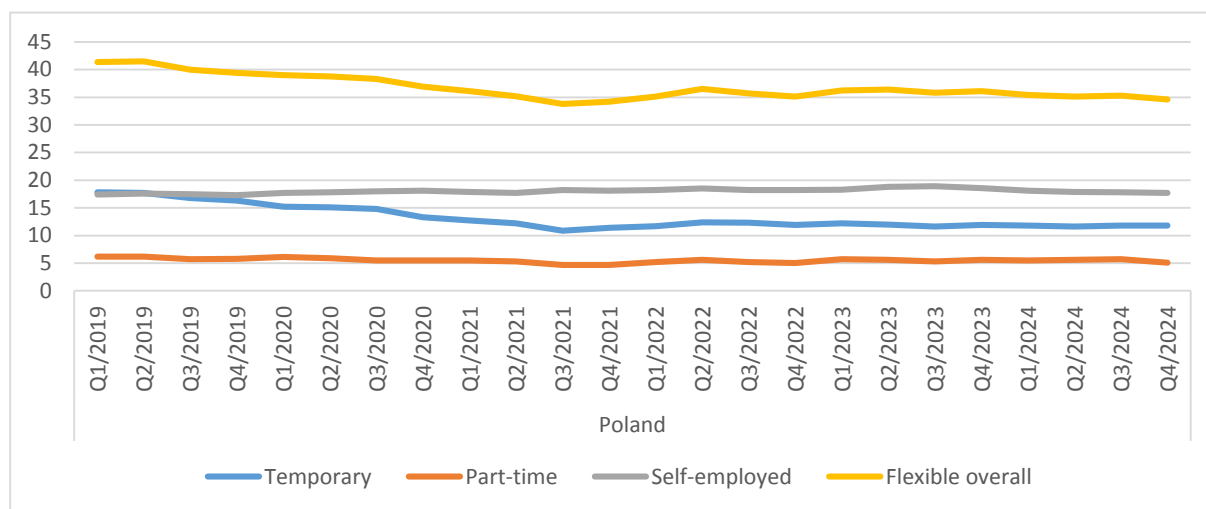


Figure 4. Share of flexible forms of employment in total employment in Poland in the period 1Q2019-4Q2023.

Source: data from Appendix (Table 3-5).

In Poland, there was a decrease in the share of flexible forms of employment in total employment, a trend that had been observed before the Covid-19 crisis. In the quarter in which the pandemic began, there was a significant decrease in the share of fixed-term workers (by 1.1 p.p.) and an increase in the share of other forms (part-time workers by 0.3 p.p. and self-employed by 0.4%). The reaction to the outbreak of war in Ukraine was an increase in the share of fixed-term workers (by 0.3 p.p.), part-time workers by 0.5 p.p. and self-employed (by 0.1 p.p.). Throughout the period under review, the share of fixed-term workers dropped significantly (by 6 p.p.), part-time workers by (1.1 p.p.), while the share of self-employed increased (by 0.3 p.p.).

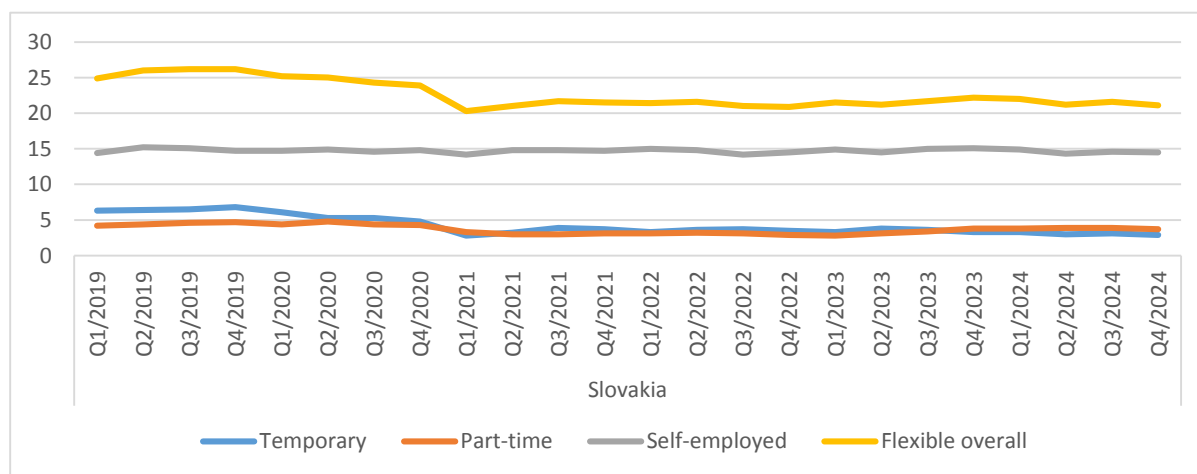


Figure 5. Share of flexible forms of employment in total employment in Slovakia in the period 1Q2019-4Q2023.

Source: data from Appendix (Table 3-5).

In Slovakia, the share of flexible forms of employment fell during periods of economic shocks, and then increased. In the quarter of the outbreak of the pandemic, there was a decrease in the share of fixed-term workers (by 0.7 p.p.), a decrease in the share of part-time workers (by 0.3 p.p.) and a maintenance of the share of self-employed. The reaction to the outbreak of war in Ukraine was an increase in the share of fixed-term workers and self-employed (by 0.3 p.p.) and a maintenance of the share of part-time workers. For the entire period under analysis, the share of fixed-term workers fell significantly (by 3.4 p.p.), part-time workers by (0.5 p.p.) and the share of self-employed increased (by 1.1 p.p.).

Differences in the response to the share of flexible forms of employment in the analyzed countries require taking into account the three basic forms that constitute them.

The share of part-time workers in total employment was stable. The minor changes in the case of this form of employment are due, among other things, to its lowest popularity in all (except Hungary) V4 countries. The share of part-time workers fell slightly during the Covid-related shock on the Czechia and Polish labor markets, i.e. in the economies with the lowest unemployment rates. In the case of the Czechia, the increase in the share of part-time workers occurred in recent quarters, which indicates that employers are reaching for this form of employment in conditions of labor supply shortages on the market.

Diversification of changes can be observed in the case of fixed-term contracts, which is largely due to the initial states. Apart from Poland, in the three remaining economies the share of this form of flexible employment was only slightly higher than part-time work (and even lower in the case of Hungary), which results in small differences in shares throughout the analysed period. In all V4 economies, fixed-term employment recorded a decline in its share in employment in response to covid-19 (the weakest in the Hungarian economy). The strongest decline in the share of fixed-term contracts occurred in Poland, although it is still significantly higher than in other V4 countries. The downward trend in the share of this form in total employment occurred in Poland before the pandemic (a decline of 2.5 percentage points in Q1 2019-Q1 2020), with this process accelerating in the pandemic year (a decline of 2.9 percentage points in Q1 2020-Q1 2021).

In the case of self-employment, while in response to the pandemic crisis there was an increase in its share in total employment in all V4 countries (in the Czechia and Slovakia for three quarters, in Poland and the Hungarian economy for at least one year), in response to the war in Ukraine an increase in the share of self-employment for over a year was observed only in the Czechia, in Poland it lasted only one quarter, in the Hungarian economy two quarters, and in Slovakia the share of self-employment in total employment fell in 2022 (Table 2). This confirms the previously observed smaller impact of the second economic shock on the labor markets of the V4 countries and their varied reactions.

Table 2.

Direction of changes in employment, unemployment and the share of flexible forms of employment in the V4 countries in 2020 and 2022 years

Country	Quarter/ Year	Employment	Unemployment	Temporary	Part-time	Self-employed
Czechia	1/2020	↘	↘	↘	↘	↗
	2/2020	↘	↗	↘	↘	↘
	3/2020	↗	↗	↗	↘	↗
	4/2020	↘	↗	↗	↘	↘
	1/2022	↘	↗	↘	↘	↘
	2/2022	↗	↘	↗	↗	↗
	3/2022	↗	↘	↘	↗	↗
	4/2022	↗	↗	↘	↗	↗
Hungary	1/2020	↘	↗	↗	↗	↗
	2/2020	↘	↗	↘	↗	↗
	3/2020	↗	↘	↗	↘	↗
	4/2020	↗	↘	↘	↘	↗
	1/2022	↘	↗	↘	↘	↘
	2/2022	↗	↘	↘	↗	↘
	3/2022	↗	↗	↗	↗	↗
	4/2022	↘	↗	↘	↘	↘
Poland	1/2020	↘	↗	↘	↗	↗
	2/2020	↘	↗	↘	↘	↘
	3/2020	↗	↗	↘	↘	↗
	4/2020	↗	↘	↘	↘	↗
	1/2022	↘	↗	↗	↗	↗
	2/2022	↗	↘	↗	↗	↗
	3/2022	↘	↗	↘	↘	↘
	4/2022	↗	↘	↘	↘	↗
Slovakia	1/2020	↘	↗	↘	↘	↘
	2/2020	↘	↗	↘	↗	↘
	3/2020	↗	↗	↗	↘	↘
	4/2020	↗	↘	↘	↘	↗
	1/2022	↘	↘	↘	↗	↗
	2/2022	↗	↘	↗	↗	↘
	3/2022	↗	↘	↗	↘	↘
	4/2022	↗	↗	↘	↘	↗

Source: data from Table 1 and Appendix (Table 3-5).

5. Discussion and conclusions

The economic shock associated with the pandemic caused a reaction of the labor markets of the V4 countries in a very short period, i.e. already in the first quarter. No such reaction was observed in the case of the second shock, which indicates that the labor markets of the V4 countries were more seriously affected by the pandemic shock. Economic shocks did not negatively affect the economic activity of the population in the V4 countries. All analyzed economies recorded an increase in economic activity, exceeding the average economic activity for the EU 27.

Crises either slowed down or reinforced existing employment trends. This is particularly evident in Poland, where employment growth observed in 2019 was only temporarily hindered during the Covid-19 pandemic, and in Czechia, where employment decline had already begun in 2019. The decline in employment occurred in the country with the highest level of professional activity at the beginning of the period under review, the decline in the share of flexible forms of employment occurred in Poland, where they are most frequently used.

While the shares of flexible forms of employment decreased (except self-employment) during the pandemic shock in all V4 countries, indicating that they served as "business cycle buffers", in the year of the outbreak of the war in Ukraine, their share in employment decreased slightly in Hungary and Slovakia, whereas in Poland and Czechia, an increase was noted. This may be due to the lower impact of the second economic shock on the labor markets of the V4 countries, but it may also indicate a gradual reduction in the use of flexible forms of employment as the labor market is being balanced out.

The decline in the share of temporary employment, particularly in Poland, may be an effect of low unemployment level, influencing both employers and employees. Standard employment contracts bind employees more strongly to the company and reduce turnover, while employees prefer permanent over flexible employment. Additionally, inter-industry transfers likely played a role (absorbing employees from industries affected by the lockdown by industries that use flexible forms of employment to a lesser extent) (Zieliński, 2022).

For part-time employment, a response to the pandemic shock was observed only in Poland and Czechia, where shares decreased. This suggests that the effect of reducing part-time employment was stronger than the job-sharing effect (reducing hours in full-time employment).

The "entrepreneurship out of necessity" effect (Dvouletý, 2017; Zieliński, 2019) was confirmed in all V4 countries in response to the pandemic crisis, with the weakest effect in Slovakia. The share of self-employment increased in the first quarters after the shock. Notably, by Q1 2021, the share of self-employment in Czechia and Slovakia had dropped below Q1 2020 levels. During the Ukraine war, the share of self-employment increased only in Czechia and Poland.

The decrease in the share of flexible forms of employment will limit the negative phenomena associated with them (employment instability, worse working and employment conditions, lower social security, etc.), which will improve the situation of people deriving income from work. Employers will be forced to take actions for employees in line with social responsibility, in order to stabilize employment. As the labor market approaches equilibrium, the share of flexible employment forms tends to decrease, driven by employees' expectations for job stability and employers' desire to reduce fluctuations and ensure greater employment stability.

The possibility of generalizing the research findings is limited because of the specificity of the analyzed countries, which were characterized by low unemployment levels (except Slovakia) before the economic shocks occurred.

Taking into account the results obtained, future research will aim to identify the reasons behind the V4 economies' success in maintaining high economic activity of the population and low unemployment rates despite economic crises. Potential factors include high levels of employee education (human capital) and the attraction of foreign direct investment (FDI) due to lower labor costs compared to the EU14 countries (Prohorovs, Bistrova 2022; Antohi et al., 2019; Schwabe, 2021).

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Appendix

Table 3.

Temporary employment - number (thousands) and percentage share in total employment

Quarter/ Year	Czechia		Hungary		Poland		Slovakia	
	Employ.	%	Employ.	%	Employ.	%	Employ.	%
1/2019	320.7	6.3	246.1	5.6	2894.3	17.8	158.8	6.3
2/2019	335.9	6.6	255.5	5.8	2920.1	17.7	160.5	6.4
3/2019	318.8	6.2	268.9	6.1	2787.2	16.8	165.3	6.5
4/2019	315.4	6.1	236.3	5.4	2704.0	16.3	173.8	6.8
1/2020	283.1	5.5	238.1	5.5	2513.1	15.2	152.0	6.1
2/2020	278.6	5.5	202.0	4.7	2406.2	15.1	130.4	5.3
3/2020	294.4	5.8	228.3	5.3	2355.3	14.8	130.5	5.3
4/2020	295.3	5.8	210.5	4.8	2214.6	13.3	120.2	4.8
1/2021	278.2	5.6	216.9	4.9	2098.0	12.7	68.2	2.8
2/2021	298.6	6.0	232.5	5.2	2025.0	12.2	79.8	3.2
3/2021	250.4	4.9	239.4	5.3	1839.2	10.9	98.6	3.9
4/2021	239.3	4.7	212.7	4.7	1914.1	11.4	95.8	3.7
1/2022	234.8	4.7	206.1	4.6	1960.2	11.7	83.3	3.3
2/2022	253.7	5.1	205.9	4.5	2075.3	12.4	91.2	3.6
3/2022	252.4	5.0	215.3	4.7	2046.1	12.3	96.0	3.7
4/2022	246.3	4.9	206.1	4.5	1991.1	11.9	90.4	3.5
1/2023	246.8	5.1	184.3	4.1	2042.6	12.2	83.9	3.3
2/2023	274.1	5.6	197.7	4.3	2014.6	12.0	96.2	3.8
3/2023	282.0	5.8	203.2	4.5	1942.3	11.6	91.9	3.6
4/2023	295.1	6.0	187.5	4.1	1999.3	11.9	85.5	3.3
1/2024	309.0	6.2	190.0	4.2	1969.9	11.8	82.6	3.3
2/2024	304.6	6.1	189.1	4.1	1937.7	11.6	77.3	3.0
3/2024	305.1	6.1	190.0	4.2	1965.0	11.8	80.1	3.1
4/2024	302.7	6.1	169.4	3.7	1972.3	11.8	75.1	2.9

Source: Eurostat database: Labour market, Employment and activity, Part-time employment and temporary contracts (age from 20 to 64 years).

Table 4.

Part-time employed - number (thousands) and percentage share in total employment

Quarter/ Year	Czechia		Hungary		Poland		Slovakia	
	Employ.	%	Employ.	%	Employ.	%	Employ.	%
1/2019	325.3	6.3	190.1	4.3	1003.0	6.2	107.0	4.2
2/2019	318.3	6.2	191.0	4.4	1017.0	6.2	109.9	4.4
3/2019	307.8	6.0	193.7	4.4	941.6	5.7	117.3	4.6
4/2019	305.5	6.0	181.9	4.1	958.8	5.8	119.8	4.7
1/2020	299.1	5.9	200.3	4.6	1007.5	6.1	109.8	4.4
2/2020	281.4	5.6	233.2	5.5	960.5	5.9	116.8	4.8
3/2020	280.5	5.5	199.9	4.6	917.1	5.5	109.1	4.4
4/2020	274.6	5.4	185.8	4.3	911.2	5.5	107.7	4.3
1/2021	271.5	5.4	207.6	4.7	912.8	5.5	80.6	3.3
2/2021	283.2	5.7	203.8	4.5	887.3	5.3	75.8	3.0
3/2021	269.1	5.3	198.3	4.4	795.4	4.7	75.2	3.0
4/2021	291.8	5.7	199.6	4.4	789.2	4.7	78.3	3.1
1/2022	278.5	5.6	187.1	4.1	872.1	5.2	79.3	3.1
2/2022	290.2	5.8	188.6	4.2	937.2	5.6	80.6	3.2
3/2022	301.2	6.0	189.0	4.2	860.1	5.2	79.3	3.1
4/2022	304.8	6.1	187.6	4.1	837.5	5.0	75.2	2.9
1/2023	312.9	6.5	179.5	4.0	954.8	5.7	71.2	2.8
2/2023	315.0	6.5	176.8	3.9	932.7	5.6	78.1	3.1
3/2023	330.5	6.8	168.0	3.7	882.0	5.3	86.6	3.4
4/2023	344.9	7.1	191.7	4.2	933.1	5.6	98.6	3.8

1/2024	366.9	7.3	188.0	4.1	921.1	5.5	97.1	3.8
2/2024	367.4	7.4	189.2	4.2	939.4	5.6	99.8	3.9
3/2024	376.1	7.6	188.4	4.1	947.5	5.7	100.1	3.9
4/2024	379.5	7.6	191.2	4.2	843.3	5.1	94.6	3.7

Source: Eurostat database: Labour market, Employment and activity, Part-time employment and temporary contracts (age from 20 to 64 years).

Table 5.

Self-employed - number (thousands) and percentage share in total employment

Quarter/ Year	Czechia		Hungary		Poland		Slovakia	
	Employ.	%	Employ.	%	Employ.	%	Employ.	%
1/2019	816.4	15.9	435.2	9.9	2834.9	17.4	365.4	14.4
2/2019	812.7	15.9	435.4	9.9	2899.5	17.6	384.3	15.2
3/2019	814.3	15.9	439.7	10.0	2908.6	17.5	383.2	15.1
4/2019	798.2	15.6	462.7	10.5	2854.7	17.3	373.7	14.7
1/2020	804.8	15.7	471.3	10.9	2909.8	17.7	368.9	14.7
2/2020	800.6	15.8	482.3	11.3	2900.0	17.8	366.0	14.9
3/2020	803.1	15.9	484.5	11.2	2976.0	18.0	361.9	14.6
4/2020	798.0	15.8	507.1	11.7	2998.8	18.1	368.3	14.8
1/2021	761.4	15.2	509.1	11.5	2956.8	17.9	350.1	14.2
2/2021	750.6	15.0	523.5	11.7	2949.3	17.7	369.1	14.8
3/2021	768.8	15.1	533.8	11.8	3061.8	18.2	375.7	14.8
4/2021	773.9	15.2	536.3	11.8	3029.6	18.1	377.7	14.7
1/2022	743.0	14.9	534.5	11.8	3042.8	18.2	380.2	15.0
2/2022	756.5	15.2	531.2	11.7	3099.4	18.5	377.8	14.8
3/2022	766.0	15.3	537.6	11.8	3029.5	18.2	363.5	14.2
4/2022	769.1	15.3	535.4	11.8	3049.5	18.2	371.7	14.5
1/2023	752.2	15.6	521.2	11.5	3073.4	18.3	377.5	14.9
2/2023	776.6	15.9	515.3	11.3	3157.9	18.8	370.6	14.5
3/2023	778.2	16.0	525.5	11.5	3174.8	18.9	381.7	15.0
4/2023	779.0	16.0	507.3	11.1	3124.0	18.6	389.5	15.1
1/2024	784.0	15.7	487.3	10.7	3021.7	18.1	379.0	14.9
2/2024	745.1	15.0	500.8	11.0	2987.9	17.9	366.1	14.3
3/2024	739.6	14.9	498.8	10.9	2980.7	17.8	370.6	14.6
4/2024	740.3	14.8	497.8	11.0	2947.3	17.7	373.9	14.5

Source: Eurostat database: Labour market, Employment and activity, Self employed (age from 20 to 64 years).

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