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FOREWORD

Presented number of Silesian University of Technology. Scientific Papers. Organization and Management Series. Presented papers contain result of researches conducted by various universities. The number consists of 26 papers.

The papers presented in the number concentrate on many topics connected with organization and management. There are in the number papers about: services management; Smart Cities; marketing; innovation management; ergonomics; industrial management; Society 5.0; tourism management; healthcare management; Generation Z; economics; project management; crisis management; Artificial intelligence in management; business models; design thinking; motivation in management; quality management; sustainable development and leadership.

Bożena Skotnicka-Zasadzień

Radosław Wolniak

THE IMPACT OF BOOKMAKERS' SPORTS SPONSORSHIP ON THE IMAGE OF FOOTBALL CLUBS

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Objective: The aim of this article is to determine the impact of sports betting sponsorship on the image of football clubs. The study seeks to answer the question of whether greater reputational benefits are achieved by the clubs themselves or by providers of betting services. An additional objective is to diagnose fans' attitudes toward betting on sports events.

Design/Methodology/Approach: The article examines the attitudes of football supporters toward sponsors and sponsored clubs. Data were collected in spring 2024 using an online survey method (CAWI) among 165 football supporters (purposive sampling). From this group, 66 respondents who had ever placed sports bets were ultimately selected for the analysis of bookmakers' influence on the image of football clubs.

Findings: The study demonstrated the existence of a social stigma associated with betting services, mainly due to concerns about gambling and past scandals. Respondents' close social circles often view betting negatively, suggesting a need for educational campaigns promoting responsible gambling. The betting sector should emphasize player responsibility and autonomy. Innovations in betting applications, such as interactive in-play wagering features, may increase user engagement. Fans are more inclined to change bookmakers if a bookmaker begins sponsoring their favorite club than if it becomes a partner of a rival team. Sponsorship should therefore be considered in terms of both economic benefits and potential reputational risks. While sponsorship does not directly translate into an increased number of bets, it supports bookmakers' brand image among fans. An in-depth analysis was also carried out of the sponsorship relationship between Lech Poznań and Superbet. This cooperation yields moderate benefits for both parties. Positive fan attitudes toward sponsors may generate long-term financial benefits and brand trust, which are crucial for future success in the betting industry.

Research limitations: Despite efforts to obtain a representative sample of fans from clubs across the entire league, the study exhibited an overrepresentation of Lech Poznań supporters. Fan communities of other Ekstraklasa clubs were underrepresented, which requires cautious generalization of the findings. Future research should extend the data collection period to ensure adequate representation of all supporter communities within the league.

Originality/Value: The study attempts to evaluate the sponsorship relationships of all football clubs in a given league during a single competitive season that were sponsored by bookmakers. The overall assessment of perceptions of relationships between bookmakers and sponsored

clubs was enriched by an in-depth analysis of the partnership between KKS Lech Poznań and Superbet.

Keywords: sponsor image, sponsorship, sports marketing, football clubs.

Category of the paper: Research paper.

1. Introduction

The phenomenon of sports sponsorship by betting companies in football is becoming an increasingly important and simultaneously controversial issue. On the one hand, this relationship generates significant financial benefits and contributes to the development of the sport by enabling football clubs to invest in growth, infrastructure, player training, and improved training conditions, but also better image of the city represented by the sport club (Ciechomski, Romanowski, 2013; Bloch, Romanowski, Romanowski, 2025). On the other hand, critical voices highlight the risk of normalizing gambling, particularly among younger generations. There is a concern that betting promotion within a sports context may lead to gambling being perceived as an integral part of sporting life, which may in turn influence young fans' attitudes toward betting on sports events (Polishfashionshops.pl, 2024).

Additional concerns relate to the impact of betting sponsorship on the integrity of competitions. Critics emphasize that companies investing substantial financial resources in sponsorship may attempt to influence match outcomes, thereby threatening the integrity of sport and the principle of fair play. These concerns are particularly significant in the context of live betting, where the potential for result manipulation may have serious consequences for fans' trust in sport (Długokęcki, 2018).

The primary objective of the conducted study, and of this paper, was to determine the impact of sports betting sponsorship on the image of sports clubs. Two research questions were formulated:

1. What are fans' attitudes toward betting on sports events?
2. Do greater reputational benefits accrue to the clubs themselves or to providers of betting services?

2. Literature Review – The Importance of Sponsorship in Sport

The sponsorship market in the 21st century has been developing rapidly; however, a significant global increase in sponsorship agreements had already occurred in the early 1970s (in Poland, due to political instability, this growth took place only at the turn of the 20th and 21st centuries; Borowiak, Garczarek-Bąk, 2024). According to archival data, in the United

Kingdom – the cradle of European football – sponsorship expenditures amounted to approximately £4 million in 1970. Only 25 years later, this figure reached £491 million, representing an increase of more than 120 times (Kończak, 2020).

The popularity of sporting competition demonstrates that enterprises have recognized sport as an attractive promotional platform. Sport possesses a universal characteristic: whether experienced passively or actively, it evokes strong emotions. These emotions enable fans to identify with clubs as well as with the entities that support them. Sponsors expect that this emotional engagement will facilitate faster identification with their brands and enhance brand recall. Sponsorship investments are generally well received by fans, who are aware of the financial support provided to their favorite clubs. Considering that consumers often make impulsive purchasing decisions, support for a business partner of a beloved sports organization may become a key determinant of purchase behavior (Kończak, 2020).

The sponsorship process involves the cooperation of three partners operating on a collaborative basis: the sponsoring entity (sponsor), the organization offering sponsorship opportunities (sponsee), and the media, which act as intermediaries between these parties through, for example, broadcasts of sporting events (Sznajder, 2015). This relationship forms a system of mutual interaction known as the “sponsorship triangle”, illustrated in Figure 1.

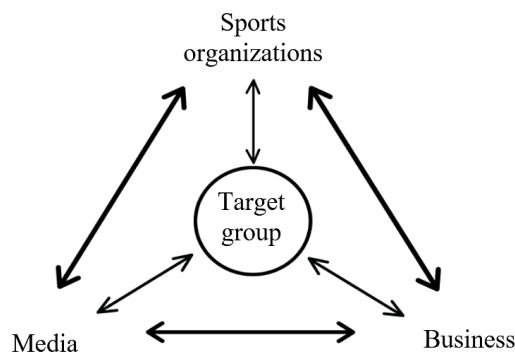


Figure 1. Sponsorship triangle.

Source: Authors' own elaboration based on Sznajder, 2015.

Group relationships within the sponsorship triangle imply reciprocal benefits and obligations among the involved entities. Each participant seeks to maximize its own gains. Sponsors aim, among other things, for matches involving the supported team to be scheduled at times that attract large audiences from their target groups. For media organizations, it is essential that matches take place at times that guarantee the highest advertising revenues, while sports clubs prefer scheduling that encourages high stadium attendance (Sznajder, 2015). These differing objectives require compromise among cooperating entities.

However, the strong and influential alliances formed in this manner have, in recent years, significantly shaped the structure of sporting competitions. An example of changes influenced by the “sponsorship triangle” is the modification of the UEFA Champions League format beginning with the 2024/25 season. Previously, the competition involved 32 teams divided into eight groups. As a result of changes advocated primarily by sponsors and media organizations,

the structure of the tournament has been transformed. The championship will now include 36 teams divided into four different seeding pots. The increase in the number of matches will raise revenues from broadcasting rights and sponsorship. Sponsors will gain additional opportunities to showcase their brands, and clubs will be able to host fans in their stadiums more frequently.

3. Research Methodology

The study conducted for this article employed the Theory of Planned Behavior (TPB) model, which enables a detailed analysis of the factors influencing human attitudes and behaviors. This framework considers attitudes toward a specific behavior, subjective norms, and perceived behavioral control, all of which shape behavioral intentions and actual actions. In the context of this research, the analysis focused on respondents' attitudes toward sports betting, the beliefs of their close social circles regarding betting, perceived control over betting decisions, future intentions related to wagering, and evaluations of sponsorship relationships between football clubs and bookmakers.

Measurement was carried out using a 7-point Likert scale (except for the assessment of actual behaviors), where 1 indicated “strongly disagree” and 7 indicated “strongly agree”. The bookmakers included in the evaluation were: STS, Fortuna, Superbet, Betclic, LV Bet, Betcris, Forbet, Betfan, Etoto, Fuksiarz, and Totalbet. A summary of the model questions used in the study, along with the sources that inspired their formulation, is presented in Table 1. The study also examined respondents' club affiliations within the Ekstraklasa league, their general experiences with bookmakers, and their level of interest in football. This comprehensive approach enabled a detailed understanding of how bookmakers' promotional activities influence perceptions of football clubs. Data collection was conducted using the CAWI (Computer-Assisted Web Interviewing) method. The questionnaire was completed between 3 April and 31 May 2024 and was made available via Google Forms, ensuring broad accessibility to respondents. A total of 165 participants took part in the study, providing a substantial dataset on football fans' perceptions of bookmakers' promotional activities in Poland. The sample consisted predominantly of young respondents, as sports betting is particularly popular within this demographic group (Pentagon Research, 2021).

Table 1.
Characteristics of the studied population

Characteristic	Response categories	Number of respondents
Gender	Female	89 (54%)
	Male	74 (44,8%)
	Prefer not to answer	2 (1,2%)
Age	Under 18 years	1 (0,6%)
	18-29 years	148 (89,7%)
	30-39 years	11 (6,7%)
	40-49 years	3 (1,8%)
	50-59 years	1 (0,6%)
	Over 60 years	1 (0,6%)
Employment status	Pupil/student	134 (81,2%)
	Employed full-time	32 (19,4%)
	Employed part-time	33 (20%)
	Self-employed	15 (9,1%)
	Unemployed	5 (3%)
	Retired/pensioner	1 (0,6%)
Place of residence	Rural area	49 (29,7%)
	City up to 20,000 inhabitants	14 (10,9%)
	City with 20,001–100,000 inhabitants	18 (10,9%)
	City with 100,001–500,000 inhabitants	8 (4,8%)
	City with more than 500,000 inhabitants	76 (46,1%)
Club affiliation at the Ekstraklasa level	Lech Poznań	116 (70,3%)
	Legia Warszawa	5 (3%)
	Warta Poznań	5 (3%)
	Widzew Łódź	4 (2,4%)
	Śląsk Wrocław	2 (1,2%)
	Raków Częstochowa	2 (1,2%)
	ŁKS Łódź	2 (1,2%)
	Pogoń Szczecin	1 (0,6%)
	Puszcza Niepołomice	1 (0,6%)
	Ruch Chorzów	1 (0,6%)
	Zagłębie Lubin	1 (0,6%)
	Jagiellonia Białystok	1 (0,6%)
	Cracovia	1 (0,6%)
	None	23 (13,9%)
Respondents' participation in sports betting during the 2023/24 season	Yes	66 (40%)
	No	99 (60%)

Source: Authors' own elaboration

The sampling procedure was purposive and included two screening questions. The first concerned the level of interest in football. Respondents who indicated no interest in football concluded their participation after completing the section examining general attitudes and preferences. At this stage, 133 out of the initial 165 respondents were invited to continue. The second screening question addressed prior experience with sports betting. Participants who had never placed bets ended their participation after the section on betting behavior.

Consequently, the initial sample of 165 respondents was reduced to 133 after the first screening stage, and ultimately 66 individuals qualified for the final analysis (Figure 2). The characteristics of the study population were diverse and included variables such as gender, age, employment status, place of residence, Ekstraklasa club affiliation, and participation in sports betting during the 2023/24 season (July 2023-May 2024).

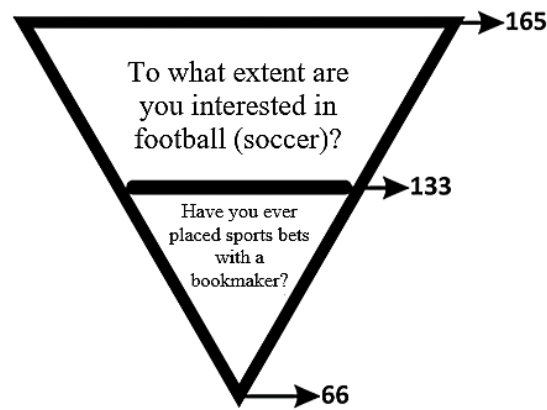


Figure 2. Distribution of the number of respondents after applying filtering questions.

Source: Authors' own elaboration.

Among the respondents, 53.9% were women, 44.8% were men, and 2 respondents (1.2%) chose not to disclose their gender. The relatively high proportion of female participants indicates growing interest in football among women and reflects the ongoing feminization of the football community in Poland. The in-depth phase of the study ultimately included 66 participants, comprising 21 women (32%) and 45 men (68%). Subsequent analyses incorporated statistics related to gender and club affiliations.

An analysis of club affiliations within the Ekstraklasa league reveals a pronounced overrepresentation of Lech Poznań supporters. They accounted for as much as 70.3% of respondents (116 individuals), while the second-largest group consisted of 23 respondents who did not identify with any club (nearly 14% of the total sample). Other clubs were only marginally represented, with Warta Poznań and Legia Warszawa ranking jointly third, each with 5 supporters (3% of the total sample). As many as five Ekstraklasa clubs had no representation in the study. The survey was conducted primarily among the Poznań local community, which likely explains the observed disproportions in respondents' answers. Nevertheless, the analysis of club affiliations provides valuable insights in the context of the sponsorship-related issues discussed later in this paper.

4. Results and Discussion – Assessment of Sports' Betting Perception in Respondents' Opinions

The investigation of bookmaker awareness began with a “top-of-mind” indicator. Respondents were asked to name one company they associated with the term bookmaker. This was an optional question answered by 123 respondents (over 92% of those qualified for this stage of the study) (Figure 3).

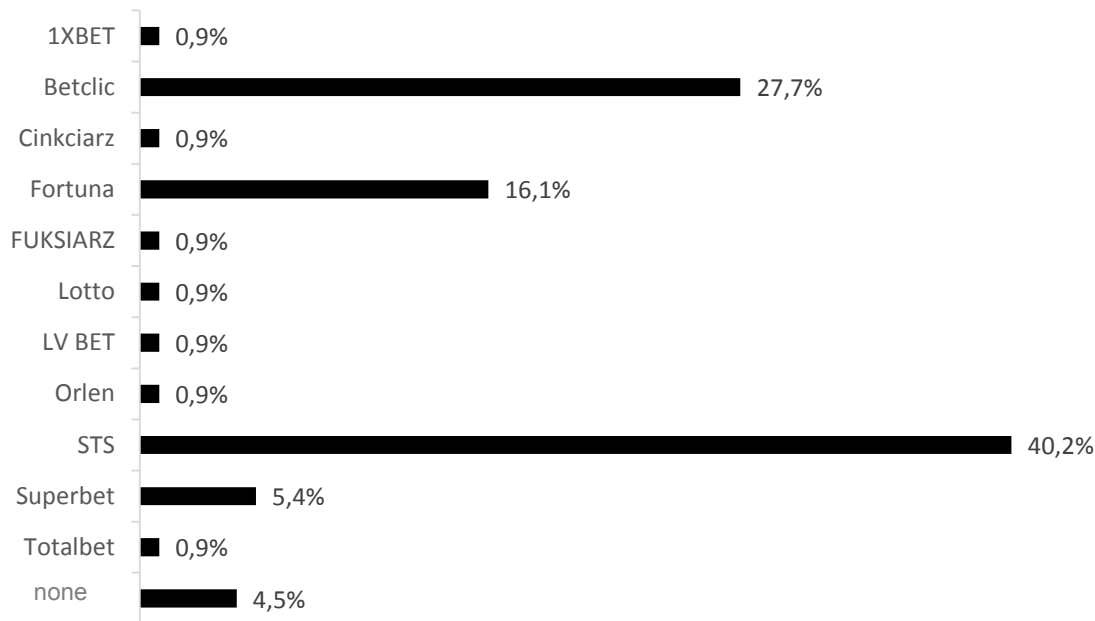


Figure 3. Top-of-mind companies associated with the term “bookmaker”.

Source: Authors' own elaboration.

A review of the results indicates that STS is by far the most frequently mentioned brand, recognized by 40.2% of respondents, which strongly suggests its dominant position in the domestic market. Betclic also enjoys substantial brand recognition (27.7%), while Fortuna was mentioned by 16.1% of participants. Superbet, with 5.4% of responses, is present in consumer awareness to a considerably lesser extent. Other companies—including 1XBET, Cinkciarz, Fuksiarz, Lotto, LV BET, Orlen (likely a respondent error due to the company's broad service portfolio, which does not include betting services), and Totalbet—each received only 0.9% of responses, highlighting their limited presence in market perception. These findings suggest that the betting market is dominated by a few key players whose effective marketing communication and broad service offerings translate into high brand recognition. The relatively low visibility of smaller brands may serve as an incentive to increase their market share through intensified promotional activities, including sports sponsorship, in order to strengthen their presence in fans' awareness and encourage the use of their services.

At this stage, more than half of the participants (67 out of 133) concluded their involvement in the study. Only respondents who had used bookmakers' services at least once in their lifetime (66 individuals) proceeded to the subsequent sections. The in-depth analysis focused on respondents' attitudes toward betting and the involvement of betting companies in sports sponsorship (Table 2).

Table 2.

Mean evaluations of attitudes toward betting and the involvement of betting companies in sports sponsorship

Attitudes toward bookmakers	Female	Male	Total
Cooperation between football clubs and bookmakers is a positive phenomenon.	4,43	4,20	4,27
Cooperation between clubs and bookmakers is attractive to me.	3,52	3,91	3,79
Football clubs associated with bookmakers have a positive impact on the world of sport.	3,81	3,62	3,68
Bookmakers should promote themselves through sponsorship of football clubs.	3,71	4,36	4,15

Note: a 7-point Likert scale was used.

Source: Authors' own elaboration based on the scale proposed by Bazargan-Hejazi et al. (2018).

The analysis of respondents' attitudes toward bookmakers and their engagement in sports sponsorship suggests that the overall perception of these phenomena is not strongly negative. The mean score of 4.27 for the overall assessment of cooperation between football clubs and betting service providers indicates a moderate attitude, with a tendency toward acceptance of such partnerships. Similarly, the mean rating of 4.15 regarding the promotion of bookmakers through football club sponsorship reflects respondents' recognition of the advertising value of these activities and a more positive than negative reception. Slightly lower yet still moderate mean scores for the perceived attractiveness of such cooperation (3.79) and its impact on the sports world (3.68) may indicate more reserved opinions regarding direct benefits and may reflect certain ethical reservations.

Based on these findings, bookmakers may be advised to continue or even intensify their engagement in sports sponsorship, particularly in football. They are not perceived unequivocally negatively, which from a reputational standpoint is valuable and may encourage further expansion within the Polish football market. At the same time, they should strive to increase transparency and educate the public about the benefits of such partnerships, which could improve perceptions of attractiveness and impact. Football clubs considering initiating or continuing cooperation with bookmakers should maintain open communication with fans, explaining how sponsorship funds are used to support team development and infrastructure. By adhering to ethical standards and emphasizing their contribution to sports development, bookmakers have the opportunity to build long-term trust and loyalty among fans, thereby strengthening their market reputation.

The next section examined subjective norms imposed by respondents' social environments regarding betting behavior. Participants were asked to indicate their level of agreement with statements concerning their close associates' attitudes toward betting (Table 3).

Table 3.*Mean evaluations of subjective norms regarding betting, by gender*

Subjective norms	Female	Male	Total
My choice regarding sports betting is shaped by the opinions of my friends/family.	3,33	2,67	2,88
My friends/family expect me to use the services of bookmakers supporting football clubs.	2,05	1,67	1,79
When it comes to betting, I want to act in line with the expectations of those closest to me.	1,90	1,84	1,86

Note: a 7-point Likert scale was used.

Source: Authors' own elaboration based on the scale proposed by Bazargan-Hejazi et al. (2018).

An analysis of responses related to the influence of family and friends suggests that women report greater sensitivity to the opinions of close others than men, as reflected in a higher mean score (3.33 compared to 2.67 for men). Although this does not indicate strong conformity, it reveals a noticeable gender difference. Both women and men, however, appear relatively convinced that their close social circles disapprove of betting, as indicated by low mean scores (2.05 for women and 1.67 for men). Social pressure and past scandals, including corruption cases, likely contribute to this perception.

Regarding willingness to align betting behavior with the expectations of close others, both genders show remarkable similarity. Low scores (1.90 for women and 1.84 for men) indicate that decisions about betting are largely autonomous. In light of these results, bookmakers involved in sports sponsorship should emphasize education and responsible gambling in ways that respect consumer autonomy. Increasing awareness of potential benefits—such as support for favored football clubs—may contribute to a more positive image. Marketing campaigns should highlight both social and personal benefits while promoting ethical gambling practices. Such an approach may attract new customers and foster long-term loyalty, gradually reducing social pressure and improving the industry's reputational standing.

The next section assessed respondents' perceived behavioral control regarding their use of betting services. This part was divided into two subsections. The first addressed general perceptions of control over betting behavior (Table 4).

Table 4.*Mean evaluations of perceived behavioral control over betting decisions, by gender*

Perceived behavioral control	Female	Male	Total
I have full control over my decisions regarding sports betting.	5,95	6,27	6,17
It is entirely up to me whether I participate in sports betting.	6,24	6,64	6,52
If I wanted to, I could regularly use the services of bookmakers supporting football clubs.	4,62	5,67	5,33

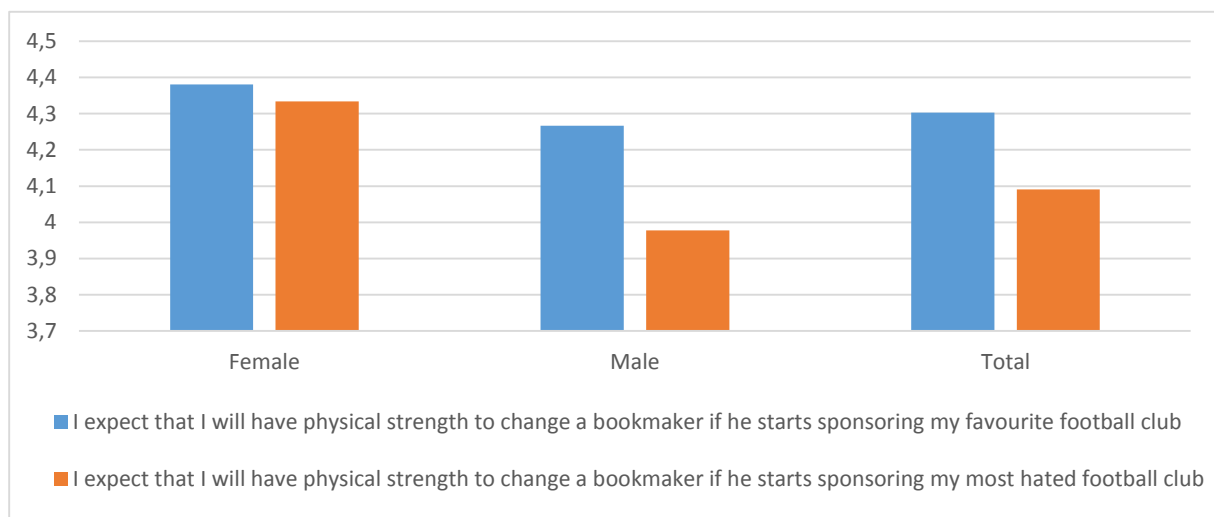
Note: a 7-point Likert scale was used.

Source: Authors' own elaboration based on the scales proposed by Bazargan-Hejazi et al. (2018) and Ajzen (2002).

Respondents reported a strong sense of control over their betting decisions, reflected in high mean scores for independence in decision-making (6.17) and autonomy in participation (6.52). However, a lower mean score of 5.38 regarding readiness to regularly use bookmakers

supporting football clubs suggests that perceived control does not automatically translate into frequent betting activity. This discrepancy may indicate the influence of concerns or external constraints. Consequently, betting companies should emphasize responsible gambling and reinforce the message that customers retain full control over their participation. The introduction of innovative application features that enhance user engagement—such as interactive, user-generated in-play betting options analyzed algorithmically by bookmakers—could further increase activity among users seeking both excitement and personal agency.

In the second part of this section, respondents evaluated statements concerning bookmakers' sponsorship of clubs toward which they held strong positive or negative emotions (Figure 4). Respondents demonstrated moderate willingness to switch bookmakers depending on sponsorship involvement. Mean scores indicate a slightly greater tendency to change providers when a bookmaker sponsors a favored club (4.31) than when it sponsors a disliked team (4.12). This difference reflects fans' preference for brands aligned with their club loyalties. Given the strong loyalty and long memory characteristic of football fans—especially regarding negative associations—bookmakers must approach sponsorship decisions cautiously.



Note: a 7-point Likert scale was used.

Figure 4. Mean evaluations of statements concerning bookmakers' sponsorship of emotionally significant clubs.

Source: Authors' own elaboration based on the scale proposed by González et al. (2012).

An inappropriate sponsorship choice may weaken a bookmaker's image within certain fan segments, particularly among female supporters, who show a greater tendency to switch providers (mean 4.33 vs. 3.97 for men). Even if the economic impact of customer attrition is limited, reputational losses may be substantial. Bookmakers should therefore carefully analyze fan dynamics before entering sponsorship agreements and maintain transparent communication explaining their choices and ethical commitments. Continuous monitoring of fan reactions would enable rapid strategic adjustments and minimize negative consequences. The study also examined participants' future intentions regarding betting services (Figure 5).

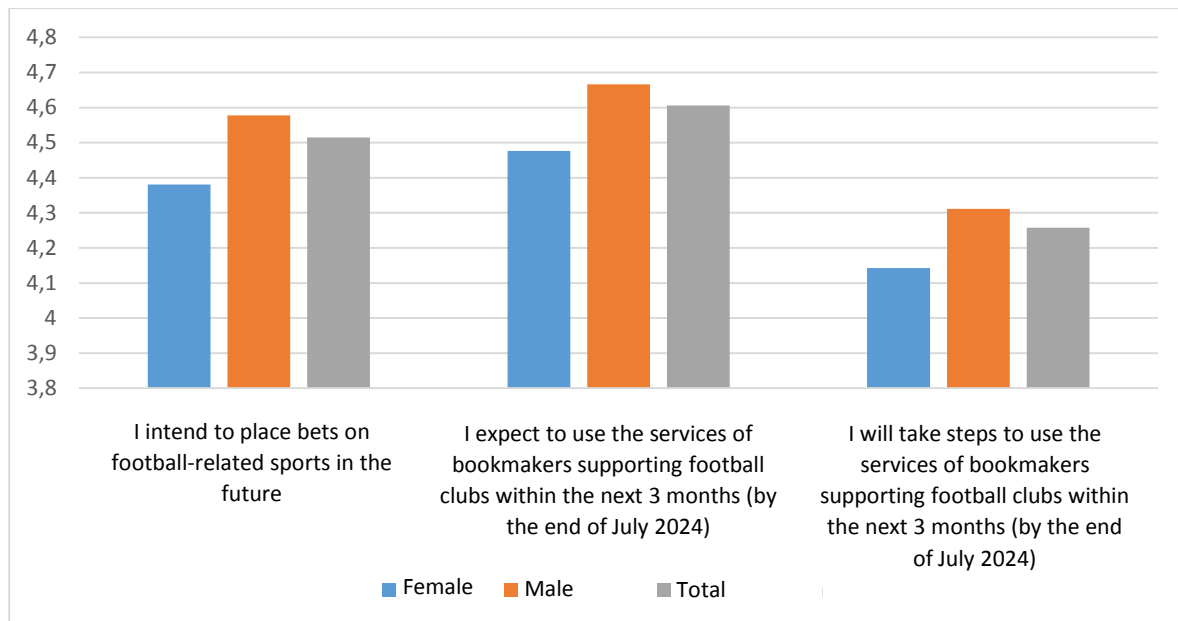


Figure 5. Mean evaluations of respondents' future intentions regarding betting.

Source: Authors' own elaboration based on Ajzen (2002) and González et al. (2012).

The results indicate a generally positive outlook among both genders toward future engagement with betting. Respondents expressed intentions to participate in betting in the near future and to use services of bookmakers sponsoring football clubs up to July 2024. The mean score for this intention was 4.67 among men and 4.48 among women. The higher male score may partly reflect the anticipation of the UEFA European Championship occurring shortly after the survey period. In a longer, unspecified timeframe, men again showed slightly stronger intentions (4.58 vs. 4.38). However, readiness to undertake concrete actions was somewhat lower (4.31 for men and 4.14 for women), suggesting potential logistical, financial, or ethical considerations that moderate the transition from intention to behavior.

For bookmakers, strengthening relationships with clubs and fans through transparent sponsorship practices will be essential. Additional initiatives—such as club-specific promotions or loyalty programs—may encourage consumers to act on their intentions. Further research should identify barriers that hinder the transition from intention to actual behavior and propose strategies to reduce them.

Respondents were also asked about their actual use of bookmakers operating in the Polish market. They could select from 11 major providers and an “other” option (Figure 6), with multiple selections allowed.

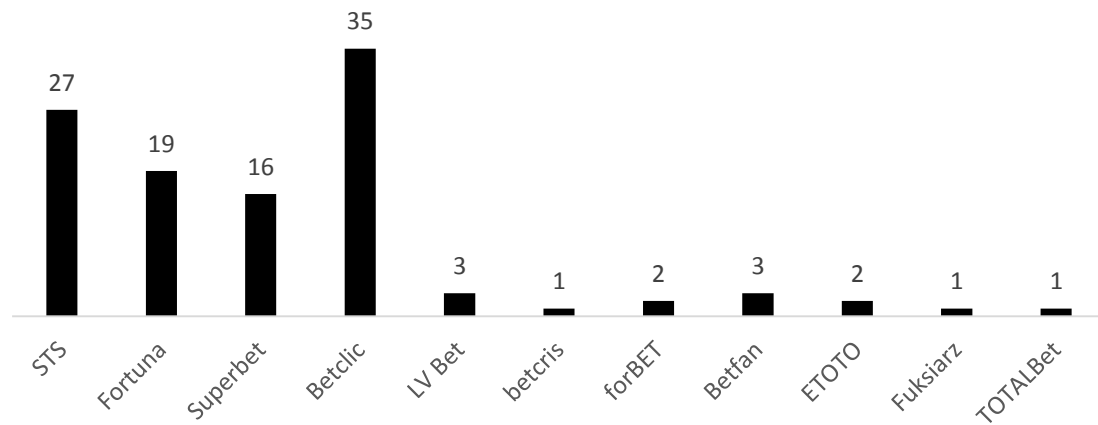


Figure 6. Betting companies used by respondents.

Source: Authors' own elaboration.

The results reveal substantial differences in popularity among companies. Betclio (35 responses), STS (27), Fortuna (19), and Superbet (16) were most frequently used. Other companies—including LV Bet, forBET, Betfan, E-Toto, Betcris, Fuksiarz, TOTALBet, and unspecified providers—received significantly fewer selections, suggesting possible limitations in their offerings or marketing strategies. Interestingly, although STS achieved a higher top-of-mind indicator than Betclio, the latter's greater usage may be linked to its tax-free betting offer, which increases potential winnings.

Despite strong fan affiliation with Lech Poznań, many supporters reported using Betclio (25 responses), even though the club is sponsored by Superbet. Only 13 Lech supporters reported using Superbet. Although the overrepresentation of Lech fans may introduce some bias, this pattern suggests that respondents prioritize attractive service offerings over relatively recent sponsorship ties. Consequently, bookmakers should not rely solely on sponsorship and promotional activities but also ensure high product quality and competitive, trend-aligned offerings.

This subsection focused on fans' perceptions of how sponsorship influences relationships between bookmakers and football clubs. Understanding these perceptions is essential for evaluating mutual reputational benefits and assessing whether sponsorship activity contributes to increased transaction volumes within the betting industry. Such analysis clarifies the dynamics of sponsor–club relationships and supports the development of more effective marketing and communication strategies. It also enables conclusions about which party derives greater reputational advantages from the partnership.

To examine these interdependencies, three questions using a 7-point Likert scale were employed. Respondents evaluated each of seventeen sponsorship relationships between Ekstraklasa football clubs and specific bookmakers (Figure 7).

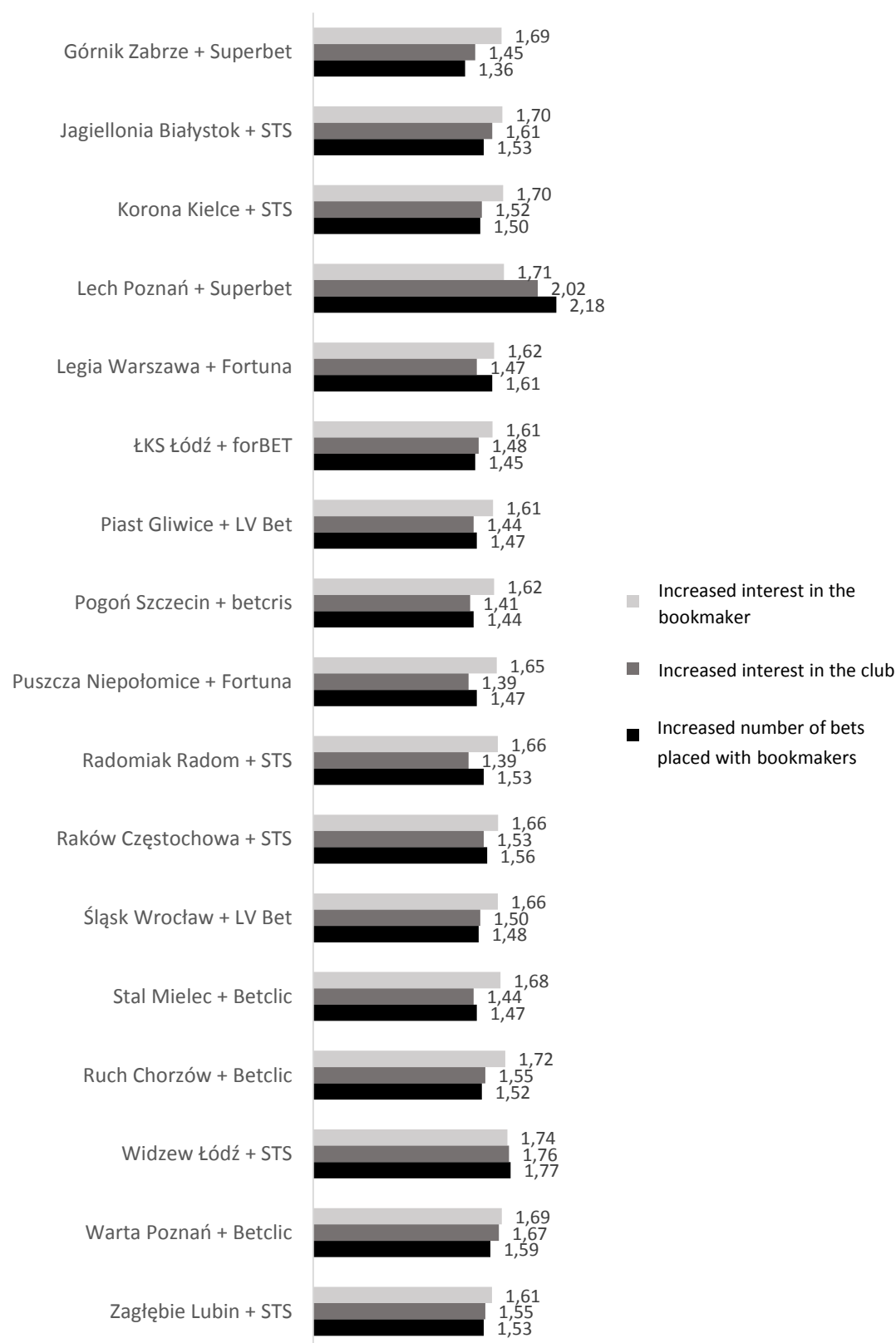


Figure 7. Mean evaluations of sponsorship relationships between Ekstraklasa football clubs and specific bookmakers.

Source: Authors' own elaboration.

The obtained results indicate generally low average ratings, suggesting that sponsorship theoretically did not exert a significant influence on respondents' interest. Scores across all three categories are surprisingly low in most cases, which may indicate a weak link between sponsorship effects and direct benefits for bookmakers and clubs. For example, even the highest average score of 2.18 (Lech Poznań + Superbet in the category of increased number of placed bets) remains far from a moderate value, which may reflect respondents' limited perception of the positive impact of sponsorship.

In particular, the analysis shows that sponsorship relationships do not automatically translate into increased fan engagement in betting activities, nor do they significantly enhance affection toward clubs. However, it is important to consider the overrepresentation of respondents identifying as supporters of Lech Poznań. Their high proportion (47 out of 66 respondents at this stage of the questionnaire) may create disparities in the perception of other clubs and bookmakers. For this reason, the analysis focused on responses from this subgroup regarding the relationship between their favorite club and its sponsor (Table 5).

Table 5.

Mean evaluations of the sponsorship relationship between the bookmaker and supporters of Lech Poznań

Impact of sponsorship on behavior	Mean score among Lech Poznań supporters	Mean score among all respondents
Increased interest in the club	2,23	2,02
Increased interest in the bookmaker	3,23	1,71
Increased number of placed bets	2,47	2,18

Source: Authors' own elaboration.

A clear discrepancy is immediately visible between the evaluations of this sponsorship relationship by the overall sample and by the segment of Lech Poznań supporters. A slightly higher score is observed regarding increased interest in the club due to sponsorship, although the difference is marginal. A similar pattern appears in relation to the increase in the number of placed bets. A pronounced contrast is evident in the area of increased interest in the bookmaker, Superbet. Lech supporters reported a mean score of 3.23, whereas the overall sample yielded only 1.71. Although this value still falls within a moderate range, it clearly indicates that, for this subgroup, the sponsorship relationship between Superbet and Lech Poznań positively influenced interest in the bookmaker and generated reputational benefits.

The marked positive difference within this group may also be influenced by the relatively recent nature of this partnership, as cooperation between the two entities began only at the start of the 2023/24 season. This suggests that Superbet may be employing strategies that resonate more strongly with the expectations of Lech supporters than with those of the broader sample, resulting in a substantial increase in interest in its offer. Although the obtained ratings are not particularly high, the difference between 3.23 and 2.23 clearly indicates that greater reputational benefits—measured by increased interest resulting from the relationship—accrue to the

bookmaker. Through sponsorship-based promotion, the bookmaker gains access to new customers and visibility among a wide audience of sports spectators.

The effectiveness of this partnership may also be reflected in the bookmaker's nomination for the EGR Marketing & Innovations Award in the category of "Best Sponsorship" (Lech Poznań, 2024). The cooperation between Lech Poznań and Superbet appears to be positively received by supporters. Initiatives such as #SUPERDZIARA, which offered fans the opportunity to refresh their supporter-themed tattoos, may contribute to strengthening relationships and further building a favorable image among fans.

The finding that bookmakers derive greater reputational benefits from sponsorship activities is not limited to the case of Poznań supporters. In 15 of the 17 evaluated club-bookmaker partnerships, an advantage was observed in terms of increased interest in the bookmaker relative to the sports entity. This suggests that the phenomenon is widespread and may largely explain the strong interest of betting service providers in promoting their activities through sport. Fans may perceive this connection as a valuable integration of their passion for sport with opportunities for additional entertainment and financial gain. This demonstrates bookmakers' ability to embed their services within the sporting context in a way that naturally attracts fan interest.

It should also be noted that the greater benefits obtained by bookmakers compared to clubs may stem from the more direct nature of the incentives offered by commercial entities. Promotions, registration bonuses, and special odds related to club-specific events are directly tangible to supporters and may quickly translate into increased betting activity and customer loyalty. Overall, within the studied group, sports sponsorship did not significantly increase the number of bets placed; however, there is visible potential for this relationship to become more advantageous for bookmakers in the future. Any increase in betting volume represents a direct conversion of promotional activities into consumer behavior. Recognizing that betting engagement is a secondary effect of initial brand interest, bookmakers may continue to explore strategies aimed at maximizing this conversion. Thus, their key objective becomes not only attracting fan attention through sponsorship but also transforming that interest into betting activity.

The comparison of sponsorship effects among Lech Poznań supporters and the overall sample reveals how substantial reputational benefits can be for bookmakers, particularly when activities are well aligned with the expectations and preferences of local fans. Betting service providers achieve noticeable success in increasing interest in their brands and associated clubs, especially among Lech supporters. The rise in bookmaker interest within this subgroup is significantly higher than in the general sample, indicating the effectiveness of sponsorship campaigns that resonate with local expectations. Although the increase in betting activity is less pronounced, it remains an important indicator of sponsorship effectiveness, as each additional bet directly contributes to bookmakers' financial outcomes.

To maximize the benefits of sponsorship activities, betting service providers should pursue greater personalization and localization of their marketing strategies. Integrating betting offers with club events, developing targeted promotions for specific fan segments, and implementing educational and engaging campaigns may significantly enhance fan interest and loyalty. Continuous monitoring of campaign effectiveness would enable bookmakers to flexibly adjust their strategies in response to evolving audience expectations and behaviors. Bookmakers that effectively employ these mechanisms can not only increase revenues but also build durable and positive relationships with supporters, strengthening long-term loyalty and engagement.

5. Conclusions and Discussion

Sports sponsorship conducted by bookmakers has become a significant component of the contemporary sports landscape, particularly in football. This article analyzed the impact of bookmaker sponsorship on the image of sports clubs and examined fan behaviors related to sports betting. The primary objective was to determine the influence of bookmaker sponsorship on the image of sports clubs. Additionally, the study addressed two research questions: (1) What are fans' attitudes toward betting on sports events? and (2) Do greater reputational benefits accrue to clubs or to betting service providers?

An important finding is that respondents expressed generally moderate attitudes toward bookmaker-driven sports sponsorship. This may be interpreted as a form of implicit acceptance of such activities, accompanied by cautious observation of their development. Consequently, companies in this sector should structure sponsorship agreements in ways that improve the perception of these relationships and maximize their attractiveness to fans, who represent the primary audience of this promotional form. Organizing events and tailoring offers to specific fan groups constitute key recommendations that may improve perceptions and ultimately influence fan attitudes.

The study also revealed the presence of social stigma surrounding betting services, largely due to concerns about gambling and past scandals. Respondents' close social circles often view betting negatively, highlighting the need for educational campaigns promoting responsible gambling. At the same time, respondents declared autonomy in their financial decision-making, suggesting that the betting sector should emphasize player responsibility and independence. Technological innovations in betting applications, such as interactive in-play wagering features, may further enhance user engagement.

The results indicate that fans are more willing to switch bookmakers if a company begins sponsoring their favorite club than if it becomes a partner of a disliked rival. This demonstrates that sponsorship decisions should consider not only economic benefits but also potential reputational risks and social media conflicts generated by supporters. Continued development

of sponsorship relationships is advisable, provided that fan sentiment is carefully monitored to avoid crises and negative publicity.

A noticeable gap also exists between declared intentions to place bets and actual reported behaviors. Identifying barriers and motivating fans through targeted offers and a better understanding of their needs is therefore essential. Although sponsorship does not directly increase betting frequency, it strengthens bookmakers' brand image among supporters, which is a necessary long-term condition for the development of both individual firms and the industry as a whole.

An in-depth analysis was conducted of the sponsorship relationship between Lech Poznań and Superbet, as the largest subgroup of respondents identified as supporters of this club. The results suggest that this partnership generates moderate benefits for both parties. Superbet's promotional initiatives, including support for local activities and event organization, increased interest in the bookmaker among Lech supporters. While the direct effect on betting volume was limited, active engagement in club life and positive relationship-building with fans significantly improved the bookmaker's image. Supporter goodwill toward sponsors may translate into long-term financial benefits and brand trust, which are crucial for future success in the betting industry.

In summary, bookmaker sponsorship in football represents a mutually beneficial relationship. Clubs gain financial resources that support development and long-term stability, while bookmakers gain access to highly engaged fan communities. The shared interest in the club serves as a bridge encouraging supporter engagement. However, fan bases are heterogeneous, encompassing individuals of different genders and generations. Promotional and sponsorship communications should therefore be inclusive and emphasize educational content and responsible gambling practices. The betting market holds substantial potential and significance for football, and it is in the interest of both sponsors and clubs to develop partnerships that generate financial benefits for teams and reputational gains for bookmakers.

For future research, it is recommended to expand the sample to include a larger and more diverse group of respondents representing various clubs and regions, as the present study was dominated by Lech Poznań supporters. This would enable a deeper understanding of sponsorship effects across different fan communities. It is also important to investigate determinants influencing fans' choice of bookmaker, such as promotional attractiveness, reputation, and club affiliations. Understanding these preferences could provide valuable guidance for optimizing marketing strategies.

Equally important is identifying barriers in the decision-making process that prevent fans from converting interest in betting offers into actual participation. Addressing these obstacles could significantly increase engagement and betting activity. Such an approach would enhance the rigor of future research and contribute to a more comprehensive understanding of the impact of sports sponsorship on diverse fan segments, which is essential for the continued development of the betting market.

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SOCIAL COMMUNICATION AND RESIDENT PARTICIPATION IN CREATING A CITY'S IMAGE

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Purpose: The aim of this article is to characterise the actions that can be undertaken by the authorities in territorial units such as cities, municipalities, and districts, to shape their identity and image, taking into account the participation of residents. The author analyses the identity and image categories of a spatial unit as well as the implementation of participation mechanisms in social communication processes.

Design/methodology/approach: This article is a retrospective on views regarding resident participation in city promotional activities. It is based on the research of the literature, reports, and online sources.

Findings: Cities compete with each other for investors, employees, tourists, and residents. Effective place-based marketing plays a key role in sustainable local development. Creating a desirable image for a city or region through the appropriate selection of content and media promotes the unique attributes of a given location and thus attracts investment, which in turn positively impacts economic development and the quality of life.

Research limitations/implications: The limited length of the text, resulting from publishing requirements, does not allow for a comprehensive approach to the issue of residents' active participation in building the desired image of a territorial unit. Nevertheless, the author attempts to familiarise the reader with the issues of city identity and image, as well as the involvement of residents in initiatives to promote it among internal and external stakeholders. It will undoubtedly be worthwhile to conduct representative empirical research in the future, both among city officials and at least several hundred residents. The content of this article may be helpful in developing a methodology for such research, including the content of survey questions.

Practical implications: Effective management of relations with stakeholders, such as city residents, and their efficient involvement in city promotion activities are of great and constantly growing importance in creating the desired image of a given agglomeration.

Social implications: The increasing importance of cooperation between city authorities and stakeholders.

Originality/value: The results have cognitive value. The article describes the importance of social communication in creating the unique image of a city and offering a mega-product to investors, tourists, and other stakeholders.

Keywords: Territorial marketing, city promotion, image, resident participation.

Category of the paper: General review.

1. Introduction

In this age of the information society, strategic information management by public administration bodies, including local governments, should encompass communication between the authorities and the residents, as well as activities that increase the appropriate and effective use of information resources. Information policy is usually associated with reporting on government activities and creating a two-way flow of information between the authorities and the citizens. In a narrower sense, it is the conscious, planned and systematic activity of local government authorities, involving communication with their environment in order to gain active public support for the implementation of strategic development goals and create a positive image of the city, municipality or district (Sakowicz, 2006, p. 239).

New public management is a result of postmodernism in management (Doru, Yildirim, Yazar, 2023, p. 107). It is interactive, not imperative. The authorities are not perceived as the only centre of influence on society, but as an entity that aims to inspire, creating development visions, gaining supporters and negotiating the conditions for the implementation of the vision with partners and interest groups. To this end, the authorities flexibly demonstrate various forms of activity in co-managing a territorial unit, such as intervening in the existing networks of connections between public life participants, creating conditions for cooperation, building consensus and joint problem-solving (Kassim, 2003, p. 140). Contemporary standards of public sector management emphasise such values as openness, transparency, efficiency, accountability and integrity of management on the different levels of public administration.

This research article is theoretical and methodological in nature. Its aim is to highlight the role of resident participation in shaping a city's image and to explore methods for examining the local community's influence on promoting a city's image. The article employs a descriptive approach to characterising market phenomena and processes, as well as specialist literature on spatial marketing. The discussion adopts the "citizens' right to the city" paradigm, an approach that assumes that cities should develop not only to meet economic needs but, above all, to meet young people's aspirations for an improved quality of life.

The study made use of the desk research method, analysing existing empirical data and professional literature on the subject. Inductive reasoning was employed in the analysis, which made it possible to draw conclusions from the observed processes. Modernly managed local government units are opening up to new, innovative, and creative ideas in campaigns promoting their offerings in the media space. Undoubtedly, a range of tools, such as artificial intelligence, can greatly facilitate the generation and implementation of original solutions for interacting with stakeholders as well as the creation of original projects for building a city's image.

2. Social communication

The issue of social communication in the context of involving residents in shaping a city's image encompasses various scientific subdisciplines, such as marketing, management, sociology and psychology. For local government units, these activities involve inspiring and maintaining two-way communication with internal and external stakeholders. Relationships with these stakeholders are referred to as public relations, which are most often defined as promoting a place's image, fostering positive relationships with the public, and shaping a positive media image (Pokrzycka, 2006, p. 251).

The literature offers various definitions of the term "communication". It is typically understood as the process of transmitting information, mutual understanding and interaction between people, and as a crucial element of information exchange. Its primary goal is to achieve a shared and uniform understanding of a given situation by all the participants in the process, namely the senders and recipients of information. The effectiveness of communication depends on whether the distributed information is understood identically by all the entities participating in the process. Therefore, ideal social communication involves meeting the information needs of the community while treating the recipients as equal partners. The opposite is information chaos or the deliberate manipulation of transmitted messages.

Visual identity plays a crucial role in communication. This term denotes a specific optical and aesthetic code that allows a city to build and consolidate its identity within its surroundings (Stanowicka-Traczyk, 2007, p. 53). A properly designed visual identification system is based on the repetition of certain artistic forms characteristic of a city (colours, typefaces, graphic styles).

An increasing number of public services are now becoming digital public services, which in Poland are referred to as e-government. Participants in the information exchange process actively use digital platforms, which promotes both greater transparency of communication and broader community participation in national and local affairs. E-offices help in the dissemination of information and in handling specific matters between the citizens and the authorities, as well as serving the promotional purposes for cities and municipalities (Ciechomski, 2013, p. 96). A major advantage of e-government is the 24/7 availability of the services offered. The efficiency of e-government can be measured by the percentage of basic e-services (such as residence registration, issuing an ID card, or car registration) that are fully available online. Electronic instruments for promoting territorial units include the following:

- profiles on social media such as Facebook, YouTube, Instagram, TikTok and WhatsApp, which do not so much provide access to information as connect people around issues that interest them, build new communities and are an important channel for distributing knowledge, views and beliefs,
- interactive appointment booking,

- information about the stage of handling a given case,
- electronic notice boards,
- cameras transmitting real-time images of the number of customers in an office,
- video files with content promoting a voivodeship, city, district, municipality,
- video files containing instructions on how to fill out forms and applications,
- interactive city maps,
- electronic guides to the city hall,
- local magazines available for download in electronic versions,
- online surveys,
- e-postcards,
- automatic notification of logged-in users about changes on the website,
- info24 tabs, regional weather and other applications.

Electronic resources can be used as a dedicated online communication channel and marketing tool for promoting a city's image. They can provide residents with access to information, functions, public services, descriptions of events organised or sponsored by the city, job offers, statistics on a given territorial unit, as well as many other current and comprehensive data. The range of online communication channels can include the following:

- official websites,
- social media platforms,
- mobile applications,
- e-mail newsletters,
- internet portals and platforms,
- social and discussion forums,
- live broadcasts and webinars,
- open data portals,
- online surveys and feedback forms,
- emergency information systems (Gracz, Ostrowska, Rudewicz, 2024, p. 120).

Communication of a city or municipality via the Internet should take into account the following dimensions:

- informational (efficiency of information transfer),
- interactive (building responsiveness and engagement),
- transactional (submitting applications, viewing the stages of their processing, payments),
- compatible (interoperability of a given system with others),
- participatory (establishing social contacts through blogs, forums, chats, online surveys, public consultations, electronic voting, use of online social media).

The main idea of marketing, including territorial marketing, is to optimally meet customer needs, which means identifying them and adapting the offering to buyers' expectations and preferences. Applying e-marketing in this broad sense to local government operations is connected with the following:

- demonstrating a subservient role of an official towards the client,
- fully recognising the rights of the client when they have incomplete information, doubts, are in ignorance, protecting their own interests, etc.,
- providing the client with the necessary assistance and advice,
- complying with formal procedures and deadlines,
- accepting the client and showing a positive attitude towards them,
- ensuring employee involvement and conscientious performance of duties,
- demonstrating the substantive and interpersonal competences of employees,
- adapting the quantity and quality of services to the needs and expectations of customers,
- treating the client as a person, not as a case (Smolorz, 2012).

Implementing the above assumptions sometimes meets with resistance from office staff. However, implementing the spatial marketing philosophy requires empathy, and especially understanding the expectations and needs of stakeholders. An excellent way to understand these is for the recipients of marketing activities to participate in the decision-making process.

3. Participation

Participation (from the Latin adjective *particeps* – participating, taking part in something) can be defined as citizens directly taking part in social, public and political life (Wiktorska-Świącicka, Kozak 2014, p. 57). It denotes residents' willingness to act for the benefit of their community and engage in collective, self-organising activities. Nowadays, this term is understood broadly as co-participation in decision-making, co-decision-making, and active involvement in shaping the surrounding reality. In management and quality sciences, it has gained importance in the context of the development of the concept of public governance. This concept treats the public sector as a crucial element of society, interacting with members of the civil society and using consultation procedures to collaborate with stakeholders.

Participation means participating in activities, but also in bearing their positive and negative consequences. The word "social" refers to all members of a given community who possess public rights. It is therefore the participation of the public community in decision-making. An interesting description of the origins of social participation, from the Greek agora to the New Charter of Athens of 2003 and the Charter of European Planning 2013, can be found in the monograph *Rola partycypacji społecznej w kształtowaniu miast* (The Role of Social

Participation in Shaping Cities) (Mirecka, 2023, p. 10). This work devotes considerable attention to the inclusion of various stakeholder groups in spatial planning and revitalisation processes. Interesting examples relating to the Wielkopolska region are included in the work *Partycypacja społeczna – inspiracje, uwarunkowania, perspektywy* (Social Participation – Inspirations, Conditioning, Perspectives) (Marciniak, Trościak, Horodecki, 2023, p. 10 et seq.). Another original publication relating to resident participation in local initiatives is the book *Dobre praktyki w zakresie zaangażowania interesariuszy regionalnych systemów innowacji* (Good Practices in Engaging Stakeholders in Regional Innovation Systems). It contains numerous examples from Germany, France, and Scandinavian countries (Wojnicka-Sycz, Piróg, Sycz, Mularz, 2023, p. 68). Another area of resident participation in improving the quality of life is their involvement in promotional activities for their city in order to obtain favourable reviews from investors and tourists and build a favourable image of the destination.

It is also worth emphasising that participation is an effective method for preventing and resolving social conflicts. The dynamic development of the modern world is resulting in changes to access of resources and disparities in the redistribution of the national product. Competitive strivings of groups of people to achieve particular benefits generate conflicts between them. Sometimes, the mere belief in an opposing party's hostile nature initiates long-term conflict. The sources of conflict are diverse, ranging from competition to meet the same needs, through those stemming from poor work organisation, harmful stereotypes or lack of freedom in decision-making, to differing hierarchies of espoused values.

From a formal perspective, participation is based on the belief that citizens' living environments function better if they are active and can modify their environments to suit their needs. While this does not guarantee automatic success, the so-called collective wisdom reduces the number of mistakes. Furthermore, it results in the development of an integrated community striving to achieve common goals. Importantly, the primary means of satisfying the need for participation in governance is not the degree to which expectations are met, but the sense of having a real influence on the decisions made (Sanoff, 2006, p. 46). Stakeholders affected by decisions made through public participation in decision-making can be divided into four groups:

- local community (residents, property owners, tenants, users, local entrepreneurs),
- interest groups (people representing non-governmental organisations, entrepreneurs, civic groups, associations),
- representatives of public bodies (state and local government),
- locally elected officials, such as members of parliament and senators, city presidents and mayors, and councillors (Margerum, 2006, p. 49).

Participation in public space encompasses different types of particular interests:

- collectivist (communal): everyone who may be affected by the consequences of a decision should have equal access to the decision-making process,
- individualistic: people as individuals are capable of participating and making decisions about the choice of public services they want to use,
- holistic: the way decisions are made encourages people to think in terms of the common good and common interest,
- particularistic: the way in which decisions are made encourages people to think in terms of interests (Długosz, Wygnański, 2005, p. 13).

It can also be seen that the percentage of people participating decreases with the amount of effort required. Residents primarily seek information about decisions made by local authorities and, if necessary, their justification. This reflects the lowest, and least demanding, level of involvement in public affairs. On average, one in ten respondents participates in consultations (Olech, 2012, p. 47). When it comes to the most time-consuming forms of participation, the number of residents engaging in them drops dramatically. For example, only one in fifty residents has ever participated in work involving the preparation of draft decisions in the form of reports or draft resolutions.

It is also worth adding that a wide range of tools for communicating and informing the public about decisions made by local authorities are discussed in the monograph *Modele partycypacji publicznej* (Models of Public Participation) (Olech, Kaźmierczak, 2011, p. 25). These include websites, local media, press conferences, e-mailing, newsletters, notice boards, and many others.

4. City identity

Creating a place's image is inextricably linked to the identity of a territorial unit, such as a municipality, district, city, region, or country. A place's image cannot be accurately created without determining its identity. This identity is a set of values and attributes that distinguish a given place from other places and give it a distinct character. Place identity is understood as a deliberately selected set of information addressed to all groups of internal and external recipients in order to build an appropriate image consistent with the set objectives (Szromnik, 2016, p. 147). Identity allows city authorities to define their own characteristics and development potential, and distinguish them from those of other cities. For this reason, a city's identity should be based on unique, attractive and memorable elements.

A. Toepfer and R. Miller created the concept of town identity, which is based on three elements: town design, understood as a unified image of the city, consisting of all the visual elements through which the city presents itself to its surroundings (architecture, urban planning,

history, monuments, famous residents, town symbols); town communications, understood as a system for communicating with the recipients of promotional activities (slogans, taglines, advertising campaigns, guides, methods of informing stakeholders about economic and social initiatives); and town behaviour, which concerns the modes of action of all city entities (residents, government representatives, managers and employees of all public and private institutions) and encompasses the "city culture", understood as social norms, ethical principles, local customs and traditions (Gracz, Ostrowska, Rudewicz, 2024, p. 14). Figure 1 presents the key components of city identity.

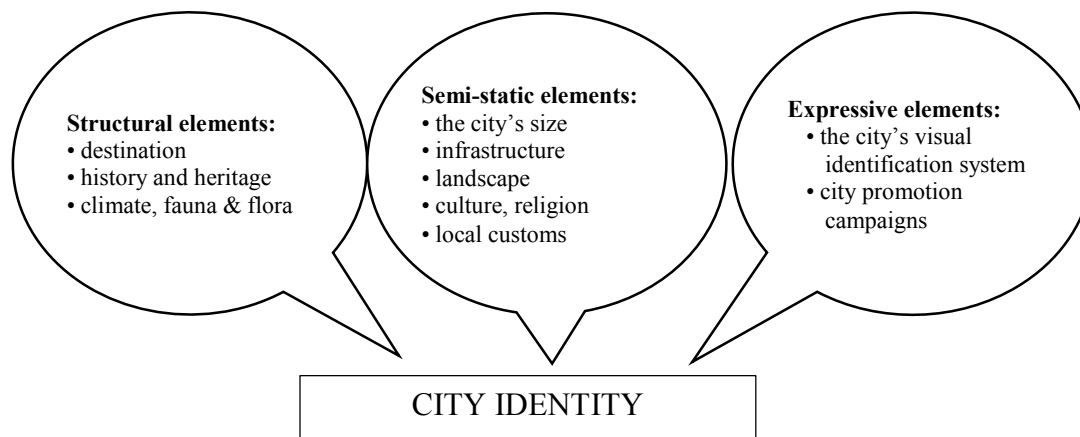


Figure 1. Elements of city identity.

Source: own compilation based on: Glińska, 2011, p. 37.

There is a feedback loop between the objective identity of a given city and its subjective image, because a unique identity facilitates the creation of an optimal image, while a unique image determines the undertaking of specific actions to build the identity, including visual identification elements such as the city's brand logo, the coat of arms, the flag, the markings of city vehicles etc.

The local government must reconcile four key goals:

- increasing the well-being of residents in the long term,
- maximising the profitability of local enterprises,
- increasing the satisfaction of visitors,
- ensuring a sustainable balance of operations (maximising economic benefits and reducing environmental and social costs) (Buhalis, 2000, p. 97).

The identity of a city or region is shaped by the attributes and resources offered to various stakeholder groups. Entrepreneurs value the availability of qualified workers and attractive markets, which are influenced by the wealth of the residents and tourists, and the benefits offered by modern urban infrastructure. Tourists, in turn, value the presence of historical monuments and other tourist attractions, amusement parks, museums, theatres, landscape parks and other areas of outstanding natural beauty. Residents prioritise safety, access to housing, jobs, shops, services and green spaces. The availability of healthcare and social care facilities, schools and preschools, as well as the level of urban infrastructure, public transport, culture and

recreation are all important factors. A place's identity is not something gratuitously acquired, but rather the result of well-thought-out and systematically implemented actions that make a given spatial unit stand out from others. Therefore, it is not a phenomenon, but a social, cultural and economic process which must be included in the development policy of a given place (Adamus-Matuszyńska, Dzik, 2022, p. 239).

5. City image

Effective image management helps build a positive, coherent image of a place. In this context, effective communication between city authorities and residents; including, for example, participatory budgeting or grassroots promotional initiatives; becomes essential for residents' participation in democratic decision-making processes. Furthermore, these activities contribute to greater satisfaction with choosing a given city as a place to live. The image of a given place is a subjective perception formed in people's minds, as well as the associations that come to mind when thinking about it. Image is one of the city's intangible assets and can constitute an important element of competitive advantage and is an instrument for creating marketing and development strategies (Adamowicz, Zwolińska-Ligaj, 2019, p. 99).

Building a desirable image is a subject of interest for many marketing theorists and practitioners. This applies to businesses, product brands, non-profit organisations as well as local government units. A suitable image for a city or region does not appear automatically; it is a consequence of time-consuming and relatively expensive promotional activities, including public relations and other promotional instruments. Building an optimal image for a spatial unit, such as a city, municipality, district or region, is one of the main tasks of territorial marketing (Ciechomski, 2017, p. 130).

Image is the sum total of subjective representations of reality, created in people's minds as a result of perception, media influence and casual information. A city's image is characterised by a range of features, including the following:

- it is an internally complex and individualised feature,
- it is not constant, it is shaped over a long period of time,
- it may increase or decrease the city's competitiveness,
- its identification requires marketing research (Szromnik, 2016, p. 142).

A favourable image of territorial units is an extremely valuable intangible asset, as it facilitates the ability to influence the expected behaviour of the recipients of promotional activities (Ciechomski, 2014, p. 370). Creating an optimal image of a territorial unit is a long-term process. This process should not only be properly planned and implemented, but also monitored and corrected. The ability of city authorities to respond to crisis situations also plays a significant role (Ciechomski, 2020, p. 58).

Image and identity are not synonymous. These concepts are often mistakenly perceived as identical, even though they are complementary. Their precise definition is essential, among other things, for a proper understanding of the process of branding a settlement, which involves transforming the initial, original image of a city into a target image consistent with the place brand being developed. Appropriately designing and creating a place identity is essential to achieving the desired image and is a key element initiating the process of building a city brand.

Figure 2 shows the basic stages in creating a city's image.

1. Initial analysis: • city identity, • selection of distinguishing features, • defining resources, • current image
2. Defining goals: • vision of the desired and promoted image, • determining the benefits, • determining the needs
3. Identifying recipients: • customer segmentation, • selecting target groups and subgroups
4. Developing messages: • the meaning and type of content dependent on the strategy, • the content and type tailored to the client
5. Selecting tools and channels: • identification of trends, • availability of channels, • guarantee of message delivery
6. Constant monitoring: • regular image measurements, • control of implemented solutions

Figure 2. Stages in creating city image.

Source: own compilation based on: Florek, 2013, p. 84 et seq.

Image serves important functions, both for a given city and for the current and potential buyers of its services. Key image functions include the following:

- it carries the city's character and determines choice decisions (related to, for example, the location of investments, residence, recreation, etc.),
- it makes it possible to simplify and select the information that is necessary to make a given decision,
- it makes it possible to subjectively distinguish and differentiate between cities,
- it organises information into a coherent and logical whole,
- it generates a positive image of the place and increases trust, which in turn reduces the risk of making bad decisions (Glińska, Florek, Kowalewska, 2009, p. 34).

In the literature, a city is referred to as a megaproduct because its shape and size are historically determined, yet are constantly changing and evolving. It is a multi-element product, consisting of both tangible elements (housing and transportation infrastructure, urban greenery) and intangible ones (atmosphere, culture, tradition). Together, these elements create an effect, i.e., an experience available to the recipient for a specific price or free of charge (Markowski, 2002, p. 112). The following components of a megaproduct, such as a city or region, can be distinguished:

- the brand of the city/region and its image,
- spatial development,
- communication infrastructure,
- availability of commercial and service outlets,
- openness to entrepreneurship,

- local cultural climate (local customs, regional dishes),
- products from local producers,
- monuments and art,
- dominant denominations,
- tourist attractions,
- famous figures (statesmen, politicians, athletes, influencers) from a given city.

6. Crowdsourcing

Forms of citizen participation in socio-economic life include public consultations, participatory budgeting, village funds, guarantees of the involvement of social organisations in administrative proceedings, referenda, citizens' legislative initiatives, petitions and institutions monitoring, e.g. the use of EU funds.

The purpose of utilising the concept of social participation is to efficiently manage the modern city. The book *Minimalizm formalny. Stosowanie instytucji partycypacji społecznej w Krakowie w świetle koncepcji smart city* (Formal Minimalism: The Use of Social Participation Institutions in Krakow in the Light of the Smart City Concept) (Galon, Plebańczyk, Sieklucki, Świstak, 2022, p. 35 et seq.) is devoted to this issue. The literature on the subject lists six dimensions of a "smart city":

- environment (smart environment): a smart city operates on the principles of sustainable development and optimises the use of resources, e.g. supports the use of renewable energy sources;
- economy (smart economy): cities should demonstrate high productivity, a climate of innovation as well as flexibility of the labour market,
- people (smart people): changes in cities should be initiated by their inhabitants, who, with appropriate technical support, are able to prevent excessive consumption of energy and water and environmental pollution, as well as striving to improve the quality of life,
- transport and communication (smart mobility): thanks to the ICT sector, the city is a gigantic network of high-speed connections,
- quality of life (smart living): a smart city provides its residents with a friendly environment, in particular by offering a wide range of public services, infrastructure, cultural and entertainment events as well as green areas,
- smart governance: creation and implementation of flexible procedures requiring cooperation between local authorities and internal and external stakeholders, as well as the use of modern technologies in the functioning of the city (Griffinger et al., 2007, p. 12).

The smart city concept combines elements of new technologies and citizenship: where the former is dealing with data sources, while in the latter it is the residents who have a significant influence on public services through constant interactions and activities in the life of the city (Mora, Bolici, Deakin, 2017, p. 3).

Crowdsourcing is a key element of local stakeholder e-participation in city governance. Citizens are not passive recipients of public services, but thanks to the development of online communication channels, they can effectively interact with public organisations and actively engage in policymaking and public service delivery. Crowdsourcing initiatives can be helpful in creating a city's brand. It is expected that crowdsourcing initiatives will be used in local governance on an increasingly large scale (Ilczuk, Glińska, 2018, p. 105).

The term *crowdsourcing* refers to the acquisition of solutions (services, ideas) from a crowd (an undefined, large group of people) through an open invitation distributed online, often via social media platforms. Its essence lies in its appeal to the wisdom of crowds, as under certain circumstances, groups are extremely intelligent and often generate intelligent solutions by leveraging synergies. Collective wisdom, therefore, is not an abstract concept and can yield very good results – it just needs to be skilfully explored. "Citizensourcing" is a crowdsourcing practice employed by local governments seeking to leverage the collective intelligence of their citizens.

The most important benefits of resident involvement include an increase in the number of investments implemented in the city; stimulating entrepreneurship; and reducing negative migration trends, particularly among those representing the creative and educated classes (e.g., Nunkoo, Ramkissoon, 2011, p. 964). Obtaining and understanding residents' opinions on a city's image is also crucial for shaping a city's strategy and is one of the methods for introducing modifications and improvements to aid its development. Some researchers suggest viewing the process of creating a city's image as a constant dialogue between the city's internal and external stakeholders (Kavaratzis, Hatch, 2013, p. 69).

A pioneering example of crowdsourcing by city authorities is the Change by Us crowdsourcing platform, created in 2011 at the request of the Mayor of New York City (Ilczuk, 2024, p. 82). The idea was to create a place where every city resident could submit ideas for what they would like to change in their immediate neighbourhood to make the city a better place to live. The Mayor of Mexico City, in turn, appointed thirty local leaders representing various areas of city life. Subsequently, the online platform Change.org was created to enable citizens to actively participate in the governance process by completing online surveys, adding comments and submitting petitions, while simultaneously recording all relevant events related to urban governance. The platform generated significant interest – over 350 petitions were created and signed by over 280,000 people in total, with the most popular petitions concerning the functioning of smart cities, animal rights, combating corruption, and tax changes. Similar initiatives have been implemented by the Mayor of London and the Madrid City Council. In Poland, examples of cities with consultation platforms include Warsaw, Gdańsk,

Gdynia, Poznań, Ruda Śląska, Olsztyn, and many others. Large urban areas undoubtedly enjoy a more favourable situation in terms of resident participation in government initiatives, including those related to creating a unique image. In the case of small towns, problems can include a lack of uniqueness and recognition, a lack of development vision, an aversion to innovative decision-making by local authorities, and limited financial resources (Sztuk, 2025, p. 58).

7. Conclusions

The ability to make decisions about oneself, to have freedom in all its dimensions, and to influence one's environment constitutes one of the fundamental human needs, equally important as meeting existential needs. Identifying and satisfying the need to participate in important matters helps to create an internally cohesive community. Social participation is the opposite of totalitarian systems, as it allows each individual to have a real impact on matters important to them. One of these is the quality of life in the city or village where they live. Thanks to the dynamic development of electronic communications, members of local communities increasingly need not be a silent, passive majority, but rather an active community engaged in local affairs.

The intense interest in the image of Polish cities is linked to the changes taking place within territorial units as a result of broadly understood globalisation and digitalisation. Cities have begun to resemble each other and simultaneously compete with each other for various benefits, such as attracting new residents and investors, organising sporting and cultural events, and so on. The distances between them, figuratively speaking, have become much shorter, and the world has become a "global village". Another important determinant of the development of territorial marketing in Poland has been the significant and dynamic development of new information and telecommunications technologies (Ciechomski, 2015, p. 94). It can be assumed that the promotion of Polish cities and regions will develop very dynamically in the future. This is driven by strong competition among territorial units. Many of them are already conducting large-scale promotional activities, creating their desired image, which serves as the basis for building a territorial brand.

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MEDICAL INFORMATION MANAGEMENT IN PUBLIC HEALTH CARE IN THE CONTEXT OF BUILDING REGIONAL COMPETITIVE ADVANTAGE

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Purpose: To analyse the role of medical information as a management resource in shaping the region's competitive advantage, with particular emphasis on patients' perceptions of the quality and availability of information in the public health care system.

Design/methodology/approach: A quantitative research method in the form of a web-based survey (CAWI) addressed to patients using public health care was used. Their ratings of the reliability of sources and forms of medical information, the staff's empathy, and the level of information asymmetry were analysed. Based on synthetic variables, an analysis of the relationships between information factors and ratings of the quality and accessibility of medical information was conducted, supplemented by patient segmentation using cluster analysis.

Findings: The results indicate that the quality of medical information, the way it is communicated, and the communication attitudes of medical staff significantly impact the perceived value of health services. Efficient information management promotes patient trust and strengthens the potential of public institutions as a pillar of social development in the region, thereby creating a source of competitive advantage.

Research limitations/implications: The study relies on patients' self-reports, which may be subject to perceptual biases and subjective assessments. The analysis covers only the public health sector; therefore, conclusions should not be automatically applied to other segments of medical services or private institutions.

Practical implications: It is recommended that health care units systematically manage the quality of information messages, strengthen staff communication competence, and invest in multichannel patient information. These measures can improve service efficiency and enhance public perception of services in the region.

Social implications: Improving the quality of medical information fosters better patient orientation to health and services, increasing patient empowerment and satisfaction. Improving the transparency and accessibility of information strengthens trust in public institutions and can positively impact the quality of life in the region.

Originality/value: The article attempts to integrate management and information approaches in the analysis of the communication function of public health care. The novel framing of the problem in the context of building regional competitive advantage and trust in public institutions brings value to both research on systemic information management and regional development of health services. The work may be helpful to researchers studying information quality in the public sector, as well as to policymakers and managers responsible for improving patient relations and the effectiveness of communication activities.

Keywords: medical information, public health care, information management, patient communication, regional competitiveness.

Category of the paper: Research paper.

1. Introduction

Modern health care is increasingly based not only on the provision of medical services but also on the effective management of patient relationships, which is founded on access to reliable and transparent information. In this context, medical information is becoming a key resource to support the quality of health services, and its management is an important element of public marketing. Properly designed and communicated information builds trust, strengthens the patient's sense of security and supports a positive image of the medical facility. The quality and availability of information also shape perceptions of the health system's efficiency and professionalism in a given region, thereby influencing its competitiveness.

In the age of the information society, patients are becoming increasingly aware and demanding - they expect not only expert care, but also partner communication and easy access to understandable medical data. Under such conditions, information management cannot be treated marginally. Communication principles, information channels, and medical staff's empathetic attitudes directly impact the quality of the patient experience, their loyalty to the system, and their overall evaluation of public health institutions.

This study aims to assess medical information management in health care and its importance in shaping the region's competitive advantage based on patients' perceptions. In particular, the patients' perceived quality and reliability of the information, the empathy of medical staff and the level of information asymmetry were analysed. In order to achieve this objective, the following research questions were formulated:

1. How do patients assess the quality and forms of medical information in public health care?
2. What information and communication factors determine the evaluation of medical information?
3. Does the quality of medical information reflect the level of trust in health care institutions?

2. Research Methodology

This study used a quantitative approach using the CAWI (Computer-Assisted Web Interviewing) survey technique. The survey tool was developed in-house and included closed-ended, scaled, and cafeteria-style questions on the following key areas: reliability and availability of medical information sources; forms of communication; empathy of medical staff; level of information asymmetry; and overall assessment of the quality of medical information in public health care. Respondents rated each aspect on a five-point Likert scale, ranging from 'very low' to 'very high', with the option to indicate a 'no opinion' response.

The survey was conducted in February-March 2025 on 247 adult patients using public health care services in Poland. The non-random selection was used: 1. purposive (students of the Wrocław University of Economics and Business); 2. convenience (friends of the Author); 3. voluntary (a link to the survey was made available on Facebook and LinkedIn platforms).

For the analysis, synthetic variables were developed, which would be formed as arithmetic averages of the assigned scores for the answers: very low (1); low (2); medium (3); high (4); very high (5); no opinion (0).

1. "Reliability of sources of medical information": assessment of the reliability of various sources of medical information in public health care: general practitioner, nurse, NHF website, information brochures and leaflets, medical telephone helplines, information obtained from the pharmacist, websites of hospitals and clinics, e-registration and patient portals (e.g. Internet Patient Account), social media (e.g. Facebook, LinkedIn, Twitter), online health forums, educational programmes on TV and radio, mobile health monitoring apps, medical articles and research, patient organisations, WHO (World Health Organisation) recommendations.
2. "Reliability of forms of medical information": assessment of the reliability of different forms of medical information in public health care: verbal information from the doctor, verbal information from the nurse, written recommendations after the visit, websites of medical institutions, patient portal (e.g. Internet Patient Account), SMS appointment reminders, telephone medical consultations, information brochures and leaflets, mobile applications for health management, video medical consultations.
3. "Empathy of medical staff": assessment of different aspects of empathy of medical staff: ability to listen to the patient, showing understanding and support, giving sufficient attention to the patient, patience when talking to the patient, politeness and respect when interacting with the patient, giving clear and understandable explanations.

In addition, the following variables were taken for analysis:

1. "Quality and accessibility of medical information" - formed based on the following responses: very low (no access to reliable information) - 1; low (difficult access, unclear information) - 2; medium (partial accessibility, need to search for information by oneself) - 3; high (good educational materials, availability of consultations) - 4; very high (complete transparency, high quality of information) - 5; no opinion - 0.
2. "Level of information asymmetry" denoting the difference in access to information between the doctor and the patient: very low asymmetry (complete transparency of information for the patient) - 5; low asymmetry (patient has access to most information) - 4; medium asymmetry (some information difficult to obtain) - 3; high asymmetry (relevant information is not made available to the patient) - 2; very high asymmetry (patient has minimal knowledge, full domination by the doctor) - 1; I have no opinion - 0.

The survey results, collected in a spreadsheet, were analysed quantitatively using measures of central tendency (mean, median) and variation (standard deviation) to assess the distribution of respondents' answers. Spearman's rank correlation analysis was also conducted to determine the strength and direction of the relationship between the dependent variable - quality and availability of medical information - and information and communication variables such as reliability of sources, forms of communication, staff's empathy and level of information asymmetry. The analysis was complemented by response frequency distributions, which allowed identification of dominant ratings and the degree of variation in patients' opinions. To separate homogeneous groups of respondents, cluster analysis was performed using the k-means method, followed by an assessment of the optimal number of clusters based on the silhouette coefficient. Preliminary interpretation of the results identified significant relationships between the assessment of information quality and communication and information factors, and differences in perceptions of the medical information system within public health care.

A narrative literature review was conducted to set the research issue in the context of the functioning of the health care system, the quality of medical information and its importance for the socio-economic development of the regions. Key words and their combinations were used for the literature search: "medical information", "communication", "regional development", "regional competitiveness", "information management". The following databases were searched (the number of publications in each database is given in brackets): ScienceDirect (5), Taylor and Francis Online (2), Emerald (2), Springer (3).

3. Theoretical framework of the study

Health information refers to the data, knowledge and content related to health, disease, treatment and care used by healthcare professionals, patients and organisations to support decisions and improve health outcomes. It includes both clinical data (such as patient records) and broader health knowledge, and its value depends on how it is collected, processed, communicated and used.

Health information includes the data and knowledge people and systems use to support healthcare decisions, including patient records, clinical guidelines and research findings (Hersh, 2002; Wyatt, Sullivan, 2005). These can be categorised into records maintained by hospitals, personal health records maintained by users and patient-generated health data (Lee et al., 2021). Medical information is not just raw data; it includes processed, contextual and practical knowledge (Hersh, 2002; Wyatt, Sullivan, 2005).

The relevance and usefulness of medical information are closely related to the context in which it is produced and used. Extracting information from its original context for wider use (such as research or administration) requires additional work to ensure that it remains accurate and meaningful (Berg, Goorman, 1999; Gorman, 1995). Doctors and health care professionals rely on medical information to answer complex, contextual questions during patient care, often needing more than facts; narrative and context are important (Gorman, 1995).

Medical information is essential for clinical decision-making, patient education, research and public health (Hersh, 2002; McCurry et al., 2023; Wyatt, Sullivan, 2005). The development of digital health technologies and the Internet has made medical information more accessible, but has also highlighted the challenges of ensuring quality, equity and comprehensibility for all users (Kubiak, 2018; Landolsi et al., 2023; Lee et al., 2021; McCurry et al., 2023). Ensuring that medical information is reliable, understandable and accessible is critical to patient rights and adequate healthcare (Kubiak, 2018; Lee et al., 2021).

In summary, medical information is a broad term encompassing all healthcare data and knowledge, from patient records to research. Their value depends on context, quality and accessibility, making them crucial for effective, equitable and patient-centred healthcare systems.

Patients in public healthcare settings interact with a variety of sources of medical information, including printed materials, online resources and social media. Overall, patients rate the quality of medical information as variable, with apparent gaps in clarity, completeness and reliability, especially online. The form and presentation of information - such as readability, use of everyday language and inclusion of evidence - significantly affect patient perceptions and usability.

Printed patient information documents in hospitals often meet basic standards (clear purpose, logical order, respectful tone), but often lack quantified risks, balanced perspectives, everyday language, contact details and evidence-based references. Few documents identify authors or funding sources, and none explicitly mention patient participation (Charvet-Berard et al., 2008). Online health information is widely available but generally rated as suboptimal. Few websites receive high-quality ratings, and most lack certification or evidence-based content. Government sources tend to be more reliable than academic or commercial sites (Daraz et al., 2019).

Surveys of patients in Polish hospitals show an almost equal split between opponents (37%) and supporters (36%) of the quality of care and information, with older patients rating the information more positively (Borowska et al., 2023). Patients value clear formats and explanatory messages that improve understanding and attitudes towards quality information. However, the impact of quality information on actual healthcare choices depends on other factors, such as cost and provider choice (Faber et al., 2009). Patients increasingly use social media and rating sites to share and access information on healthcare quality. Although these platforms may reflect objective quality measures, ratings are often based on a small, non-representative sample and are overwhelmingly positive (Lagu, Greaves, 2015; Verhoef et al., 2014).

The quality of information and communication between patients and providers strongly shapes perceptions of the healthcare system as patient-centred. Key factors include patient-centred communication, trust, access to relevant information and patient involvement in care decisions.

Clear, empathetic, and responsive provider communication is consistently associated with higher perceptions of patient-centred care. This includes listening, providing understandable information, involving patients in decision-making and addressing concerns (Asan et al., 2021; Cvetanovska et al., 2023; Czerwinski et al., 2021; Hong, Oh, 2020; Hou, Shim, 2010; Langford et al., 2024; Okamura et al., 2024; Rohimakumullah et al., 2025). Trust is both an outcome and a mediator of effective communication. When patients perceive communication as patient-centred, their trust in providers increases, which in turn improves their overall evaluation of the healthcare system (Asan et al., 2021; Czerwinski et al., 2021; Gaffney, Hamiduzzaman, 2022; Hong, Oh, 2020; Rohimakumullah et al., 2025). Timely, tailored and easy-to-understand medical information helps patients feel more comfortable, better informed and optimistic about their care, directly influencing their perception of patient-centredness (Cvetanovska et al., 2023; Gaffney, Hamiduzzaman, 2022; Rohimakumullah et al., 2025). Patients who feel empowered to participate in their care, through access to medical information, involvement in decision-making and the ability to communicate electronically, report greater satisfaction and a stronger sense of patient-centredness (Cvetanovska et al., 2023; Esmaeilzadeh et al., 2021; Langford et al., 2024).

High-quality medical information can significantly support regional development by increasing public trust and the effectiveness of public institutions, especially in health care. Trust in public institutions is closely linked to the quality, accessibility and delivery of medical information, affecting public satisfaction, health outcomes and regional competitiveness.

Better delivery, timeliness, professionalism, and, especially, the availability of accurate medical information in health services directly increase public satisfaction and trust in local authorities and institutions. This particularly impacts basic services such as health care and education, where better information provision leads to greater citizen trust and satisfaction with regional authorities (Allen-Duck et al., 2017; Lanin, Hermanto, 2018; Shan et al., 2016). Effective communication between healthcare providers and the public, supported by robust information policies, is essential for building trust. Weak information systems and low information literacy levels among professionals and the public are significant barriers. These areas can improve attitudes towards public healthcare institutions and foster a more accountable approach to health (Adjekum et al., 2018). In digital health systems, trust is built through data privacy, ease of use, clear communication and the reputation of service providers. Poor information quality and lack of transparency are significant barriers to trust (Adjekum et al., 2018).

There is a direct causal relationship between the quality of regional health systems (including medical information quality) and regional economic competitiveness. Strong health systems, supported by practical information and communication strategies, enhance regional development and stakeholder engagement (Letunovska et al., 2022). High-quality regional governance, which includes transparent and reliable information provision, increases overall trust among residents, further supporting regional development and effective public service delivery (Lombardo, Ricotta, 2022).

In summary, the quality of medical information and effective communication between healthcare providers and patients lead to higher patient satisfaction, adherence to medical recommendations and use of preventive services. This, in turn, improves the perceived and actual effectiveness of public health institutions (Kruk et al., 2018; Mechanic, 1996; Thom et al., 2004). Indeed, high-quality medical information and effective communication are fundamental to building trust in public institutions and improving their effectiveness. This trust enhances the use and impact of public health services and supports wider regional development by promoting well-being, satisfaction and institutional legitimacy.

4. Results and Discussion

In order to answer the first research question, "How do patients assess the quality and forms of medical information in public health care?", the following descriptive statistics were first determined: arithmetic mean, standard deviation and median for the two synthetic variables and the variable "Quality and accessibility of medical information" (Table 1).

Table 1.

Descriptive statistics for selected variables

Variable	Mean	Median	Standard deviation
Reliability of sources of medical information	3,00	3,00	0,61
Reliability of forms of medical information	3,34	3,36	0,69
Quality and accessibility of medical information	2,88	3,00	0,98

Source: own study based on the results of the CAWI survey.

The statistical analysis results indicate that respondents rate both the reliability of sources of medical information and the form of communication of this information at a moderate level. Average values oscillating around 3.00 indicate that the dominant part of the respondents perceives neither high nor low quality of these elements - an 'average' rating prevails, with a slight indication of greater satisfaction with the form of transmission than with the sources. This may suggest that patients perceive an improvement in how they communicate (e.g., e-services, graphical presentations of information), even if they still have limited trust in the sources (e.g., medical staff, institutional websites). The slightly higher average for the reliability of information communication (3.34) may indicate a positive perception of tools such as patient portals, educational graphics, electronic documentation, or online accessibility that facilitate orientation in the health care system.

The evaluation of the quality and accessibility of medical information also remains in the average range (mean: 2.88; median: 3.00), but it is worth noting the relatively higher standard deviation (0.98). This means that respondents' answers were more varied. Some patients may have assessed the system critically, while others may have assessed it positively, which may be related to their experience, digital skills, and local access to health services.

The conclusions from these results are relevant to the practice of health system management and to the development of patient communication tools. Indeed, the moderate scores indicate the need to strengthen further the credibility of sources (especially doctors, nurses, and the National Health Service), while confirming that investments in the quality and innovation of the message have a relatively positive effect.

Secondly, in the context of the first research question, response frequency distributions (%) were determined for the variable "Quality and accessibility of medical information": 0 - No opinion: 4.45%; 1 - Very low: 2.83%; 2 - Low: 16.19%; 3 - Medium: 55.87%; 4 - High: 17.81%; 5 - Very high: 2.83%. The distribution of respondents' answers shows that a dominant proportion of patients, as many as 55.87%, rate the quality and availability of medical

information as medium. This means that more than half of the respondents are moderately satisfied with the information system in public health care. A rating of 'average' can be interpreted as a signal of the simultaneous perception of both positive and problematic aspects of patient communication - e.g., formal access to information while lacking clarity, timeliness, or language adaptation.

Low ratings (1 - very low and 2 - low) were given by 19.02% of patients. This is a significant group that indicates serious deficiencies in the availability and quality of information. This could mean a lack of educational material, difficulty obtaining information about treatment, or limited contact with medical staff. Such results suggest an urgent need to improve not only the information infrastructure but also the staff's communication competence. In contrast, high ratings (4 - and 5 - very high) received 20.64% of indications. Although this is less than a quarter of the total, it represents an important group that sees positive changes and the functioning of effective patient information solutions. It can be assumed that these people use modern information channels (e.g. Internet Patient Account, EDM) or have contact with better-organised facilities. It is also worth noting that 4.45% of respondents answered "I have no opinion", which may indicate a lack of experience with public services, low patient involvement in information, or insufficient data to make an assessment.

In summary, the distribution of responses indicates that the information system in public health care is moderately effective, with a clear margin for improvement. The relatively high proportion of 'average' ratings and the scattered distribution of extreme ratings indicate an uneven patient experience, which may result from regional, organisational and technological variation between facilities.

In the context of answering the second research question: "What information and communication factors determine the evaluation of medical information?", Spearman's rank correlation coefficients (Table 2) were determined.

Table 2.

Correlations with the variable: quality and accessibility of medical information

Variable	Spearman's ρ	Interpretation of the strength of the relationship
Empathy of medical staff	0,298	Moderate positive
Reliability of forms of medical information	0,273	Moderate positive
Level of information asymmetry	0,268	Moderate positive
Reliability of sources of medical information	0,176	Weak positive

Source: own study based on the results of the CAWI survey.

The strongest correlation with rating the quality of medical information is the empathy of medical staff: patients rate the quality of the message higher when they feel listened to and understood. The reliability of medical information forms (e.g. e-services, brochures, websites) also significantly influences quality ratings - the form of communication is as important as its content. Information asymmetry is also important - the more knowledge a patient has access to, the better they rate the quality of information in the system. The reliability of sources has the

weakest relationship - it can be taken for granted (doctor = source of knowledge). However, it is not necessarily sufficient to assess the overall quality of the information system.

Secondly, a cluster analysis was performed to distinguish patient clusters in the context of the second research question. Figure 1 illustrates the silhouette coefficients for different numbers of clusters. The values of this measure indicate that the optimal number of clusters for analysing patients' information and communication assessments is three. Based on this, K-means clustering was performed, and a profile for each group was developed (Table 3). Table 4 illustrates the characteristics of the identified clusters.

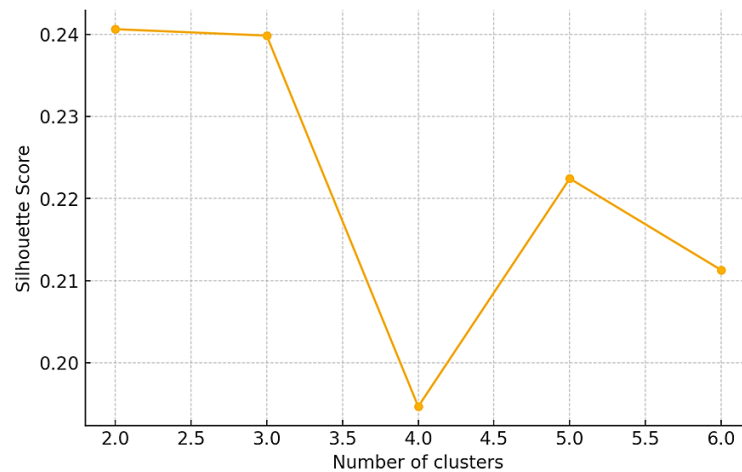


Figure 1. Silhouette coefficient values for different numbers of clusters.

Source: own study based on the results of the CAWI survey.

Table 3.
Profiles of patient clusters based on k-means clustering

Cluster	Reliability of sources of medical information	Reliability of forms of medical information	Empathy of medical staff	Level of information asymmetry	Quality and accessibility of medical information	N
1	3,29	3,70	3,58	3,50	3,39	119
2	2,44	2,63	2,49	2,78	2,68	82
3	3,24	3,65	3,04	1,91	1,91	46

Source: own study based on the results of the CAWI survey.

Table 4.
Characteristics of the three identified clusters

Cluster	Cluster name	Scores for variables	Patient behaviour	Summary	N
1	"Satisfied and well informed"	High scores for all variables	This group of patients feels well informed, has confidence in the system, and the staff show empathy.	High quality of information = high level of trust and communication effectiveness	119
2	"Moderately critical"	Medium or slightly downgraded scores on all indicators	Patients in this group are critical, expressing low trust in information sources and limited empathy, as reflected in lower ratings of the quality of medical information.	Patients may experience communication barriers, despite some access to information.	82

Cont. table 4.

3	"Confused with low accessibility"	High rating of sources and forms, but very low rating of information asymmetry and quality of information	Patients perceive sources and forms as "potentially good", but their real access to the content or understanding of the information is strongly limited.	This situation indicates a significant gap between the potential of systemic information and the patient experience.	46

Source: own study based on the results of the CAWI survey.

The cluster analysis revealed an apparent variation in patients' experiences of information communication in the health care system. The most satisfied patients are those who experience high-quality information, an empathetic staff, and more complete access to medical data simultaneously. In contrast, low empathy and information exclusion are key factors that lower message quality ratings. These results point to the need to adapt information strategies to the diverse needs of audiences to increase communication effectiveness and improve the quality of the patient-health system relationship.

Regarding the third research question "Does the quality of medical information reflect the level of trust in health care institutions?", the analyses to date empirically confirm that the quality of medical information reflects the level of patients' trust in health care institutions - both at the level of individual ratings (correlations) and the group level (clusters). Namely, moderate positive correlations between information quality and empathy ($\rho = 0.298$) and asymmetry ($\rho = 0.268$) indicate a systematic relationship that is independent of the data distribution. The low correlation with source reliability ($\rho = 0.176$) may indicate that patients value the relationship and mode of transmission more than the institutional label of the source itself (e.g., a doctor $\neq$ is automatically of high quality if there is no contact or empathy).

In cluster analysis, patients with the highest ratings of information quality were the most trusting group: high empathy, low asymmetry, and good forms of communication. In contrast, the 'critical' group rated the system lowest, declared a lack of empathy and limited access to knowledge, reflecting a lack of trust and a sense of information exclusion.

Medical information is not seen solely as a document or a source of knowledge, but as an integral part of the relationship between the patient and health care institutions. Its quality becomes a trusted vehicle - the patient trusts the system when he or she has access to understandable content, can interpret it and feels that his or her information needs are respected. Trust does not take a declarative form; it is revealed indirectly by assessing the usefulness, clarity, and accessibility of the information the system provides.

In summary, the study assessed how patients perceive the quality and forms of medical information in public health care, as well as the factors that influence these perceptions. Most respondents rated the information quality as average, with ratings of the communication forms slightly higher than those of the sources themselves. Moderate positive correlations with empathy, communication, and information asymmetry indicate that information quality is strongly related to the patient's experience in the system. Cluster analysis showed that more

satisfied patients have better access to information and feel listened to, while critical groups experience information exclusion. These results confirm that the quality of information reflects the level of trust in health care institutions and can be a factor in building regional competitive advantage.

5. Limitations

The article has several limitations. Firstly, the CAWI survey method used non-random selection, which limits the generalisability of the results to the entire patient population and makes the conclusions relevant only to the analysed group. Secondly, the scope of the analysis was limited to selected information and communication variables, omitting other potentially relevant factors, such as digital competence, educational level, and regional differences. Third, using cluster analysis and synthetic indicators derived from PCA may have simplified the phenomena and lost some interpretative context. Fourthly, the statistical analyses were cross-sectional, which precluded the assessment of changes over time and limited the ability to identify the direction of evolution of the health care information system.

6. Conclusions and Practical Implications

The literature review showed that patients using public healthcare rated the quality of medical information variable, with significant room for improvement in clarity, completeness and evidence-based content. While new forms, such as online resources and social media, are popular, they often lack credibility. The results of our study confirm these observations: patients mostly rate the quality and accessibility of information as average, with staff empathy, the message form, and the level of information asymmetry having a key influence on their perceptions. Improving the patient-healthcare system relationship requires better information tools, competent, attentive staff, and tailored communication. The results indicate that effective health information management, grounded in trust, empathy, and accessibility, can be an important factor in building the region's competitive advantage by increasing public trust and improving the efficiency of public institutions.

Given the above, it is recommended, among other things, to strengthen healthcare professionals' communication competence, develop user-friendly information tools, reduce information asymmetry by improving access to medical data, segment communication to account for patient diversity, and systematically monitor information quality.

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EXAMINING THE RELATIONSHIP BETWEEN INTERACTIVE MARKETING COMMUNICATION AND CITY BRAND EFFECTS

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Purpose: The paper aims to examine the relationship between interactive marketing communication and city brand effects, and whether city size moderates this link.

Design/methodology/approach: The quantitative study covered 140 Polish cities with populations of 20,000 or more. The conceptual model was evaluated using survey data and a two-stage analytic strategy (measurement validation via exploratory and confirmatory factor analysis, followed by structural tests with robust inference). Interactivity was measured with a multi-item scale. City brand effects were modelled as a second-order construct comprising image and key stakeholder effects. City size was tested as a moderator.

Findings: Interactive marketing communication is positively and statistically significantly related to city brand effects (conceptualised as a second-order construct encompassing image, resident, business, tourism, and social effects), and the relationship is substantively meaningful and robust. However, they do not provide empirical support for the moderating role of city size in this relationship, as no reliable differences are observed across population categories in this dataset.

Research limitations/implications: The evidence is based on Polish cities, which limits its generalizability to other institutional and cultural contexts. The study relies on perception-based measures, which are susceptible to attribution bias and common-method variance. Future research can triangulate survey perceptions with objective indicators, apply longitudinal or quasi-experimental designs, test cross-country applicability, and examine reciprocal dynamics between interactivity and brand effects.

Practical implications: Interactivity in marketing communication should be treated as an organisational capability of municipal administration and institutionalised through systematic listening, two-way response, and integration with service-delivery processes to ensure closed feedback loops. City brand effectiveness should be assessed using outcome-oriented, multidimensional measures rather than activity metrics. No evidence of a moderating effect of city size suggests that organisational capabilities and governance mechanisms, not population scale, are the decisive factors.

Originality/value: The study provides validated measures and large-sample tests, and offers robust evidence of the link between interactive marketing communication and city brand effects. As no evidence of a moderating effect of city size was found, attention shifts from scale to organisational capabilities and governance. The study also introduces a reusable CBEf measurement framework.

Keywords: interactive marketing communication, city brand effects, city brand effectiveness, city branding, city marketing communication.

Category of the paper: Research paper.

1. Introduction

Nowadays, city brands should be understood as dynamic, social processes, with value continuously created through interactions between the brand and its stakeholders. Interactive marketing communication (InMC) advances city branding by replacing one-way messaging with structured dialogue and cross-sector collaboration. As a relational, adaptive practice, it recasts stakeholders from passive audiences into partners in meaning-making, cultivating mutual understanding and durable ties. Interactivity operates both as a managerial capability and a participatory process, facilitating dialogue with various stakeholders, strengthening relational capital, promoting engagement, and supporting brand development. This perspective provides a basis for examining how interactive marketing communication contributes to brand effects.

Previous research on interactive marketing communication has predominantly focused on business organisations, while studies in city branding and city marketing have often offered only fragmentary conceptualisations of cities' interactive marketing communication. The scoping review (Mays et al., 2001; Arksey, O'Malley, 2005; Colquhoun et al., 2014), which enabled an exploratory mapping of the literature on interactive marketing communication, city marketing communication, city branding, and city brand effects, revealed a lack of empirical research and coherent theoretical explanation regarding the relationship between interactive marketing communication and city brand effects. This gap, both empirical and exploratory, highlights the need to further investigate the relationship between interactive marketing communication and city brand effects.

The primary objective of this study was to identify and explain the relationship between interactive marketing communication and city brand effects. Furthermore, given that the effects of city branding may vary across contexts, the second objective was to assess whether this relationship is moderated by city size. Understanding the relationship is essential for both theory and practice, as cities may increasingly leverage the potential of interactivity to communicate with stakeholders, foster identification and engagement, and consequently enhance the city brand.

Accordingly, the paper examines whether interactive marketing communication (InMC) enhances city brand effects (CBEf) and whether this link depends on city size. Two hypotheses are tested: H1: InMC is positively related to CBEf. H2: City size moderates the relationship between InMC and CBEf. The model is evaluated using survey data from 140 Polish cities and a two-stage analytic strategy (measurement validation via exploratory factor analysis and

confirmatory factor analysis, followed by structural tests with robust inference). The following sections develop the theoretical background, define the constructs, describe the methodology, including data collection and measures, present the results for H1 and H2 with diagnostics and robustness checks, and conclude by presenting the study's conclusions, including theoretical and practical implications, as well as limitations and suggestions for future research.

2. Theoretical background

2.1. Interactive marketing communication

The evolution of marketing communication reflects a shift from one-way persuasion toward a dynamic, two-way process of interaction between organisations and their audiences. Interactive marketing communication refers to this dialogic, relational, reciprocal, and adaptive process that enables organisations to engage stakeholders in ongoing relationships and co-create value (Kent, Taylor, 2002; Reid, 2005; Finne, Grönroos, 2009; Moriarty, Schultz, 2012; Tafesse, Kitchen, 2017; Daszkiewicz et al., 2023). Interactivity is a fundamental attribute of contemporary communication systems and has become an essential dimension of integrated marketing communication (Porcu et al., 2017; Daszkiewicz et al., 2023).

Initially, the notion of interactivity was primarily associated with digital technology, understood as users' ability to control, manipulate, and respond to online content (Johnson et al., 2006). This approach assumed that if a medium gives the user the ability to choose paths, to reorder content, and to respond, communication already becomes interactive. However, research in marketing communication progressively extended this concept beyond technological affordances to encompass behavioural and relational dynamics between senders and receivers (Kliatchko, 2008; Tafesse, Kitchen, 2017).

Increasingly, scholars underline that interactivity implies a relational orientation: rather than delivering uniform messages to passive audiences, organizations manage a dynamic process of dialogue that enables them to listen, respond, and learn (Finne, Grönroos, 2009; Avidar, 2017; Anderson, 2016; Finne, Grönroos, 2017; Kang et al., 2021). As Moriarty and Schultz (2012a, 2012b) argue, interactivity transforms communication into a continuous feedback system in which each interaction can reinforce or weaken the relationship. This dialogic nature makes interactivity a key driver of trust, engagement, and long-term loyalty (Manser Payne et al., 2017).

Contemporary perspectives, therefore, view marketing communication as a dynamic exchange between organisations and stakeholders (Finne, Grönroos, 2017). Within this paradigm, interactivity is not limited to the technological capacity for feedback but represents a strategic capability that enables dialogue, responsiveness, and relationship building. Porcu

et al. (2017) emphasise that effective integrated marketing communication requires continuous adjustment to stakeholder feedback and contextual changes, resulting in an adaptive, reciprocal communication process. Managing interactive communication involves both listening and participating in stakeholder-generated conversations. Failure to engage in these exchanges may lead to perceptions of organisational distance or unresponsiveness, thereby eroding stakeholder trust (Macnamara, 2019; Bammer, 2024).

Interactive marketing communication can thus be defined as an ongoing, reciprocal process of message exchange and meaning negotiation between the organisation and its stakeholders, characterised by openness, responsiveness, and mutual adaptation (Finne, Grönroos, 2017; Porcu et al., 2017; Daszkiewicz et al., 2023). Extending this perspective, Daszkiewicz et al. (2023) apply the notion of interactivity to the territorial context, defining it as a continuous process of dialogue, monitoring, and feedback between the city and its diverse audiences. Such interactional dynamics support responsiveness and adaptive management in city marketing communication, allowing urban authorities to co-create brand meaning and strengthen relationships with stakeholders.

Although the use of information and communication technologies (ICTs) does not, in itself, guarantee interactivity, their strategic application significantly enhances the potential for interactive communication. Social media, mobile applications, and participatory platforms create opportunities for real-time dialogue, user engagement, and data-driven responsiveness (Mulhern, 2009; Dwivedi et al., 2021). When supported by an appropriate organisational culture and communication strategy, technological tools enable co-creation, feedback, and mutual learning between organisations and stakeholders (Daszkiewicz et al., 2023; Qi et al., 2024).

Table 1.
Dimensions of Interactive Marketing Communication

Dimensions	Conceptual focus	Key features
Processual (dialogue, reciprocity)	Describes how communication processes unfold between the organisation and its stakeholders, emphasising interaction, reciprocity, and shared understanding.	Involves a two-way message exchange where both parties actively participate in creating meaning, leading to shared understanding and stronger relational bonds.
Behavioural (responsiveness)	Refers to how organisations respond to stakeholder feedback and needs, ensuring transparency and authenticity.	Highlights the importance of timely and adequate organisational responses to stakeholder feedback, which enhance transparency, authenticity, and perceived trustworthiness.
Strategic (adaptivity, co-creation)	Explains how insights derived from stakeholder interaction are used to adapt strategies and co-create brand meaning.	Emphasises continuous learning from stakeholder feedback and the use of insights to adjust strategies and co-create brand meaning and value through participatory processes.

Source: Author's own elaboration based on Finne and Grönroos (2009, 2017); Kliatchko (2008); Johnson, Bruner, Kumar (2006); Porcu, del Barrio-García, Kitchen (2019); Tafesse, Kitchen (2017); Prahalad, Ramaswamy (2004); Daszkiewicz, Mazurek, Pukas (2023).

The literature supports the view that interactivity is not a monolithic concept but comprises several interrelated dimensions that describe how organisations and stakeholders engage in communication processes. Table 1 summarises the key dimensions of interactive marketing communication identified in the literature: dialogue and reciprocity, responsiveness, adaptivity and co-creation. The processual dimension (dialogue and reciprocity) captures the interactive flow of communication, the behavioural dimension (responsiveness) relates to organisational reactions and authenticity, and the strategic dimension (adaptivity and co-creation) highlights the organisation's ability to integrate stakeholder input into brand meaning and value creation. Exchange, feedback, and learning emerge as central mechanisms in communication between organisations and their stakeholders. Collectively, these dimensions position interactivity as a strategic resource for building trust, engagement, and long-term brand relationships.

Interactivity reflects a departure from the logic of mass communication toward relationship communication (Finne, Grönroos, 2009, 2017). Interactive marketing communication can therefore be understood not merely as a tactical tool, but also as a strategic capability and process that strengthens relational capital and supports long-term brand building. In the context of city branding, such a relational and adaptive understanding of interactivity provides a conceptual foundation for examining how interactive marketing communication contributes to the brand effects.

2.2. City Branding and City Brand Effects

In recent decades, the branding of places, especially cities, has become an integral part of urban management. Increasing global competition among cities for investment, residents, and visitors, combined with growing societal expectations of participation and transparency, has transformed how city brands are conceived and managed. In response to these changes, scholars and practitioners have increasingly sought to understand city branding as a process through which city brands are formed, expressed, and managed. Interest in evaluating outcomes has also grown, yet this remains challenging due to the complexity of place-branding processes and the need to account for diverse stakeholders.

To understand the city branding conceptually, it is first necessary to outline how the notion of a brand has evolved in recent marketing theory. Brands are increasingly understood as dynamic and social processes whose value is continuously created through interactions between the brand and its stakeholders (Merz et al., 2009). This approach departs from the traditional view of the brand as a firm-owned asset (Keller, 1993; Sinclair, Keller, 2014; Belo, 2014), and instead conceptualises it as a social system of shared meanings, co-created by multiple stakeholders - including the organisation, customers, partners and the broader community. Such a perspective emphasises the relational and interactive nature of branding, where meaning, value and identity are continuously negotiated and reconstructed through stakeholder engagement (Iglesias, Ind, 2020; Iglesias et al., 2020; von Wallpach et al., 2017; Simmons, Durkin, 2023; Keller, 2023).

Existing literature reviews on city branding indicate that the concept has evolved from promotional practices toward a multidimensional process integrating governance, communication, and stakeholder engagement (Lucarelli, 2018; Boisen, Terlouw, Groote, Couwenberg, 2018; Braun et al., 2022). According to Boisen et al. (2018), *city branding* should be distinguished from *marketing* and *promotion*. While promotion focuses on visibility and marketing on exchange, branding refers to the ongoing construction of meaning and identity rooted in stakeholder relationships. This conceptual distinction highlights that city branding is a process linking strategic narratives, identity formation, and participatory communication.

The concept of city branding extends beyond mere promotion or visual identity to encompass a strategic, long-term process of shaping meanings and relationships between a city and its stakeholders (Kavaratzis, 2004; Anholt, 2007; Hankinson, 2010; Zenker, Beckmann, 2013; Lucarelli, 2018). It can thus be understood as a collaborative and adaptive process through which city identities and values are continuously co-created and negotiated through dialogue, interaction, and shared experiences (Eshuis, Klijn, 2012; Kavaratzis, Hatch, 2013; Braun et al., 2022).

In this view, city branding merges marketing logic with governance, integrating economic, social, and cultural objectives and positioning stakeholders as co-creators rather than passive audiences (Eshuis, Edelenbos, 2009; Kavaratzis, Hatch, 2013). Accordingly, city branding is increasingly regarded not merely as a communication strategy but as an ongoing, relational process involving multiple actors whose participation and interaction shape the brand's meaning and legitimacy.

Beyond these communicative and participatory dimensions, recent conceptual work emphasises the importance of understanding city branding as an interactional process shaped by the specific roles that stakeholders assume within it. Källström and Ripoll González (2025) argue that the roles actors assume in the place-branding process influence their propensity for brand citizenship behaviour and voluntary actions that support the place brand.

City branding can be viewed as a cross-sectoral policy process that intersects with education, business, tourism, and social inclusion, generating diverse outcomes that should be identified and assessed (Lucarelli, 2018; Florek et al., 2021; Hereźniak, Florek, 2024). In city branding, the need to evaluate effects is highly justified, as related practices are cross-sectoral and closely tied to multiple public policy domains (Florek et al., 2021).

In the literature, the measurement of city brand effects is often conflated with assessments limited to image-related outcomes. Hereźniak et al. (2018) advocate moving beyond this narrow evaluative sphere and broadening the lens for evaluation of city branding. According to the authors, measuring the effectiveness of a city brand requires integrating perspectives of public management performance and customer-based brand equity for multiple stakeholders (see also Augustyn et al, 2017).

Hereźniak, Florek, and Augustyn (2018) propose designing city-brand effectiveness indicators by integrating a brand-impact perspective (Lucarelli, 2012) with a public management logic framework (Bouckaert, Halligan, 2008). Following this approach, city-brand evaluation may encompass a set of effects, including outputs, outcomes, and impacts, within a flexible structure that accommodates different brand concepts and stakeholder perspectives. Outputs denote direct and immediate effects, relating to tangible results produced during the implementation of branding-related activities (e.g., launched programmes, enhanced city platforms, new procedures, etc.). Outcomes capture mid-term changes in behaviours and perceptions of key stakeholders (e.g., participation in initiatives, growth in city awareness, visitor footfall, willingness to recommend, expansion of partners in social projects). Impacts refer to long-term, enduring changes for stakeholders and the urban system (e.g., investment attractiveness, attraction of new residents, and stronger collaboration climate).

While the role of outputs in the logic chain of city brand building is recognised, outputs are generally treated as production-oriented activity measures with high attribution to implementation (e.g., launched programmes, new procedures, prepared brand carriers) rather than as stakeholder-relevant effects. As the literature typically frames outputs as direct, immediate, and tangible results of actions, they remain useful for monitoring but offer only a limited proxy for effectiveness. Accordingly, the evaluation of city brand effects should concentrate more on outcomes and impacts.

City brand effects can therefore be understood as a multidimensional construct encompassing the overall city image and a range of outcomes and impacts for key stakeholders, including residents, tourists, businesses, investors, and the wider local community.

2.3. Relationship between interactive marketing communication and city brand effects: Theoretical framework and research hypotheses

Cities operate as complex, multi-stakeholder systems in which numerous actors engage in communication and co-create brand meaning (Kavaratzis, Kalandides, 2015; Braun et al., 2013; Lucarelli, 2018). Furthermore, communication in urban governance is not limited to information exchange but also encompasses collaboration, mutual responsiveness, and participatory mechanisms through which stakeholders co-create urban value (Meijer et al., 2012; Meijer et al., 2019; Viale Pereira et al., 2018; Mahmoud et al., 2021; Toukola et al., 2023). Interactive communication enables cities to effectively disseminate information, collect feedback, monitor public reactions and sentiment, and foster participatory relationships with stakeholders. Given the growing recognition of cities as communication-based, co-created brands, understanding how interactive communication relates to brand outcomes is increasingly important.

Quantitative and empirical studies examining the relationship between interactivity and city brand effects are limited and largely fragmentary. One of the few studies addressing this issue is the research by Šerić and Vernuccio (2019), who empirically tested how two dimensions of

integrated marketing communication (IMC) - consistency and interactivity - influence city reputation and consumer brand engagement in a tourism context. Their findings indicate that IMC interactivity had a stronger effect on consumer brand engagement than consistency, and that both IMC dimensions positively influenced city reputation, which in turn was positively associated with consumer brand engagement. These results suggest that interactive communication can enhance stakeholder involvement and strengthen perceptions of city reputation.

However, the Šerić and Vernuccio (2019) study's scope remains limited in several ways. It focuses on tourists, examining the city as a destination brand, and thus does not address the broader concept of the city brand, which includes multiple stakeholder groups such as residents, entrepreneurs, and investors. Moreover, the dependent variables - city reputation and consumer brand engagement - represent selected dimensions of the city's brand effects. Although promising, this study by Šerić and Vernuccio (2019) is limited and does not cover the full range of city brand effects across multiple stakeholder groups. Such evidence thus provides a valuable but partial basis for expecting a positive link between interactive communication and city brand effects.

Braun et al. (2014) state that *place brand communication is most effective when it relies on interaction and experience rather than one-way promotional tools* (Braun et al., 2014, p. 68). The authors, in their quantitative study of Dutch cities, examined how different communication channels influence city attractiveness through brand image. Their results demonstrated that word-of-mouth (WOM) - understood as interpersonal communication and recommendations among residents, visitors, and other stakeholders - had a significantly stronger positive effect on perceived city attractiveness, via improvements in city brand image, than traditional media and symbolic promotional activities. This finding provides empirical support for the notion that dialogic and experience-based communication is more effective in shaping favourable brand perceptions than one-way campaigns. Although the study did not explicitly conceptualise WOM as interactive marketing communication, its results align with the broader view that stakeholder interaction and engagement are key drivers of positive city brand effects.

Theoretical and exploratory studies have long indicated that interaction and dialogue between cities and their stakeholders enhance recognition, shape perceptions, and lead to relational outcomes such as brand attachment and advocacy (Kavaratzis, Hatch, 2013; Braun et al., 2022). These conceptual contributions suggest that such interactional processes may therefore strengthen city brand effects by fostering trust, engagement, and long-term identification with the city. Empirical evidence provides partial support for this view, showing that participatory communication and stakeholder involvement in place branding enhance trust, engagement, and brand-supportive behaviours, although these findings remain limited to specific contexts and stakeholder groups (Klijn et al., 2012; Eshuis et al., 2020).

Klijn et al. (2012) conducted a quantitative study examining how stakeholder involvement within governance structures affects the effectiveness of place branding projects. Their research, based on Dutch municipal branding initiatives, showed that greater actor participation in decision-making processes enhances clarity and internal support for the brand concept. In other words, when city stakeholders are actively involved in shaping and implementing the brand, the resulting place brand tends to be more coherent and broadly endorsed. Although their analysis focused on governance involvement rather than on interactive communication with stakeholders, the findings indirectly support the argument that dialogue and collaboration contribute to stronger city brand outcomes.

Previous research provides fragmented yet broadly consistent evidence that interactive communication enhances key city brand outcomes, including identification, reputation, and stakeholder engagement. However, most existing studies focus on single stakeholder groups (e.g., tourists or residents) or specific communication channels, rather than the multifaceted and multichannel interactivity of city marketing communication. This indicates the need for an integrated approach that captures how interactive marketing communication relates to city brand effects across diverse stakeholders.

The broader relationship between interactive marketing communication and city brand effects remains underexplored and warrants further empirical investigation. Despite limited empirical evidence, existing conceptual and fragmentary studies provide grounds for assuming that interactive marketing communication plays an important role in shaping how city brands are formed and perceived. Prior research indicates that interactivity enhances stakeholder engagement, fosters trust, and facilitates the co-creation of meaning—mechanisms that are likely to generate positive brand-related outcomes. In the context of city branding, such effects are typically expressed as cognitive, affective, and behavioural responses that collectively constitute city brand effects. On this basis, it is reasonable to expect that the perceived interactivity of city marketing communication is positively related to city brand effects.

Previous studies suggest that the effectiveness of city branding and communication strategies varies according to contextual factors such as city size, resource capacity, and level of development. In a recent conceptual contribution, Zenker (2024) argues that “size matters”, as the scale of a city shapes its branding mechanisms by influencing available resources, governance structures, communication channels, and the degree of stakeholder interaction. Empirical evidence supports this view: comparative analyses of urban strategies in Chinese cities demonstrate that municipalities with different population sizes and economic capacities adopt distinct approaches to communication and image management (Ma et al., 2021). Larger cities tend to rely on institutionalised communication systems and external visibility, whereas smaller cities depend more on relational proximity and community engagement. These contextual differences suggest that city size may moderate the relationship between interactive marketing communication and city brand effects.

Based on the reviewed theoretical premises, and in order to examine the relationship between interactive marketing communication and city brand effects while accounting for contextual differences between cities, the following hypotheses were formulated:

H1: There is a positive relationship between interactive marketing communication and city brand effects.

H2: City size moderates the relationship between interactive marketing communication and city brand effects.

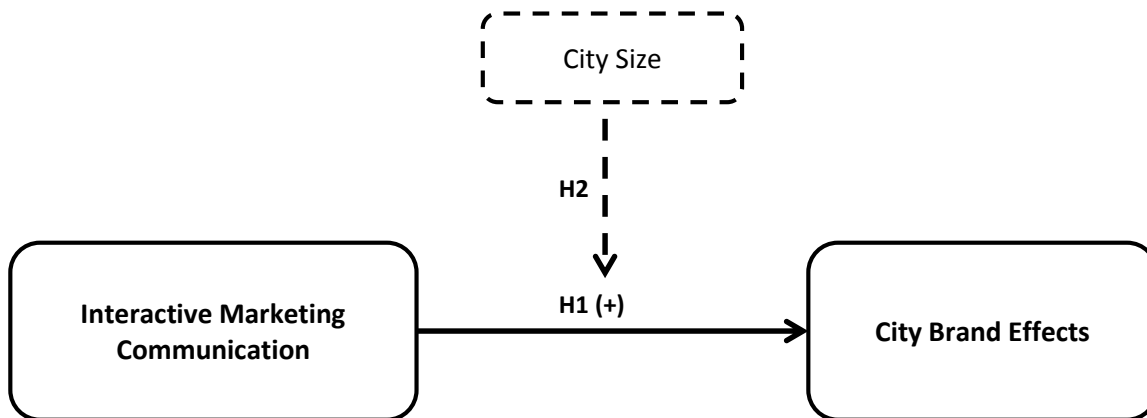


Figure 1. Conceptual model of the relationships between interactive marketing communication and city brand effects.

Building on these hypotheses, a conceptual model was developed to test the relationships between interactive marketing communication and city brand effects, while accounting for the potential moderating role of city size. The conceptual framework is illustrated in Figure 1. The constructs were operationalised using established measurement scales, and the model was empirically examined through the research design described in the next section.

3. Methodology

3.1. Data collection and sample

The quantitative study was conducted on a sample of 140 Polish cities with 20,000 or more residents. The respondents were officials from city or municipal offices who are responsible for decisions regarding the city's marketing communications. The survey was administered between July and August 2025 using a CAWI questionnaire by a research agency with experience in public entity research.

To achieve an adequate response rate, after sending invitations to participate—each including a unique survey link and an authentication letter—follow-up telephone contacts were conducted. The first call verified whether the email had reached the appropriate person and organizational unit. During the conversation, the purpose, scope, and timeline of the study

were outlined, the scientific character of the project was emphasized, and respondents were assured of the anonymity of individual answers and the aggregate nature of the analysis. When necessary, additional calls were made to encourage completion of the questionnaire.

The total population under study consisted of 209 cities with 20,000 or more inhabitants (Statistics Poland, 2024). To determine an appropriate sample size for this finite population, a calculation was performed using a confidence level of 95%, a margin of error of 5%, and an assumed population proportion of 0.5, which yields the most conservative estimate and ensures maximum variability (Babbie, 2020; Creswell, J.W., Creswell, J.D., 2018). According to standard sample size formulas adjusted for finite populations (Israel, 1992), the minimum required sample was approximately 136 cities. In this study, data were collected from 140 cities, which exceeds the calculated threshold. Therefore, the sample size is considered sufficient to ensure statistical validity and generalizability of the findings within the specified confidence parameters. The sample structure, presented by number of residents, is shown in Table 2.

Table 2.
Sample characteristics by city population size

Number of residents	n	%
20,000 to 99,999	106	75.7
100,000-199,999	22	15.7
200,000 and more	12	8.6
Total	140	100.0

Source: Computations based on survey data (N = 140).

Data were collected using a structured questionnaire. The conceptualisation of the model's constructs and the development of the measurement instrument were informed by a literature review, a content analysis of strategic documents from Polish cities, and prior quantitative studies on city marketing communication (Daszkiewicz et al., 2023). Details of the measures are presented in the next subsection of the article.

3.2. Measures

In the study, three variables were included for measurement and analysis: Interactive Marketing Communication (InMC), City Brand Effects (CBEf), and City Size. The constructs of InMC and CBEf were measured using multi-item scales designed to capture respondents' perceptions across several dimensions. Both were treated as latent variables and later assessed for reliability and validity. City Size was treated as a single-item, observed variable, operationalised using population thresholds, and included as an ordinal moderator in the analysis. Table 3 provides a brief overview of the measures; detailed descriptions are provided below.

Table 3.*Brief overview of measures*

Construct	Abbrev.	Measurement	Coding/Aggregation
Interactive Marketing Communication	InMC	6 items; 7-point Likert scale	Mean of six items
City Brand Effects	CBEf	17 items; 7-point Likert scale	Subconstructs means, CBEf as a second-order factor (latent)
City Size	n/a	Ordinal, ranges 20,000-99,999; 100,000-199,999; $\geq 200,000$	Codes 1, 2, 3

Note. To prevent ambiguity, Interactive Marketing Communication is denoted as InMC, differentiating it from IMC, which conventionally refers to Integrated Marketing Communications. Likewise, City Brand Effects is denoted as CBEf to distinguish it from CBE, a label commonly used for City Brand Equity or Corporate Brand Equity in prior research.

Source: Own elaboration.

Interactive Marketing Communication (InMC) was conceptualised as an interactive, relationship-oriented communication process characterised by dialogue, responsiveness, and co-creation. This conceptualisation is consistent with contemporary views of marketing communication as an ongoing two-way, feedback-driven exchange rather than a one-way message transfer (Finne, Grönroos, 2017; Porcu et al., 2017). The InMC construct was operationalised using a six-item scale derived from prior research and adapted to the context of city marketing (Daszkiewicz et al., 2023). The items captured perceived interactivity, including: multi-channel contact and facilitated dialogue with stakeholders; systematic collection and internal sharing of stakeholder feedback; responsiveness enabled by ICT tools; active two-way communication via social media; ongoing development of interactive platforms that support stakeholder dialogue and participation; and monitoring of informal online communication. Respondents evaluated each statement on a seven-point Likert-type scale (1 = “strongly disagree”, 7 = “strongly agree”). For each respondent, a composite InMC score was computed as the arithmetic mean of the six items. No items were reverse-coded.

City Brand Effects (CBEf) were measured using a 17-item scale developed on the basis of existing literature on place and city branding outcomes, brand effectiveness, brand performance, brand equity, and place-related communication effects, with particular attention to the perspectives of multiple stakeholder groups (e.g., Zenker, Martin, 2011; Kavaratzis, Hatch, 2013; Augustyn, Florek, Hereźniak, 2017; Hereźniak et al., 2018; Florek et al., 2021; Alsayel et al., 2022; Sokołowska et al., 2022; Hereźniak, Florek, 2024). The full list of CBEF items is available from the authors upon request. Respondents were asked to indicate the extent to which each effect had applied to their city over the past 3-4 years, using a seven-point Likert scale ranging from 1 ("definitely not") to 7 ("definitely yes").

The CBEf scale was designed to capture a broad range of brand-related effects across five sub-dimensions: Image Effects, Resident-Related Effects, Business-related Effects, Tourism Effects, and Social Effects. The Image Effects construct captures perceived external outcomes of the city brand, specifically: external brand recognition (i.e. increased awareness of the city), brand knowledge (greater familiarity with the city's key attributes among external audiences),

positive media coverage, and the city's overall reputational standing relative to competing cities. These aspects are intentionally excluded from the remaining sub-dimensions (Resident-related Effects, Business-related Effects, Tourism Effects, Social Effects), which focus on stakeholder-specific brand outcomes. Taken together, the sub-dimensions operationalise city brand effects as a multidimensional construct reflecting perceived outcomes of the city's branding efforts for different stakeholder groups. The CBEf construct was modelled as a second-order latent variable, with each dimension treated as a first-order factor in the confirmatory factor analysis.

To collect perceptual responses regarding InMC and CBEf, a seven-point Likert scale was employed. Seven-point scales are widely reported to offer advantages in response sensitivity, discrimination between adjacent categories, and overall data quality. Prior studies indicate that 7-point formats provide a pragmatic balance between measurement precision and respondent burden, and they allow for finer differentiation and more reliable statistical properties than shorter formats such as 5-point scales, without imposing excessive cognitive load on respondents (Finstad, 2010; Leung, 2011; Preston, Colman, 2000; Joshi et al., 2015; Asensio, Revilla, 2022).

City Size was included in the analysis as a moderating variable to account for contextual differences between cities. The decision to include City Size as a moderator is supported by prior research on city branding mechanisms and communication strategies (Zenker, 2024; Ma et al., 2021). The variable was operationalised based on official population thresholds, with three categories: 1 = 20,000-99,999 inhabitants; 2 = 100,000-199,999 inhabitants; 3 = $\geq 200,000$ inhabitants. City Size was treated as an ordinal variable, reflecting the assumption that administrative capacity, communication resources, and stakeholder complexity increase across categories.

3.3. Reliability and validity of measurement scales

Following established guidelines (e.g., Hair et al., 2019; Kline, 2016; Fornell, Larcker, 1981), the measurement model was assessed in three steps. First, dimensionality and item performance were examined through exploratory factor analysis using principal axis factoring. Varimax rotation was applied where multi-factor solutions were expected, and factorability was assessed using KMO and Bartlett's test. Second, internal consistency was evaluated using Cronbach's alpha (Cronbach, 1951). Finally, confirmatory factor analyses were estimated for the first-order InMC and second-order CBEf constructs, reporting standardised loadings, composite reliability (CR), average variance extracted (AVE), and global fit indices (CFI, TLI, RMSEA with 90% CI, SRMR). Convergent validity was indicated by $AVE \geq 0.50$ and $CR \geq 0.70$, while acceptable model fit was typically reflected by $CFI/TLI \geq 0.90-0.95$, $RMSEA \leq 0.08$, and $SRMR \leq 0.08$.

EFA supported the hypothesised structure of both scales. We report summary indices; item-level loadings and communalities are available upon request. For InMC, sampling adequacy and factorability were satisfactory ($KMO = .838$; Bartlett's test of sphericity, $\chi^2(15) = 392.18$, $p < .001$). A single factor extracted with principal axis factoring (PAF) explained 53.4% of the variance. For CBEf, sampling adequacy and sphericity were strong ($KMO = .905$; Bartlett's test of sphericity, $\chi^2(136) = 2449.68$, $p < .001$). A theory-driven five-factor solution (Image, Resident, Business, Tourism, Social), extracted with PAF and varimax rotation, accounted for 81.1% of total variance (23.1%, 17.3%, 12.4%, 14.2%, 14.1%, respectively). The loading pattern was clean (primary loadings $\geq |.40|$; no problematic cross-loadings). Given the conceptual relatedness among brand effects, an oblique-rotation robustness check was conducted to verify interactor correlations prior to imposing final CFA constraints.

Internal consistency assessed with Cronbach's alpha, using the conventional $\geq .70$ benchmark for acceptable reliability (Nunnally, Bernstein, 1994). All scales surpassed this threshold. InMC showed good internal consistency ($\alpha = .859$). CBEf subscales exhibited high to very high reliability ($\alpha = .894-.945$). The overall CBEf composite reached a very high level ($\alpha = .954$), a magnitude that can indicate potential item redundancy; accordingly, potential overlap was considered, and the reliability evaluation was complemented with CFA-based indices.

Table 4.
Model Fit Indices (CFA)

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	RMSEA [90% CI]	SRMR
InMC (first-order)	35.55	9	3.95	.932	.886	.145	[.097-.197]	0.056
CBEf (second-order)	323.14	114	2.83	.915	.898	.114	[.100-.129]	0.070

Note: CFA analyses were performed in R (version 4.x) using the lavaan package (Rosseel, 2012). Detailed CFA outputs are available from the author upon reasonable request due to data-sharing constraints.

Source: Computations based on survey data ($N = 140$).

Confirmatory factor analysis (CFA) was performed to examine the construct validity of the first-order (InMC) and second-order (CBEf) measurement models. Table 4 presents the model fit indices. Although RMSEA values were elevated (InMC: 0.145 [0.097-0.197]; CBEf: 0.114 [0.100-0.129]), the comparative fit indices ($CFI \approx 0.90$, $TLI \approx 0.90$) and $SRMR < 0.080$ meet commonly used "acceptable" thresholds for exploratory social science applications, provided that cutoffs are applied cautiously and contextually (Marsh et al., 2004; Hair et al., 2019).

Convergent validity and composite reliability were evaluated using the average variance extracted (AVE) and composite reliability (CR). Convergent validity is supported for all constructs: $AVE \geq .50$ in every case (InMC = .533; Image = .809; Resident = .733; Business = .841; Tourism = .871; Social = .697). Composite reliability is uniformly high: $CR \geq .87$ (InMC = .870; the CBEf dimensions range from .901 to .944). These values meet or exceed common benchmarks ($AVE \geq .50$, $CR \geq .70-.80$) and indicate well-defined latent constructs.

Despite elevated RMSEA values, comparative fit indices (CFI, TLI) and SRMR suggest an acceptable fit for complex models with moderate sample sizes. Together with high CR and AVE, these results support the convergent and discriminant validity of the measurement model (Hair et al., 2019; Kline, 2016).

Additional validity evidence is provided by two complementary approaches: the Fornell–Larcker criterion (comparing $\sqrt{\text{AVE}}$ with inter-construct correlations) and the HTMT ratio, a stricter check of discriminant validity (Fornell, Larcker, 1981; Henseler et al., 2015). All diagonal $\sqrt{\text{AVE}}$ values (0.73–0.93) exceed inter-construct correlations (0.37–0.80), indicating discriminant validity. HTMT ratios remain below 0.90 (max = 0.854 for Image–Resident; min = 0.408 for InMC–Tourism), reinforcing this conclusion.

Overall, the measurement model is solid enough for the structural analyses that follow. Internal consistency is good to excellent (InMC $\alpha = .859$; CBEf subscales $\alpha = .894$ – $.945$; CBEf $\alpha = .954$), with $\text{CR} \geq .87$ and $\text{AVE} \geq .50$ across all constructs, confirming convergent validity. Discriminant validity is supported by both Fornell–Larcker ($\sqrt{\text{AVE}} = .73$ – $.93$ exceeding inter-construct correlations .37–.80) and HTMT $< .90$ (max .854). Although RMSEA is elevated (InMC .145; CBEf .114), the remaining fit indices are acceptable for this context (CFI $\approx .93$ /.92, TLI $\approx .89$ /.90, SRMR = .056/.070; $N = 140$). Collectively, the measures exhibit adequate reliability and validity

4. Results

4.1. Descriptive statistics and correlations

This subsection reports descriptive statistics and zero-order associations among the study variables. Interactive Marketing Communication (InMC) and City Brand Effects (CBEf) were measured on 7-point Likert scales, with the overall CBEf indicator operationalised as a second-order composite formed by equal weighting of the five first-order dimensions (Image, Resident, Business, Tourism, Social). City Size (ordinal, coded 1–3) is included for completeness. The descriptive results provide a baseline characterisation of the sample ($N = 140$) and inform the interpretation of subsequent analyses. Pearson correlations are presented for comparability across variables, and the corresponding conclusions from complementary Spearman's rho analyses are summarised.

Table 5.
Descriptive statistics

Variable		Min	Max	Mean	SD
InMC		1.50	7.00	5.03	1.16
CBEf		1.80	7.00	5.00	1.05
CBEf subscales	Image	2.25	7.00	5.21	1.32
	Resident	2.25	7.00	4.94	1.25
	Business	1.00	7.00	4.88	1.26
	Tourism	1.00	7.00	4.91	1.55
	Social	1.00	7.00	5.08	1.04
City Size (1-3)		1.00	3.00	1.33	0.63

Note. InMC and CBEf were measured on 7-point Likert scales. CBEfis a second-order composite (equal-weighted mean of Image, Resident, Business, Tourism, and Social Effects). City Size was coded as City size was coded as 1 = 20,000-99,999, 2 = 100,000-199,999, 3 = $\geq 200,000$.

Source: Computations based on survey data (N = 140).

Descriptive statistics (Table 5) indicate that Interactive Marketing Communication (InMC) and the second-order City Brand Effects (CBEf_total) were above the scale midpoint on the 7-point Likert metric, with adequate dispersion (InMC: M = 5.03, SD = 1.16; CBEf_total: M = 5.00, SD = 1.05; N = 140). These means suggest that, on average, respondents rated both the level of interactive communication and the aggregate brand effects favourably. The standard deviations (≈ 1.0 -1.2) indicate sufficient between-city variability for subsequent analyses, with no indication of floor or ceiling compression around the scale endpoints. CBEfis was operationalised as a second-order composite (equal-weighted mean of the Image, Resident, Business, Tourism, and Social dimensions), reducing item-count imbalances across subdimensions and yielding a balanced overall index.

Table 6.
Pearson correlations among study variables (two-tailed)

	InMC	CBEf	CBEf subscales					City Size
			Image	Resident	Business	Tourism	Social	
InMC	—	0.598***	0.523***	0.509***	0.508***	0.373***	0.572***	0.238**
CBEf	0.598***	—	0.865***	0.864***	0.717***	0.804***	0.848***	0.238**
Image	0.523***	0.865***	—	0.797***	0.425***	0.607***	0.724***	0.132
Resident	0.509***	0.864***	0.797***	—	0.478***	0.547***	0.756***	0.091
Business	0.508***	0.717***	0.425***	0.478***	—	0.502***	0.546***	0.285***
Tourism	0.373***	0.804***	0.607***	0.547***	0.502***	—	0.535***	0.288***
Social	0.572***	0.848***	0.724***	0.756***	0.546***	0.535***	—	0.150
City Size	0.238**	0.238**	0.132	0.091	0.285***	0.288***	0.150	—

Note. Entries are Pearson's r (two-tailed); for City Size (ordinal), Spearman's ρ is shown in brackets. $p < .05$, $p < .01$, $p < .001$. The diagonal shows an em dash. CBEf is a second-order factor reflected by five first-order subscales (Image, Resident, Business, Tourism, Social). City size categories: 1 = 20,000-99,999, 2 = 100,000-199,999, 3 = $\geq 200,000$.

Source: Computations based on survey data (N = 140).

Pearson correlations (Table 6) indicate a positive and statistically significant association between Interactive Marketing Communication (InMC) and the second-order City Brand Effects (CBEf_total), $r = 0.598$, $p < .001$ (N = 140). A similar positive pattern emerges across each of the five first-order CBEf dimensions (Image, Resident, Business, Tourism, Social), confirming that higher levels of interactive communication co-occur with stronger brand

outcomes at both the aggregate and subdimension levels. Given the ordinal coding of City Size (ordinal, 1-3), Pearson coefficients are reported for comparability with the other variables. Complementary Spearman's rho results were consistent with the Pearson findings, indicating similar direction and magnitude of association. The rank-order association between InMC and the second-order CBEf was positive and substantial ($\rho = 0.594$, $p < .001$; $N = 140$), closely mirroring the Pearson estimate ($r = 0.598$). This convergence indicates a robust, monotonic relationship not driven by distributional assumptions or outliers. Correlations involving City Size were positive but comparatively modest (City Size–CBEf: $\rho = 0.223$, $p = .008$; City Size–InMC: $\rho = 0.254$, $p = .002$). Full Spearman correlation matrices (with p-values) are available from the authors upon request.

The descriptive statistics indicate that both Interactive Marketing Communication (InMC) and City Brand Effects (CBEf) were rated above the midpoint of the scale, suggesting generally positive perceptions among respondents. Pearson correlations revealed significant, positive associations between InMC and all five dimensions of city brand effects, supporting a consistent relationship between interactive communication and brand outcomes. These findings provide preliminary evidence for the hypothesised positive link between interactive marketing communication and city brand effects, justifying further examination in the structural model.

Overall, the descriptive results and correlation patterns provide preliminary support for the hypothesised associations and lay the groundwork for the formal testing of the conceptual model in the next section.

4.2. Assessment of the conceptual model and hypothesis testing

Following established recommendations for conceptual model assessment (Kline, 2016; Hair et al., 2019), we first validated the measurement structure using confirmatory factor analysis (CFA) and then assessed the structural model to test the hypothesised relationships (see Fig. 1).

To evaluate the proposed conceptual model, a two-stage analytical approach was adopted. First, the measurement model was assessed using confirmatory factor analysis to ensure the validity and reliability of the latent constructs (Brown, 2015; Hair et al., 2019). This step confirmed that the constructs—Interactive Marketing Communication and City Brand Effects—were measured with satisfactory internal consistency and factorial validity.

Second, the structural model was tested to examine the hypothesised relationships between the variables. Two hypotheses were formulated: H1 assessed whether interactive marketing communication is positively associated with city brand effects, while H2 examined whether this relationship is moderated by city size. The constructs of Interactive Marketing Communication and City Brand Effects were operationalised as latent factor scores derived from validated measurement models. City Brand Effects was modelled as a second-order latent construct comprising five subdimensions: Image, Resident, Business, Tourism, and Social Effects.

Hypotheses were tested using regression-based analysis with heteroskedasticity-consistent standard errors (HC3), which provide robust inference in the presence of non-normality or heteroskedasticity in the residuals (Long, Ervin, 2000; Hayes, 2018). City size was included as an ordinal moderator, coded as follows: 1 = 20,000-99,999; 2 = 100,000-199,999; 3 = $\geq 200,000$ inhabitants. The following subsections present the results of the hypothesis testing and structural model evaluation.

4.2.1. Regression analysis (H1)

To empirically test the first hypothesis (H1) and assess the positive relationship between interactive marketing communication (InMC) and city brand effects (CBEf), a regression analysis was conducted. Both constructs were operationalised as standardised latent factor scores, with CBEf modelled as a second-order construct.

H1 was tested using ordinary least squares (OLS) with the dependent variable operationalised as the second-order latent factor score of overall City brand effects (CBEf). Factor scores were derived via Bartlett scoring from standardised CFA loadings. First, first-order factor scores for Image, Resident, Business, Tourism, and Social were computed; next, these scores were combined using their standardised second-order loadings to form the second-order outcome. Interactive Marketing Communication (InMC) was represented by a first-order latent factor score derived from six indicators. Both factor scores were standardised prior to estimation. The report includes classical OLS and HC3-robust inference, model fit, and diagnostic summaries in a single compact table.

Table 7 presents the standardised regression coefficient for InMC predicting the second-order CBEf together with classical and HC3-robust standard errors, t-statistics and p-values. The table also reports the sample size (N), R^2 and adjusted R^2 , the overall F test, Cohen's f^2 as an effect-size index, and the 95% confidence interval for the slope. Finally, normality, heteroskedasticity and influence diagnostics are provided to contextualise the inference and motivate emphasis on HC3 where relevant.

The results confirm the hypothesised positive relationship between Interactive Marketing Communication (InMC) and overall City brand effects (CBEf). With CBEf modelled as a second-order construct (factor score), the standardised OLS estimate was $b = 0.536$, $t(138) = 7.42$, $p < .001$; 95% CI [0.393, 0.679]. The HC3-robust inference was convergent ($t = 7.38$, $p < .001$), and the model explained $R^2 = 0.285$ (Adj. $R^2 = 0.280$). Substantively, this positive relationship implies that a one-SD increase in InMC is associated with a ≈ 0.54 -SD increase in overall city brand effects, aggregating the image, resident, business, tourism, and social dimensions.

Table 7.*OLS regression: InMC → CBEf (second-order) — coefficients, model fit, and diagnostics*

Coefficients (standardized factor scores; OLS with HC3)							
Predictor	b (std.)	SE (OLS)	t (OLS)	p (OLS)	SE (HC3)	t (HC3)	p (HC3)
InMC (latent)	0.536	0.072	7.42	< .001	0.073	7.38	< .001
Model fit							
N	R ²	Adj. R ²	F (1, N-2)	Cohen's f ²		95% CI for b (OLS)	
140	0.285	0.280	55.04 (p < .001)	0.399		[0.393, 0.679]	
Diagnostics (brief)							
AD normality A ² (p)		Breusch–Pagan LM (p)		Max Cook's D		Obs. > 4/N	
1.11 (= 0.006)		2.63 (= 0.105)		0.064		6	

Note. The dependent variable is the overall City brand effects (CBEf) operationalised as a second-order latent factor score. Coefficients are estimated on standardised factor scores; SE (OLS) = classical standard errors; SE (HC3) = heteroskedasticity-robust standard errors.

Source: Calculations based on survey data; statistical methodology informed by Hayes (2018), Kline (2016), Long, Ervin (2000).

Model diagnostics indicated minor deviations from strict OLS assumptions (non-normal residuals and several higher-influence observations), but no strong heteroskedasticity (Breusch–Pagan $p = 0.105$), and the HC3-robust results were virtually identical to classical OLS ($t = 7.38$ vs. 7.42 , both $p < .001$). This indicates that the estimated InMC effect is stable to these diagnostic concerns.

The evidence supports H1. InMC shows a positive and statistically significant relationship with CBEf ($b = 0.536$, $p < .001$), with a substantively meaningful effect size ($f^2 = 0.399$) and robust to standard diagnostic concerns and to convergence of OLS and HC3 inference despite the noted assumption violations. Concluding, Interactive Marketing Communication is positively and statistically significantly related to overall City Brand Effects.

4.2.2. Moderation analysis (H2)

To empirically test the second hypothesis (H2) and assess whether City Size moderates the relationship between interactive marketing communication (InMC) and city brand effects (CBEf), an OLS moderation model with HC3-robust inference was estimated using latent factor scores derived from the CFA. Specifically, CBEf was operationalised as a second-order factor reconstructed via Bartlett scoring from standardised loadings (R output), and InMC was estimated as a first-order Bartlett factor from six items; InMC and City Size (coded 1-3) were mean-centred prior to forming the interaction term (InMC $\times$ City Size). Standardised coefficients β (HC3) for the moderation model are reported in Table 8, and HC3 simple slopes of the InMC $\rightarrow$ CBEf association across City Size categories (1, 2, 3) are provided in Table 8.

Table 8.*Moderation model predicting CBEf*

Term	β (HC3)	t	p
InMC	0.478	5.651	< .001
CitySize	0.110	1.240	0.217
InMC $\times$ CitySize	-0.194	-1.574	0.118

Note. Standardised β (HC3). City Size coded 1-3; interaction from standardised terms. DV = second-order CBEf factor score (Bartlett, from CFA). HC3-robust SE. $R^2 = 0.300$; $N = 140$.

Source: Calculations based on the original survey dataset; CFA (R output); OLS with HC3.

The City Size $\times$ InMC interaction was not statistically significant ($\beta(\text{HC3}) = -0.194$, $t = -1.57$, $p = .118$), indicating no reliable evidence that the association between interactive marketing communication (InMC) and city brand effects (CBEf_total, second-order) differs across City Size categories in this sample. The main effect of InMC remained positive and statistically significant ($\beta = 0.478$, $p < .001$), consistent with the expectation of a positive relationship between interactive communication and overall city brand effects. The main effect of City Size was positive but not significant ($\beta = 0.110$, $p = .217$). Overall model fit was modest ($R^2 = 0.300$; $N = 140$), indicating that the predictors account for approximately 30% of the variance in the second-order city brand effects score.

The results are consistent with a positive relationship between InMC and overall city brand effects, while providing no reliable evidence that this relationship varies by City Size in the analysed data. Any apparent differences across City Size categories should be considered exploratory, given the non-significant interaction under HC3-robust inference.

Although the City Size $\times$ InMC interaction was not statistically significant, conditional effects are reported for transparency. Table 9 presents HC3-robust simple slopes of the InMC $\rightarrow$ CBEf association across City Size categories (1, 2, 3). Simple slopes were obtained from the centred specification of the moderation model (InMC and City Size mean-centred prior to forming the interaction) and are reported with HC3 standard errors, t-values, and p-values. These estimates indicate the expected change in the second-order city brand effects score associated with a one-unit increase in InMC at each City Size category and should be interpreted descriptively given the non-significant interaction.

Table 9.

Simple slopes of InMC $\rightarrow$ CBEf across City Size categories (HC3)

City Size categories	Simple Slope (b)	SE (HC3)	t	p
(1) 20,000-99,999	0.547	0.076	7.18	< .001
(2) 100,000-199,999	0.245	0.177	1.39	0.168
(3) $\geq 200,000$ inhabitants	-0.057	0.355	-0.16	0.873

Note: Simple slopes from the centered model; HC3-robust SE, t, and p. Slopes indicate the change in second-order CBEf per one-unit increase in InMC at each City Size category (1, 2, 3). No multiple-comparison adjustments.

Source. Calculations based on the same dataset; OLS moderation with HC3; City Size coded 1-3.

Residual normality was rejected by the Anderson–Darling test ($A^2 = 1.055$, $p = .009$), indicating departures from normality. The Breusch–Pagan test provided borderline evidence of heteroskedasticity, near the conventional 5% threshold ($LM = 7.77$, $p = .051$; $F = 2.66$, $p = .051$). These features justify the use of HC3-robust inference, which is designed to mitigate size distortions under non-normal and heteroskedastic errors. Influence diagnostics indicated some influential observations: the maximum Cook's D was 0.106, with 6 cases exceeding the $4/N$ threshold (0.029). This pattern may indicate relatively influential cases; HC3-robust inference was used to reduce potential impact, and the findings should be interpreted with appropriate caution. Taken together, the diagnostics support reliance on HC3-robust standard

errors and warrant a cautious interpretation of p -values. Importantly, the substantive pattern reported for H2 (non-significant interaction; positive main effect of InMC; non-significant main effect of City Size) is consistent with inference procedures that are robust to these diagnostic features.

The results of the moderation analysis indicate that the City Size $\times$ InMC interaction was not statistically significant ($\beta(\text{HC3}) = -0.194$, $t = -1.57$, $p = .118$), providing no evidence of moderation by City Size. InMC showed a positive, significant association with CBEf ($\beta = 0.478$, $p < .001$), whereas City Size was not significant ($\beta = 0.110$, $p = .217$). Simple slopes across City Size categories are reported for completeness and should be interpreted descriptively, given the non-significant interaction. The results provide no evidence of moderation by City Size, therefore H2 was not supported in the analysed data.

4.2.3. Hypothesis testing results

The empirical findings support Hypothesis 1 (H1), which posits a positive relationship between interactive marketing communication (InMC) and city brand effects (CBEf). Regression analysis using standardised latent factor scores confirmed that InMC was a significant predictor of overall city brand outcomes, operationalised as a second-order construct comprising image, resident, business, tourism, and social dimensions. The effect size was both statistically significant and substantively meaningful ($\beta = 0.536$, $p < .001$, $R^2 = 0.285$), indicating that higher levels of perceived interactivity in city marketing communication are associated with stronger brand-related outcomes.

Hypothesis 2 (H2), which proposed a moderating effect of city size on the InMC–CBEf relationship, was not supported. Although the interaction term (InMC $\times$ City Size) was included in the moderation model, it did not reach statistical significance ($\beta = -0.194$, $p = .118$), suggesting that the strength of the relationship between interactive marketing communication and brand effects does not differ significantly across cities of varying population size. The main effect of InMC remained positive and robust across specifications.

Table 10.

Summary of hypothesis testing

Hypothesis	Relationship	Result
H1	InMC $\rightarrow$ CBEf	Supported
H2	City size $\times$ InMC $\rightarrow$ CBEf	Not supported

Source: Original survey, $N = 140$.

Table 10 summarises the hypothesis tests: H1 is supported (InMC $\rightarrow$ CBEf), whereas H2 is not (City size $\times$ InMC $\rightarrow$ CBEf). The results confirm the relevance of interactive marketing communication for enhancing city brand effects. However, they do not provide empirical support for the moderating role of city size in this relationship.

5. Conclusions and implications

The study examined whether Interactive Marketing Communication (InMC) is associated with City Brand Effects (CBEf) and whether this relationship differs by city size. The study verified the proposed conceptual model and provided valuable theoretical and practical insights.

Across 140 Polish cities ($\geq 20,000$ residents; survey July–August 2025), InMC showed a positive and statistically significant relationship with overall CBEf, modelled as a second-order construct aggregating image, resident, business, tourism and social effects (standardised OLS: $b = 0.536$, $p < .001$, $R^2 = 0.285$). The effect was substantively meaningful and robust to HC3 inference and standard diagnostics. In contrast, city size did not moderate the association ($\beta = -0.194$, $p = .118$), indicating no reliable differences across population categories in this dataset. This means that Hypothesis H1 was confirmed, indicating a positive relationship between interactive marketing communication and city brand effects. In contrast, Hypothesis H2, which assumed a moderating role of city size, was not confirmed. These results suggest that the more cities engage in interactive communication activities, the more pronounced the positive overall brand effects become.

The research reveals several valuable theoretical implications. The findings reinforce relational explanations of city branding: more interactive communication is associated with stronger city-brand effects (image, social, business, tourism, and resident-related). This supports the view of branding as a dialogic, multi-stakeholder process in which responsiveness and co-creation yield outcomes that matter to various publics.

The city size did not reliably moderate the relationship between InMC and CBEf in this sample and research design, implying broadly comparable effects across population brackets. Any apparent differences in simple slopes are exploratory, given the non-significant interaction under HC3-robust inference. Theoretically, attention should shift from scale to organisational capabilities and governance as the more plausible boundary conditions.

The study contributes measurement structure by operationalising CBEf as a second-order latent variable with adequate reliability and validity ($\alpha \geq .859$; $CR \geq .87$; $AVE \geq .50$; $HTMT < .90$). Despite elevated RMSEA, other fit indices are acceptable for the study's design ($CFI/TLI \approx .90$; $SRMR < .08$), enabling cautious use of latent scores in structural tests. Subject to further validation, this integrated framework may be reusable in future research.

Based on the empirical findings, several practical and policy implications emerge. Interactivity in marketing communication should be understood as a key organisational capability. Therefore, cities should institutionalise processes for listening and for timely, two-way responses (e.g., service standards for response time, the share of dialogic exchanges, and closed feedback loops). This requires the use and development of actionable levers, including this platform and tools that enable and support interactive communication.

From a city-branding standpoint, evaluation should extend beyond outputs (such as the number of posts, events, and reach) and focus on outcomes and impacts, meaning changes in the city's image, shifts in stakeholders' attitudes and behaviours, and their longer-term consequences. When evaluating effects, it may be helpful to anchor measurements in the multidimensional structure of city brand effects employed in this study.

Since city size did not reliably moderate the InMC–CBEf relationship in this sample and research design, scale is not a limiting condition in this context. Cities of different sizes can implement interactive marketing communications and achieve positive city-brand effects. Smaller cities can exploit organisational proximity and community-based channels to strengthen dialogic exchanges (e.g., direct engagement, neighbourhood forums, locally moderated social media), while larger cities should prioritise platform governance (clear ownership, service-level standards, data stewardship) and process integration across departments to sustain responsiveness at scale. Regardless of city size, interactivity should be treated as a capability and supported by tools for performance management, monitoring, and evaluation.

6. Limitations and future research

The study has limitations that qualify the inferences and point to clear avenues for future work. First, the evidence is based on Polish cities, which limits its generalizability to other institutional and cultural contexts. Differences in governance arrangements, administrative digitalisation, and communication norms may condition both the measurement approach and the observed effects. Future research should conduct cross-country or cross-regional comparisons and test measurement invariance to assess whether the CBEf structure and effect sizes hold in other contexts. Second, the study relies on perception-based measures, which are susceptible to attribution bias and common-method variance. While perceptions are central to city branding, a fuller assessment should triangulate with objective indicators (administrative records, behavioural traces, responsiveness metrics) and employ longitudinal or quasi-experimental designs, as well as multi-source, multi-wave data, to strengthen causal inference and separate intervention effects from background noise.

Future research should examine the potential reciprocity between interactive marketing communication and city brand effects. The present study examined the relationship between interactivity and the formation of city brand effects. However, these effects can increase interactivity by motivating stakeholders to engage in dialogue and participation. The feedback mechanism accords with relational, co-creative views of city branding, in which communication processes and brand outcomes co-evolve. Testing this reciprocal dynamic would provide a more process-oriented account of city brand communication as a continually

evolving system of stakeholder interactions. Longitudinal and mixed-method designs would be especially valuable for establishing temporal ordering and capturing mutual reinforcement over time.

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GOOD PRACTICES OF TECHNOLOGY TRANSFER CENTERS IN POLAND IN INDIVIDUAL PHASES OF THE INNOVATION PROCESS – QUALITATIVE ANALYSIS BASED ON IN-DEPTH INTERVIEWS

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Purpose: The aim of this article is to identify and analyze good practices used by Technology Transfer Centers in Poland in individual phases of the innovation process.

Design/methodology/approach: The study was conducted using a qualitative paradigm and individual in-depth interviews. The empirical material includes 10 interviews with representatives of technology transfer centers operating in various types of scientific institutions in Poland.

Findings: The results of the study indicate that the effectiveness of technology transfer centers largely depends on the level of professionalism of their activities, the presence of competent technology brokers, and the ability to build relationships with scientists and business partners. The most frequently identified good practices include: technology scouting and direct meetings with research teams, the use of programs supporting the improvement of TRL levels, the development of educational activities in the field of intellectual property, and the individualization of commercialization strategies depending on the nature of the technology.

Research limitations/implications: The study is qualitative and exploratory in nature, and the results obtained cannot be directly generalized to all technology transfer centers in Poland. Another limitation is the lack of triangulation of quantitative data on implementation effects.

Practical implications: The results can serve as a basis for formulating recommendations for technology transfer centers and university authorities on improving innovation support processes. Identifying good practices allows them to be adapted in other units, particularly in

the area of standardizing commercialization procedures, building a technology offering, and strengthening cooperation with business.

Social implications: The professionalization of CTT activities and increased efficiency of technology transfer can contribute to faster implementation of innovation in the economy, increased use of publicly funded research results, and a greater role for science in solving social problems.

Originality/value: The originality of the article lies in presenting the technology transfer process in phases and identifying good practices of technology transfer centers in Poland based on qualitative research. The article was produced as part of a project implemented by Bydgoszcz University of Science and Technology entitled: *Improving the process of transfer and commercialization of innovative solutions between science and the economy*, under the program “Science for Society II”. The publication was financed from the state budget under the program of the Minister of Education and Science titled “Science for Society II”, project no. NdS-II/SP/0235/2024/01; amount of funding: PLN 1,400.00; total project value: PLN 626,941.33.

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Category of the paper: Empirical article.

1. Introduction

The modern economy is increasingly based on knowledge and innovation, and the key challenge is to effectively transform scientific research results into solutions with practical market and social applications. In this context, technology transfer and knowledge commercialization mechanisms play an important role as a key element of innovation systems at the national and regional levels. Technology Transfer Centers (TTCs) operating at universities and research institutes play a special role in this process. Their task is to mediate between the scientific community and the economy and to support the implementation of R&D results.

TTCs carry out activities including the identification of the implementation potential of research, the protection of intellectual property, the building of relationships with the socio-economic environment, and the initiation of commercialization processes through licensing, the sale of rights, R&D cooperation, and the creation of spin-off companies. The functioning of these centers is thus part of cross-sector cooperation models in which economic innovation results from the interaction of science, business, and public administration.

Despite the development of instruments supporting innovation and the growing importance of technology transfer, the process of commercializing research results in Poland still faces significant barriers. One of the key problems remains the implementation gap, understood as the difficulty in moving from research to implementation and scaling of technology. Its causes include limited funding for proof-of-concept and prototyping stages, the complexity of legal regulations, insufficient managerial skills of research teams, and a weak culture of academic

entrepreneurship. Institutional barriers, such as unclear division of competences in universities and the lack of stable models of cooperation with the business environment, are also significant.

In this context, the activities of TTCs require not only the implementation of formal procedures, but also the implementation of effective organizational solutions and management tools to support innovators at subsequent stages of the innovation process. However, it should be noted that technology transfer centers in Poland are characterized by varying levels of organizational maturity, resources, and operational models, which translates into a lack of uniform operating standards. As a result, the importance of identifying and disseminating good practices that can support the professionalization of TTCs and increase the effectiveness of technology transfer is growing.

Previous analyses of the functioning of CTTs in Poland have often focused on quantitative indicators, neglecting an in-depth qualitative perspective on the practical mechanisms of these units. Meanwhile, qualitative research allows for the identification of effectiveness factors, such as the importance of interpersonal relationships, informal forms of cooperation, and management practices tailored to the specific nature of the academic environment.

Therefore, the aim of this article is to identify and analyze good practices used by technology transfer centers in Poland in particular phases of the innovation process, based on qualitative research conducted using in-depth interviews.

2. Technology transfer and the role of Technology Transfer Centers in the innovation system

Technology transfer is one of the key mechanisms that enables the effective functioning of a knowledge-based economy. In such an economy, the main source of competitive advantage is the ability to create, absorb, and implement innovations. In general terms, technology transfer can be understood as a process of moving knowledge, technical solutions, and research and development results between entities. A particularly important role is played by the flow of technology from the scientific sector to the business sector. Technology transfer includes both formal aspects, such as patent licensing, the sale of rights, or the creation of spin-off companies, as well as informal activities related to the exchange of experience, employee mobility, consulting, and project cooperation. This process is multidimensional. It includes technological, organizational, legal, and social components. As a result, its effectiveness depends not only on the quality of the technology itself, but also on institutional competences and the ability to manage relationships between stakeholders (Bozeman, 2000).

In the literature, technology transfer is often described as part of a broader process of knowledge commercialization. This process leads to the practical use of research results in the economy. Commercialization includes the identification of implementation potential, legal

protection, market evaluation, searching for business partners, and final implementation in the form of a product, service, or process technology. In this approach, technology transfer is a dynamic process. Its result is not only the transfer of technology itself, but also the creation of conditions for its further development, adaptation, and scaling. An important concept in this context is the absorptive capacity of enterprises. It determines whether an organization is able to use acquired knowledge and transform it into economic value (Markman et al., 2008).

The development of innovation systems theory shows that innovations are not created by single entities alone. They are the result of interactions between institutions forming a network, such as universities, research institutes, enterprises, and public administration. In the systemic approach, the role of intermediary institutions is strongly emphasized. These institutions facilitate the flow of knowledge and support the development of cross-sector relationships. They are especially important in countries with a relatively lower level of innovation system maturity, where communication and organizational barriers between science and business are stronger. Therefore, technology transfer should not be seen only as a technical process of transferring solutions. It should also be treated as part of an innovation infrastructure that requires proper organizational and institutional support (Lundvall, 2010).

One of the most frequently cited models explaining modern innovation mechanisms is the triple helix concept. It assumes that the development of an innovative economy results from interactions between three sectors: science, business, and public administration. This model indicates that universities no longer serve only educational and research functions (Morawska-Jancelewicz, 2016). They become active participants in economic development by creating innovations and supporting academic entrepreneurship. In this approach, universities act as entrepreneurial organizations. They generate knowledge, initiate cooperation with business, and participate in commercialization processes. The triple helix concept also highlights the importance of institutionalizing cooperation. This means creating organizational structures that enable long-term relationships between sectors (Borkowska, Zielińska, 2014).

An extension of this approach is the quadruple helix model. It also includes the role of civil society, media, and end users in the innovation process. In this model, innovations are not created only through cooperation between public and economic institutions. They also arise in response to social needs and through active involvement of users in the design and testing of solutions. The inclusion of the fourth component shows the growing importance of social, participatory, and user-oriented innovations. This also affects the way technology transfer centers operate. More often, they must integrate the perspectives of the market, society, and the environment in the process of technology assessment (Morawska-Jancelewicz, 2016).

In the innovation system, an important role is played by intermediary institutions, including Technology Transfer Centers (TTCs). These are specialized organizational units that support the commercialization of knowledge and research results. TTCs are a response to the growing complexity of technology transfer and the need to professionalize activities at the interface between science and business. Their existence results from the fact that technology creators

(scientists and research teams) do not always have competences in intellectual property law, technology marketing, business negotiations, or market analysis. Therefore, technology transfer centers act as a “bridge” between the academic world and economic practice. They reduce information, organizational, and cultural barriers (Grzyb, 2008).

The main tasks of TTCs include identifying research results with implementation potential, assessing technology readiness levels, and analyzing commercialization possibilities. In practice, this means conducting technology scouting activities. This involves actively searching for innovations in the academic environment, selecting them, and supporting their preparation for implementation (Morawska-Jancelewicz, 2016). Another key area of TTC activity is intellectual property management. This includes preparing patent documentation and supporting decisions on protection strategies. In addition, TTCs provide advisory support in developing technology offers, building relationships with industrial partners, and conducting licensing negotiations. In many cases, TTCs also support the creation of spin-off companies. They help develop business models, attract investors, and prepare documentation for funding institutions (Wiśniewska, 2012).

The literature emphasizes that the effectiveness of technology transfer centers can be evaluated both quantitatively and qualitatively. Quantitative indicators include the number of patent applications, the number of licensing agreements, commercialization revenues, and the number of created spin-off companies. However, there is increasing emphasis on the need to include qualitative factors as well. These include the level of process professionalization, the ability to support technology development at an early stage, effectiveness in building relationships with the economic environment, and the ability to create a culture of innovation within academia. For this reason, TTC activity should be analyzed from a process perspective. This approach considers their role in different phases of the innovation process (Gwizdała, Śledzik, 2017).

In Poland, the role of technology transfer centers is particularly important due to persistent systemic barriers in knowledge commercialization. Despite the development of institutional infrastructure and the increasing number of innovation funding instruments, challenges still remain. These include a low level of cooperation between science and business, limited university experience in managing technology portfolios, and insufficient use of research results in the economy. In this context, TTCs can play a stabilizing and professionalizing role. They can support universities in fulfilling their so-called third mission, which involves actively contributing to socio-economic development through the transfer of knowledge and technology (Perkmann et al., 2013).

To summarize, technology transfer is a complex process. Its effectiveness depends on the quality of cooperation between science and the economy, as well as the existence of intermediary institutions capable of managing risk, relationships, and knowledge resources. Technology Transfer Centers play a key role in this system. They connect research activities with market mechanisms of innovation implementation. Due to the growing role of universities

in a knowledge-based economy and the need to increase the effectiveness of research commercialization, the analysis of TTC functioning and the identification of effective management practices remains an important area of scientific research and practical activity.

3. The innovation process and the concept of good practices as a framework for analyzing CTT activities

The innovation process is a fundamental analytical category in research on innovation management and technology transfer. In the literature, innovations are defined as the implementation of new or significantly improved products, processes, organizational methods, or marketing methods that generate economic or social value. In this approach, innovation is not only the result of research activity. It is the outcome of a complex process that includes knowledge creation, technological development, market potential assessment, and final implementation. Therefore, the analysis of the innovation process requires a systemic and multi-stage approach. It should include technological, organizational, and market aspects (Szukalski, 2011).

In classical approaches, the innovation process was described as a sequence of stages. It started with research and development activities and ended with market implementation. Over time, it was noted that innovations do not emerge in a linear way. They are created through feedback loops between research, development, testing, and commercialization. Interactive and network models emphasize that the innovation process is dynamic. Its course depends on cooperation between many actors, such as scientists, enterprises, intermediary institutions, investors, and end users. In this context, relationships between technology creators and entities capable of implementation and scaling are particularly important (Pietras, 2013).

In research and practical applications, a phase-based approach is often used. It helps to organize the innovation process into logical stages and identify key activities within each phase. This approach is especially useful in the analysis of institutions supporting innovation, such as Technology Transfer Centers. It allows specific support instruments to be linked to specific stages of technology development. The phases of the innovation process may be defined differently depending on the adopted model. However, in the literature and technology transfer practice, the most common approach includes the following stages: idea generation, technology development, intellectual property protection, commercialization, and market implementation (Rogers, 2003).

The first phase of the innovation process is the identification and generation of innovative ideas. This stage includes the creation of new technological concepts and the identification of research results with application potential. The literature indicates that innovation sources may come from research activity, market needs, user observations, and cooperation with enterprises.

It is particularly important to identify a real market problem that can be solved using the scientific potential of a university. In this context, the importance of user-oriented approaches and open innovation concepts is increasing. In such models, enterprises and scientific institutions co-create solutions by sharing knowledge and resources (Piecuch, 2020).

The second phase of the innovation process is technology development and prototyping. It includes activities aimed at increasing the technology readiness level and adapting the solution to market requirements. This stage involves high technological and financial risk. It requires investments in industrial research, development work, and validation tests. The literature highlights the importance of instruments supporting the transition from the laboratory phase to the demonstration phase. This transition is often described as the “valley of death” of innovation. It is a moment when the technology has potential but lacks resources for further development. In this area, tools for assessing technology readiness levels are particularly important. They allow progress to be monitored and further stages of development to be planned (Klimczuk, 2021).

The third phase of the innovation process concerns intellectual property protection. This is one of the key conditions for successful technology commercialization. From a strategic perspective, intellectual property is a resource that creates competitive advantage. It protects research results from unauthorized use. IP protection includes patents, utility models, trademarks, and know-how. The choice of the appropriate protection form depends on the nature of the technology, its market potential, and the implementation strategy. The literature indicates that effective intellectual property management requires not only legal competence. It also requires the ability to assess the value of a technology, its novelty, and its possible applications in specific economic sectors (Piecuch, 2020).

The next phase of the innovation process is commercialization. It is understood as the process of introducing technology into economic practice through the transfer of rights, product implementation, or the creation of a new business entity. Commercialization may take different forms. These include licensing, selling intellectual property rights, joint ventures with enterprises, providing research and development services, and creating spin-off companies. The literature emphasizes that commercialization success depends not only on the quality of the technology. It also depends on the ability to develop a business model and adapt the solution to market needs. In this context, value creation and value capture are particularly important. They determine whether technology implementation is profitable for both the creators and the implementing enterprise (Klincewicz, 2016).

The final phase of the innovation process is implementation and market development of the technology. This phase includes scaling, adapting the product to user requirements, and further improvement. In this approach, innovation does not end when a licensing agreement is signed or when the technology is sold. It requires continuous improvement, monitoring implementation effectiveness, and developing cooperation between the parties. The literature indicates that innovation implementation is often a long-term process. It depends on

an organization's ability to manage change, introduce new production and organizational processes, and build market competences. A dynamic approach is particularly important here. It treats innovation as a cycle of learning and adaptation to changing economic conditions (Rogers, 2003).

In the analysis of Technology Transfer Centers, the phase-based approach to the innovation process is especially useful. It helps to organize TTC activities according to logical stages of technology development and assign specific support functions to each stage. Technology transfer centers can participate in the innovation process at every phase. This includes idea identification and technology scouting, advisory support in obtaining funding and increasing TRL, preparation of patent documentation, development of commercialization strategies, and support in business negotiations. This role of TTCs goes beyond the traditional view of technology transfer as a simple handover of a solution. It includes comprehensive management of the implementation process (Pietras, 2013).

An important element of TTC activity analysis is also the concept of good practices. Good practices are understood as proven and effective organizational, procedural, or operational solutions. They increase the effectiveness of institutions and can be replicated in other organizations. Good practices represent a form of organizational learning and management knowledge transfer. They help institutions improve performance by adapting solutions developed by leaders in a given industry or sector. Management literature indicates that identifying good practices is particularly important in organizations operating under high uncertainty. In such conditions, there are no clear standards, and effectiveness depends on experience, competences, and the quality of internal processes (Rogers, 2003).

The analysis of good practices in TTC activity is especially important because these centers operate in an environment characterized by high technological diversity, varied stakeholder expectations, and institutional limitations resulting from legal and organizational conditions at universities. As a result, technology transfer processes are rarely fully repeatable. Their effectiveness depends on the ability to flexibly adjust tools to the specific technology and industry. At the same time, the literature indicates that some process elements can be standardized. This increases transparency and operational efficiency and supports commercialization decision-making. Therefore, good practices are an important reference point for building TTC operating models. They help identify solutions that reduce risk, shorten implementation time, and increase the chances of successful commercialization (Perkmann et al., 2013).

The innovation process provides a useful analytical framework. It allows the systematization of activities carried out by technology transfer centers and supports the evaluation of their effectiveness at different stages of technology development. At the same time, the concept of good practices makes it possible to identify and compare organizational solutions used by TTCs. It also helps indicate actions that can be considered particularly effective under institutional conditions typical for the Polish innovation system. The use of

a phase-based approach combined with good practice analysis supports a deeper understanding of the role of TTCs in technology transfer. It also provides a basis for developing recommendations aimed at the professionalization of these units.

4. Research methodology

The study was conducted within a qualitative research paradigm. Its aim was to gain an in-depth understanding of organizational phenomena, processes, and institutional mechanisms. This was done by analyzing the experiences, opinions, and practices of people directly involved in the studied area. A qualitative approach is particularly appropriate when the subject is complex and strongly context-dependent. It is also useful when the goal is not to test statistical hypotheses, but to identify patterns of action and interpret the meanings that participants assign to specific practices. In the case of Technology Transfer Centers (TTCs), organizational conditions, institutional differences, and varying levels of maturity of technology transfer structures make qualitative research an adequate tool. It allows the reconstruction of innovation support mechanisms and the identification of good practices.

The study used in-depth individual interviews (IDIs). This method made it possible to obtain detailed information about procedures, tools, and operational activities related to technology transfer and the commercialization of research results. In-depth interviews support exploration of the respondents' perspectives. They help identify success factors and organizational barriers. They also provide examples of specific solutions used in institutional practice. The use of IDIs is particularly justified in research on TTC activities. Many technology transfer processes are informal and relationship-based. Their effectiveness depends on experience, competences, and the institutional context.

The study had an exploratory and diagnostic character. On the one hand, it focused on how technology transfer centers operate in Poland. It also examined solutions used in subsequent phases of the innovation process. On the other hand, it enabled a diagnosis of the practices most often perceived by respondents as effective. It also pointed to areas that require further development. The exploratory approach captured the diversity of TTC activities. It also identified elements that can serve as a basis for a national good practice model. In total, 10 in-depth individual interviews were conducted with representatives of technology transfer centers operating in Poland. The sample was selected purposively. The key assumption was to maximize institutional diversity. This made it possible to capture different organizational and operational models used by technology transfer units.

The selection included TTCs operating within large research universities, as well as centers from regional universities and research institutes. Including institutions of different scale and profile helped identify good practices typical for different types of scientific institutions and different technology sectors.

The selection of technology transfer centers was based on a set of effectiveness criteria. These included, among others: the scale of commercialization, the number of signed licensing agreements, the number of established spin-off/spin-out companies, revenues from commercialization, the intensity of educational and advisory activities, the length of time the unit has been operating, membership and activity in the PACTT network, the level of internationalization, the quality of intellectual property protection, financial efficiency, and recognition in the science–business community. These criteria supported the selection of units with an established position in the national technology transfer system, as well as smaller and developing centers.

The respondents held key roles within technology transfer structures. They included TTC directors, technology brokers, commercialization specialists, and technology transfer experts. This group was chosen because they have practical knowledge of innovation implementation mechanisms, business negotiations, and the management of intellectual property protection processes.

To present the sample characteristics in an orderly way, the article includes a list of institutions together with respondent roles and interview dates (Table 1).

Table 1.

Characteristics of the research sample (TTCs included in the qualitative study)

Institution / unit	Type of entity	Respondent role	Interview date
Maria Curie-Skłodowska University in Lublin	university	TTC director	07.05.2025
Wrocław University of Science and Technology	technical university	TT expert	13.06.2025
Wrocław University of Economics	economics university	center director	12.06.2025
University of Warsaw	university	acting deputy director	12.06.2025
Kazimierz Wielki University in Bydgoszcz	regional university	center director	26.06.2025
University of Wrocław	university	acting deputy TTC director	12.06.2025
Warsaw University of Life Sciences (SGGW)	agricultural university	TTC director	03.07.2025
Medical University of Gdańsk	medical university	acting TTC director	04.07.2025
Institute of Horticulture – InHort	research institute	head of TT team	07.07.2025
Poznań University of Technology	technical university	TTC director / special-purpose company director	09.07.2025

Source: author's own work based on the study documentation.

The research tool was an original in-depth interview guide. It was designed to identify good practices used by technology transfer centers across successive phases of the innovation process. The guide was semi-structured. It included a set of key research questions and thematic

areas. At the same time, it allowed deeper exploration of topics important to respondents. The structure was based on a phase approach to the innovation process and covered the following areas:

- identification and generation of innovative ideas (e.g., scouting, networking activities, cooperation with business, market potential assessment),
- technology development and prototyping (support in increasing TRL, obtaining funding, cooperation with laboratories and industrial partners),
- intellectual property protection (IP identification procedures, cooperation with patent law firms, education on rights protection),
- commercialization (commercialization procedures, licensing models, spin-off/spin-out, technology marketing tools, negotiations),
- technology development after commercialization (monitoring implementation outcomes, support in scaling, obtaining funding),
- cooperation and exchange of experience (relations with other units, international inspiration, unique features of a given center).

This structure enabled the collection of comparable data across units. It also supported a process-based analysis of TTC activities, consistent with the adopted theoretical framework.

The in-depth interviews were conducted between May and July 2025. Each interview followed the same guide. This ensured comparability of the collected data. At the same time, the approach allowed flexibility to develop new threads that emerged during the conversation.

Due to the specificity of the respondent group and organizational constraints related to the availability of TTC managers and experts, interviews were conducted either face-to-face or remotely (online). The interviews usually lasted between about 45 and 90 minutes. This made it possible to gather detailed information on operational processes and examples of specific implementation activities.

Data were collected in the form of research notes and structured interview sheets. The respondents' answers were recorded according to the thematic structure of the guide. To ensure research reliability and data consistency, the same documentation structure was used for each interview.

5. Research results – good CTT practices in the phases of the innovation process

The analysis of the empirical material collected through ten in-depth individual interviews showed that the activities of Technology Transfer Centers (TTCs) in Poland differ significantly in terms of organization and procedures. However, it was possible to identify a set of recurring good practices that appeared in most of the analyzed units. Respondents emphasized that the

effectiveness of technology transfer does not result only from formal procedures. It depends mainly on the ability to build relationships with researchers and on the capacity to actively manage the innovation process from the early idea stage to commercialization.

The research results also indicate that the best practices of TTCs can be organized according to a phase-based model of the innovation process. This structure makes it possible to capture the specific activities carried out by centers at each stage. It also shows how organizational instruments and support tools are adjusted to the level of technology maturity.

The most frequently indicated good practice in the first phase of the innovation process was technology scouting. It was understood as active outreach to researchers and research teams in order to identify research results with application potential. Respondents emphasized that in universities and research institutes, innovations are rarely reported spontaneously. Therefore, the proactive attitude of TTC brokers and specialists plays a key role.

This practice mainly involved direct meetings with researchers, one-on-one conversations, and monitoring ongoing research projects. One respondent stated that “one-on-one conversations with researchers are the most effective”, because scientists are often willing to talk about their work. This makes it easier to identify solutions with implementation potential. A similar view was expressed by respondents from Wrocław University of Science and Technology. They highlighted the importance of direct meetings and systematic support already at the stage of research project planning. In research institutes, a slightly different approach was observed. Innovation identification was more strongly linked to relationships with industry. A representative of the Institute of Horticulture pointed out that idea generation most often takes place through direct contact with business, especially during discussions about the needs and challenges of entrepreneurs.

The second key practice in the identification phase was the organization of matchmaking meetings and initiating contacts between researchers and representatives of the business sector. This practice was particularly developed in units with access to international cooperation networks. In the case of the Medical University of Gdańsk, respondents emphasized the importance of participation in international matchmaking initiatives, including those organized within EIT Health. They noted that such meetings allow research ideas to be verified and increase the chances of technology development in partnership with business. In other units, matchmaking was often local and regional. It focused on building relationships with enterprises operating in the direct environment of the university. An example is Kazimierz Wielki University in Bydgoszcz. Respondents stated that the center mainly analyzes the market needs of local companies and public institutions and then initiates meetings to identify potential areas of cooperation.

Another practice identified in the study was the organization of professional community events, such as conferences, debates, workshops, and science-to-business initiatives. Respondents emphasized that these activities serve two purposes. First, they promote research

results. Second, they create space for interdisciplinary cooperation and allow ideas to be confronted with a business perspective.

At Kazimierz Wielki University in Bydgoszcz, respondents stated that organizing debates and conferences allows researchers from different disciplines to present their results and build potential for interdisciplinary cooperation. At the same time, it enables business representatives to assess the ideas. Similar activities were carried out by the TTC of Poznań University of Technology. Respondents highlighted participation in industry and trade fairs as a tool for identifying new cooperation areas and as an impulse for developing commercial projects.

The analysis of the empirical material showed that the assessment of the market potential of ideas is not always formalized. In some units, there were no formal selection procedures. Decisions were made based on the experience of the TTC team. An example is the University of Warsaw. Respondents stated that there are no unified evaluation procedures, and the assessment is based mainly on the individual expertise of TTC employees. The situation was different at the Medical University of Gdańsk, where the initial technology assessment is conducted using the TRL model and the IRL model (KTH IRL), as well as consultations with industry experts. At Wrocław University of Science and Technology, a stage-based approach was described. It includes initial screening of research results using criteria such as ownership rights, innovativeness, and market demand. This is followed by a more detailed analysis of commercialization potential. In practice, this solution can be considered a good practice for early elimination of projects with limited implementation chances.

Respondents emphasized that researchers' willingness to report innovations depends strongly on motivation mechanisms and on raising awareness of the benefits of commercialization. The most frequently mentioned activities included training sessions, information campaigns, practical guides, and the promotion of implementation success stories. At Wrocław University of Science and Technology, respondents stated that educational activities and presenting successful case studies are effective motivational tools. They strengthen the belief that commercialization is realistic. The Medical University of Gdańsk emphasized the role of advisory support in preparing patent applications. It also highlighted the promotion of successful implementations as a mechanism encouraging researchers to report solutions.

In the second phase of the innovation process, respondents indicated that the main challenge is securing funding for development work, prototyping, and proof-of-concept activities. The most frequently mentioned good practice was the use of systemic public funding programs, such as Inkubator Innowacyjności (+, 2.0, 4.0) and Science4Business – Inkubator Rozwoju. An expert from Kazimierz Wielki University emphasized that these programs enabled pre-implementation work. They also supported technology promotion and preparation for market entry. Similar experiences were reported at Maria Curie-Skłodowska University. There, Inkubator Innowacyjności was used to identify research results with commercial potential, support researchers in planning prototyping activities, and provide administrative and

commercialization support. At the Medical University of Gdańsk, respondents also noted the possibility of obtaining funding through IDUB programs and innovation incubators financed by the Ministry of Science and Higher Education. This made it possible to carry out development and prototyping activities with TTC support.

The interview analysis showed that effective management of pre-implementation projects requires the use of project management tools, as well as schedules and milestones. At Maria Curie-Skłodowska University, respondents stated that good results come from stage-based work and team-based project supervision. This includes the involvement of an R&D expert, a patent attorney, a broker, and a project specialist. A similar approach was described by the Medical University of Gdańsk. Respondents emphasized the importance of integrated project management and systems for monitoring R&D progress, including schedules and milestones. This practice allows better control of the technology development process and reduces the risk of projects being stuck at the prototype stage.

Respondents also emphasized the importance of cooperation with industrial partners already at the concept stage. Maria Curie-Skłodowska University indicated that close cooperation with a business partner at an early stage is one of the most important success factors in technology development. A similar approach was presented by InHort. A key practice was searching for partners among industry companies cooperating with the institute and identifying funding sources for development work.

The results show that intellectual property protection is one of the most developed TTC functions. However, differences were also observed in the level of formalization. At Maria Curie-Skłodowska University, respondents pointed to mandatory reporting of results with commercialization potential as a good practice. They also highlighted cooperation with a patent attorney combined with an assessment of the market uniqueness of the solution. An important part of the study was the comparison of cooperation models with patent attorneys. Respondents stated that having an internal patent attorney ensures better availability and more efficient information flow. In contrast, cooperation with an external law firm may extend the process and limit direct contact between researchers and the expert.

A representative of the University of Wrocław stated that after switching to an external law firm model, researchers lost direct contact with the patent attorney. The center was forced to act as an intermediary, which extended the process and created additional organizational workload. At the same time, the respondent noted that in some universities cooperation with an external law firm may work well. However, in the analyzed unit the internal model was considered more effective. At Maria Curie-Skłodowska University, an opposite problem was observed. The patent attorney employed by the university was not interested in cooperation with the TTC. This limited the possibility of involving the attorney in commercialization at an early stage. This result indicates that the mere presence of an internal patent attorney is not sufficient. What matters is the integration of the attorney into TTC processes.

In the commercialization phase, respondents emphasized the importance of actively building a technology portfolio and preparing a professional offer for external partners. One good practice was developing industrial and investor contact databases and participating in industry fairs to attract potential licensees. The Medical University of Gdańsk indicated that contact databases, participation in international fairs (e.g., MEDICA), and technology presentations to venture capital funds are effective tools. Interview analysis confirmed that the most effective commercialization forms are licensing agreements and the creation of spin-off companies. Respondents emphasized that licensing is particularly effective when the technology is well defined and can be implemented quickly by a company. Spin-offs are preferred when the technology requires further development and investment funding. The Medical University of Gdańsk stated that the most effective solutions are licensing agreements and spin-offs involving the inventors. Respondents also noted the growing importance of joint development agreements with foreign venture building entities. One example of a successful practice was a spin-off based on a diagnostic technology. It obtained seed funding and started clinical trials as well as the hospital exemption process.

Respondents also indicated that commercialization requires flexibility and adjustment to the specific nature of the technology. At the University of Wrocław, it was emphasized that fully standardized procedures do not exist. The center uses common elements such as market analysis, freedom-to-operate analysis, and partner identification, but each project is treated individually. In contrast, the Medical University of Gdańsk reported the existence of internal commercialization procedures. These include IP valuation, market analysis, risk assessment, and negotiations of licensing and sales agreements. This result shows that standardization can be effective in units with greater experience and organizational resources. In smaller centers, a flexible model is more common.

The interview analysis showed that the implementation and market development stage is the weakest element of TTC activity in Poland. Respondents stated that support after signing a licensing agreement or selling rights is often limited. Centers mainly focus on reaching the contract stage. Representatives of the Medical University of Gdańsk stated that post-commercialization support is provided only to a limited extent in the case of licenses. In the case of spin-offs, the center does not directly engage in market activities. The University of Warsaw declared readiness to support inventors also after commercialization if needed. This support may include marketing activities and preparation of grant applications related to IP protection and commercialization strategy. At the same time, respondents emphasized that limitations in developing this phase result mainly from a lack of staff resources and the absence of formal tools for monitoring implementation. Therefore, the post-commercialization stage remains an area requiring further development. It may also become an important direction for the professionalization of technology transfer centers.

6. Conclusions

The most frequently identified good practices of Technology Transfer Centers included active technology scouting and direct relationships with researchers, the use of a stage-based approach to technology development (milestones and schedules), obtaining funding for proof-of-concept and prototyping activities (e.g., Inkubator Innowacyjności, Inkubator Rozwoju), as well as the professionalization of intellectual property protection and commercialization processes through negotiation support and legal-business advisory services. Respondents also highlighted the importance of educational and promotional activities, which strengthen the culture of innovation and motivate inventors to report research results with implementation potential.

At the same time, the study revealed significant differences between the analyzed TTCs. These differences resulted from the level of organizational maturity, available human resources, and adopted operational models. Some centers relied on standardized procedures and formal technology assessment tools (e.g., TRL), while others operated in a more flexible way, based on team experience and an individual approach to each technology. Differences were also observed in the organization of IP support, including access to patent attorneys and the level of TTC involvement in the implementation phase and post-commercialization market development after signing commercialization agreements.

The research results confirm that TTCs play a strategic role in the innovation system as intermediary institutions between science and the economy. They reduce the implementation gap and strengthen the ability of universities and research institutes to use research results in practice. The effectiveness of TTCs directly contributes to increased efficiency of knowledge commercialization, the development of academic entrepreneurship, and the building of long-term relationships with the business sector. This is an important element of competitiveness in a knowledge-based economy.

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DETERMINANTS OF RUNNING A SERVICE BUSINESS ON THE POLISH AND CZECH SIDES OF CIESZYN

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Purpose: The purpose of this article is to conduct a comparative analysis of the operations of Fabryka Urody, a service company operating on the Polish and Czech sides of Cieszyn. The analysis covers customer preferences, fashion trends, and formal (legal, tax, etc.) conditions for conducting business activity.

Design/methodology/approach: The article is based on a review of literature and online sources. In addition, as part of the effort to obtain a comprehensive picture of the realities of operating the Fabryka Urody beauty salon in the border towns of Cieszyn and Český Těšín, an in-depth interview was conducted with the manager and co-owner of the company. The time frame of the analyses covers the years 2024-2025.

Findings: Expansion into foreign markets is a major challenge for small companies operating in the beauty industry. It carries many potential risks, but also opportunities for business development. The key to success is knowledge of purchaser behaviour and preferences.

Research limitations/implications: There is no doubt that in the future it will be beneficial to conduct representative empirical research among several hundred respondents – Polish and Czech customers of beauty salons – in order to thoroughly diagnose the similarities and differences in their market behaviour. The content of this article may be helpful in the development of the methodology for such research, including the content of the survey questionnaire.

Practical implications: Effective management of a service company's strategy and market offer is of great importance in competing for customers' financial resources. In border regions, limited development opportunities for companies in their home country raise questions about the chances of expanding into external markets. For many companies including the Fabryka Urody beauty salon in Cieszyn, entering the additional market in Český Těšín proved to be a very good solution. The case study described here can be used by other entrepreneurs, especially those operating in the fields of trade, services, hospitality and catering that intend to diversify their business activities.

Originality/value: The results have cognitive value. The article describes the expansion strategy of a Polish beauty company into the Czech market.

Keywords: Consumer behaviour, entrepreneurship, service company, beauty salon, border towns.

Category of the paper: General review.

1. Introduction

Any expansion into foreign markets requires a thorough knowledge of those markets. In such a situation, it is important for manufacturers and sellers – from the point of view of designing effective marketing strategies – to know the behaviour of purchasers and their purchasing preferences. The desire to enter a foreign market determines the development of many companies, as it allows them to diversify the risk of business failure and to acquire new sources of revenue.

Understanding customer expectations is important from the point of view of designing a new company offer. In this context, it is particularly important to obtain information and opinions about consumer perceptions, satisfaction and how they perceive the services offered. It should also be remembered that the effective commercialisation of a company's offer depends largely on the degree of difference between new innovative services and existing ones. If the degree of difference is significant, then the new product/service has a much better chance of gaining a positive and distinctive image in the minds of end consumers, which may positively influence their purchasing behaviour by effectively distinguishing it from other available offers (Barska, 2017). Moreover, the modern world of business and marketing is undergoing dynamic changes driven by technological development, the growing importance of artificial intelligence and rapidly changing customer preferences.

The purpose of this article is to conduct a comparative analysis of the functioning of a selected service company on the Polish and Czech sides of Cieszyn. The analysis covers customer preferences, fashion trends, and formal (legal, tax, etc.) conditions for conducting business activity. Fabryka Urody, a company operating in the border towns of Cieszyn and Český Těšín, was selected for the analysis.

2. Consumer behaviour in border regions

Consumer behaviour is influenced by many factors. Identifying these factors and determining the directions and methods of their influence allows for the design of effective marketing strategies. The literature points to three broad groups of factors influencing the choice of products and services by purchasers:

- product-related factors, referring to its physical and chemical properties, sensory characteristics (taste, smell, appearance, texture), functional characteristics (packaging, availability, convenience) or nutritional value,

- consumer-related factors, which include personal characteristics (age, gender, education), psychological factors (personality, experience, moods), and physiological factors (health, level of food satisfaction),
- related to the consumer's environment, including economic factors (price, income), cultural factors (beliefs and convictions), social factors (social role and status, opinion leaders, reference groups) (Barska, 2013).

A. Małysa-Kaleta (Małysa-Kaleta, 2010) writes more extensively about the many turbulent conditions of consumption and consumer behaviour in the context of globalisation and integration processes. The author provides a range of statistical data and compares the dynamics and structure of consumption in Poland and the Czech Republic. In turn, the issue of choosing places to purchase main groups of consumer goods and services is described by G. Maciejewski (Maciejewski, 2016). The results of his research indicate changes in consumer preferences regarding the choice of place of purchase. Most purchasers go to discount stores primarily for food and cleaning products. Elective goods, such as homeware, clothing and footwear, are mainly purchased in specialist shops, although the Internet is playing an increasingly important role in the case of these product groups. Shopping centres are an important retail format, as consumers are attracted to them by the convenience and atmosphere of shopping and the product range breadth.

Starting from the period of dynamic political changes in Poland at the turn of the 1980s and 1990s, retail trade in border towns underwent significant changes. Initially, these changes concerned the development of local municipal markets, and then new formats of large-area stores (Kłosowski, 2001; Kulczyńska, Matykowski, 2008). This applies in particular to discount stores and supermarkets, and in larger cities such as Świnoujście and Zgorzelec, also to modern shopping centres. Shopping centres from the 1990s attest to the political transformation and the first steps towards Western shopping culture. Currently, however, many of them must undergo thorough upgrades and renovation to meet the growing competition from modern shopping malls and online commerce.

An interesting classification of decision-making styles among Czech customers is presented in the scientific article 'Czech consumers' behaviour toward domestic brands' (Chovancová, Wanninayake, 2014). The results of the research showed that the following factors primarily influenced the decision to purchase a Czech brand: fashion, entertainment values, impulse buying and price. The results of this research are useful for determining purchaser behaviour patterns and market segmentation.

A highly original research topic is the purchasing and consumption behaviour of local communities in divided border towns such as Zgorzelec, Gubin and Cieszyn. K. Kulczyńska has devoted her analyses to this issue (Kulczyńska, 2010, 2019). The author described a number of factors determining the spatial behaviour of cross-border consumers in what are known as divided cities, including political, legal, administrative, infrastructural, economic, demographic and cultural factors. The phenomenon of cities divided by national borders has also been

described by other researchers (Zenderowski, Brzezińska, 2014). These authors have highlighted the interdisciplinary nature of the phenomenon under study in terms of political science, sociology, economics and anthropology. They have presented the origins and typology of divided cities in Central and Eastern Europe, as well as the constraints that often hinder the process of reintegration of these cities in formal, legal, cultural, economic, social and infrastructural terms. Examples relating to twin cities in the Baltic region, such as Tornio - Haparanda (Finland - Sweden), Valga - Valka (Estonia - Latvia), Narva-Ivangorod (Estonia-Russia) and Imatra-Svetogorsk (Finland-Russia), can be found in other scientific publications (Anischenko, Sergunin, 2012). One study lists as many as 26 such pairs of twin cities (Zenderowski, Brzezińska, 2014). Another original study is a comparative analysis of cities on the Mexican-American border (Baruca, Zolfagharian, 2013) and the Polish-Ukrainian border (Brańka, 2010). It should be added that among many other publications on the functioning of Cieszyn as a city on the Polish-Czech border in the context of cross-border mobility of residents, the following scientific articles are also noteworthy (Dołzbłasz, 2013, 2015). Ł. Wróblewski (Wróblewski, 2020) described the example of the divided city of Cieszyn as a cross-border market for cultural services. The author not only diagnosed the behaviour of customers of cultural institutions (such as theatres, cinemas, museums, galleries, libraries), but also characterised the marketing instruments used to create the expected behaviour of purchasers on the Polish-Czech cultural services market. Another monograph lists a number of interregional partnership projects aimed at the internal integration of the Cieszyn Silesia Euroregion (Kasperek, 2014). To sum up, the functioning of border towns, including what are known as divided towns, is a very inspiring area of scientific research.

It is also important to emphasise the need to equalise development opportunities in the peripheral areas of the Czech-Polish borderland (Vaishar et al., 2013). Cross-border partnership within the development of the Cieszyn Silesia Euroregion should cover many areas of social and economic life, including transport, security and crisis management (Gabryšová, Ciechomski, 2019). An important element of this partnership is also economic partnership in the areas of trade (Gabryšová, Ciechomski, 2024) and tourism (Gabryšová, Ciechomski, 2025).

3. Basic conditions for conducting business activity in the European Union

Expansion into the market of another country, including a member state of the European Union, requires knowledge of the legal regulations in force in that country. The Republic of Poland and the Czech Republic have been members of the European Union since 1 May 2004, when they officially joined the community along with 8 other countries (Cyprus, Estonia, Lithuania, Latvia, Malta, Slovakia, Slovenia and Hungary) as part of the largest enlargement of the Union in history. This historic event united the continent after the Cold War, increasing the

number of EU members to 25 and significantly influencing economic growth and trade in Europe. Doing business in the EU provides a single market, free movement of goods and services, and is subject to regulations common to all EU countries, as well as certain national regulations. Every EU citizen has the right to set up a company (or do business as a natural person) in any EU country (or in Iceland, Norway and Liechtenstein) and to establish a branch or subsidiary of an existing company based in an EU country. The requirements for this vary from country to country. However, the EU encourages all countries to adopt liberal regulations that facilitate the establishment of new companies. Identical contact points have been set up in each EU country to simplify procedures such as registration and obtaining the necessary authorisations or licences.

Most companies operating in the EU must register for value added tax (VAT). An entrepreneur must register when the company's turnover exceeds a certain threshold. The tax threshold depends on the type of activity, especially in the case of cross-border sales or the provision of digital services. Once registered, every entrepreneur has an obligation to charge VAT, submit tax returns and keep proper business records. Companies have an obligation to prepare annual financial statements. Depending on the number of employees, balance sheet and annual turnover, companies may potentially benefit from simplified or exceptionally lenient reporting requirements.

If a company plans to hire employees, it must comply with EU and national rules on employment contracts, working conditions and social security. Employers are generally responsible for registering employees, providing a safe working environment and complying with minimum labour standards. A company that employs workers in another EU country must register as an employer with the local authorities and comply with labour law, including paying social security contributions and taxes. When hiring employees, it is important to be aware of EU rules on social security contributions. An employee can only be subject to the social security rules of one country at a time, usually the country where they work, whether they are an employee or self-employed. If a company employs workers in another EU country, it must register as an employer with the local authorities. This ensures compliance with local labour laws, including those relating to social security contributions and taxes. In this context, it is important to note that each country has its own registration procedures and employers must contact the relevant authorities (often social security institutions or tax offices) to register as employers. Once registered, employers are often given an identification number, which they use to file tax returns and social security declarations. Once registered as an employer, you are required to register your employees in the country where they are to work to ensure that they are covered by social security in the local system.

Employees working in an EU country are usually subject to that country's social security regulations, and employers are responsible for deducting and paying both the employer's and employee's contributions. Each country may have different rates and requirements for contributions, which include:

- health insurance,
- pension contributions,
- unemployment insurance,
- other social benefits (e.g. parental leave, disability insurance).

Under EU law, a person can only be insured under the social security system of one country at a time, even if they work abroad. The choice of country is usually determined by the nature and place of the employee's work. As an employer in the EU, a businessperson must provide their employees with adequate social security, such as healthcare and pension rights. Each EU country has its own social security rules, but EU rules coordinate national systems to ensure that people who move to another country do not lose their social security and always know which national rules apply to them. Every employer must register with the social security institution in the country where their employees work and pay contributions, even if the company does not have a registered office there. This entitles them to participate in the local social security system. The company must also register its employees with the social security institution in the country where they work. This ensures that they are covered by the local social security system. In the EU, the general rule is that only the legislation of one country applies.

Employees can only be subject to the social security rules of one EU country at a time. The obligations and rights under these rules are the same for all employees in a given country, no matter if they are local or foreign. The country where an employee works or is self-employed is usually the country where they pay social security contributions. This applies regardless of the employee's place of residence and the company's registered office. If employees or self-employed persons live in an EU country other than the one where they work or are insured, they can receive healthcare services in their country of residence while still being covered by the social security system of the country where they work.

Although each EU country is responsible for managing its own pension system, EU rules ensure coordination between them when there is a cross-border element to an employee's situation. Every employer must register their employees with the social security system of the country where they work. If an employee moves to work in another EU country, they must be registered with the national social security system and pay contributions in accordance with local regulations. Upon retirement, each country where the employee has been employed determines their pension entitlements based on their periods of insurance. Retired employees then receive separate payments from each country. It is the responsibility of every company operating in the EU to ensure that employees are covered by the system of only one country and to coordinate with the relevant authorities to avoid gaps in the system.

4. The Czech Republic as an economically attractive country for Polish investors

For years, the Czech Republic has been one of the most attractive countries in Europe for Polish entrepreneurs looking for a stable, transparent and friendly environment in which to do business (<https://mojafirma.infor.pl/biznes-finanse>). Currently, this interest shows no sign of waning. More and more entrepreneurs consider moving their business across the southern border in order to gain more favourable conditions for work and company development. The Czech Republic still offers what the Polish tax system cannot provide: simplicity and predictability of the rules, lower taxes and more favourable settlement rules (Table 1).

The Czech tax system is simpler, more transparent and much less oppressive towards entrepreneurs than its Polish counterpart. The basic corporate income tax (CIT) rate in the Czech Republic in 2025 is 19%, but the actual burden on companies is often lower thanks to the possibility of deductions. Lump-sum settlement forms are available for sole traders, which allow them to run their business without accounting bureaucracy. Entrepreneurs pay a fixed amount of tax and contributions and do not have to submit complicated tax returns or worry about formal errors.

The transparency and simplicity of the tax system in the Czech Republic means that more and more Polish investors and entrepreneurs considering relocating their businesses are choosing this country. The tax system there is more stable, transparent and definitely less oppressive. The Czech tax office treats entrepreneurs as partners. The approach of officials is cooperative and factual – their goal is to explain, not to punish. In the practical terms, this means that when running a company in the Czech Republic, entrepreneurs gain a sense of security. Registering a company in the Czech Republic usually takes a few days, and most of the formalities can be completed remotely. There are no complicated reporting systems or endless inspections. Many activities can be performed online, and communication with offices is logical and user-friendly. In the Czech Republic, entrepreneurs know that when conducting planning for a financial strategy over a period of 5-10 years, they do not risk a sudden, unannounced reform that would upset the existing stability (<https://mojafirma.infor.pl>). This sense of stability allows them to build their companies with a long-term vision – to invest, grow and hire employees without fear that the rules may change tomorrow.

Table 1.*Comparison of the tax system in the Czech Republic and Poland*

Tax system in the Czech Republic	Tax system in Poland
The Czech tax system is based on several key elements, such as personal income tax, value added tax (VAT) and business tax. In 2025, the Czech authorities updated the income threshold that determines the application of a higher tax rate. The new regulations stipulate that 36 times the average monthly wage (instead of 48 times as before) is subject to a 23% rate, which amounts to approximately CZK 1.67 million. Below this amount, the personal income tax rate is 15%. In the case of VAT, the Czech system mainly provides for a standard rate of 21%. A reduced rate of 12% applies to certain goods and services, and some goods are subject to a zero rate. Czech residents pay tax on their total worldwide income, while non-residents pay tax only on income earned in the Czech Republic. The Czech VAT system, although similar to the Polish one, differs in several aspects. The Czech government applies a basic VAT rate of 21% to most goods and services. A reduced rate of 12% applies to hotel, catering, water and sewage services, heating, passenger transport, gluten-free products, press publications, medicines and tickets for cultural events. Books are subject to a 0% rate, which was previously 10%. From the beginning of 2025, the Czech authorities raised the limit for mandatory VAT registration from CZK 2,000,000 to CZK 2,536,500.	In Poland, individuals benefit from a tax-free amount, which in 2025 amounts to PLN 30,000 per year. The Personal Income Tax Act (PIT) sets two tax thresholds. Income up to PLN 120,000 is taxed at a rate of 12%, and income above this threshold is taxed at a rate of 32%. Entrepreneurs who have opted for flat-rate tax pay 19% tax. Non-residents pay 20%. Awards are taxed at 10%, and undisclosed income at as much as 75%. In order to qualify for flat-rate tax, an entrepreneur must submit an appropriate statement before the start of the tax year. Every natural person, legal entity or organisational unit conducting business activity becomes a VAT taxpayer. Poland also classifies what are known as 'small VAT taxpayers'. To obtain this status in the following year, an entrepreneur must achieve a VAT turnover not exceeding the equivalent of EUR 2,000,000 (or EUR 45,000 for brokerage entities, investment funds, etc., excluding commission transactions). In 2025, the basic VAT rate in Poland is 23%. A reduced rate of 8% applies, for example, to residential buildings up to 150 square metres, as well as cultural, sports, recreational and catering services. The 5% rate covers certain food products, such as meat, dairy products, books and data carriers. In some cases, such as rescue vessels or sea boats, a 0% rate applies.

Source: Own study based on <https://czechybiznes.expert/informacje>

A company in the Czech Republic operating as a sole proprietorship is an activity conducted under one's own name in order to make a profit as an objective. A person wishing to run a business must obtain a licence issued by the relevant office and have an entry in the business register, which distinguishes between three categories: unregulated, regulated (crafts and liberal professions) and licensed (www.firmawczechach.pl).

It should also be mentioned at this place that the current climate for the development of economic relations between Poland and the Czech Republic is favourable. Various institutions and government and local government bodies are actively involved in intensifying mutual relations on mutually beneficial terms. Korenik and Mempel-Śnieżyk (2012) write in more detail about the areas and goals of Polish-Czech partnership. These authors highlight the competences of institutions whose statutory tasks include supporting international trade partnership. These include: the Ministry of Industry and Trade of the Czech Republic, the Investment and Development Agency, the Polish Business Club in the Czech Republic, the Department of Trade and Investment Promotion of the Czech Republic, the Export Promotion Agency, the Czech Chamber of Commerce and Industry, and the Economic Chamber of the Czech Republic. The paper also describes examples of economic and infrastructure projects implemented at the national and local levels.

5. International activities of Fabryka Urody

The accession of Poland and the Czech Republic to the EU has created new opportunities and prospects for cross-border partnership and business activities in the Cieszyn Silesia Euroregion. When assessing the situation and prospects for cross-border partnership in the Czech-Polish border region, historical ties, relatively low language barriers in communication, and cultural similarities play an unquestionable role. Many Polish companies have been established in the border areas of the Czech Republic, and many Czech companies have been established in Poland. Polish Cieszyn and Český Těšín are exceptionally convenient places for doing business on both sides of the border. One such company is Fabryka Urody, which operates across the border. In order to obtain reliable data, an in-depth interview was conducted on 3 November 2025 with the manager and co-owner of the beauty salon, Mr Artur Dziadek. The questions asked during the interview were sent in advance by email. The interview provided answers to 8 questions concerning the company's activities and the behaviour of Polish and Czech customers.

1. How long has your company been in business?

The respondent replied that the company's beginnings can be traced back 40 years, when his mother opened a hairdressing salon in her family home in the Polish town of Cieszyn (where she lived). The salon is still operating in Poland today, but is now run by Artur's son. Over the years, the company has gained excellent reputation and acquired many regular customers.

2. What was the main idea (motivation) behind opening a second branch on the Czech side of the border?

The decision to set up a company on the Czech side was completely accidental. As a young and caring father living in the Polish town of Cieszyn, the interviewee often took walks with a pram through the streets of Český Těšín. During one such walk, he noticed an offer for rent in a very attractive place. The location is Střelniční Street, leading from the railway station in Český Těšín to the Polish border. The location is ideal, as it is one of the busiest streets in Český Těšín. The building belongs to a housing cooperative, and the financial offer for the lease proved to be acceptable. The second part of the company was established and quickly established itself on the Czech service market.



Figure 1. The front part of the company's building in Český Těšín.

Source: Own photography.

3. What services does the company offer?

The family-owned part of the company operating on the Polish side of the border offers only hairdressing services. The company operating in Český Těšín also offers all hairdressing services, except for permanent wave. The range of services here is extended to include manicure and cosmetology services. The most frequently performed cosmetic treatments are reflexology and body treatments.

4. How many employees does the company have and in what do they specialise?

On the Polish side of the border, there is a typical family business consisting of: the interviewee, Artur responsible for women's haircuts and colouring, and his mother, who performs less popular services such as permanent wave and hairstyles that are less fashionable but more popular with older women. The third employee is the interviewee's brother, who specialises in hairdressing services for men. Joining the family team are two apprentices, who receive training in the company, and one employee on a permanent employment contract. On the Czech side of the border, cosmetic treatments are performed by two employees, including the interviewee's wife and an employee responsible for manicure. Hairdressing services are provided by 5 employees, and the interviewee's brother works 2 days a week.

5. In which facility do you notice more interest in beauty care?

Interest in beauty care can only be compared in the field of hairdressing, as the Polish part of the company does not offer classic beauty services. According to the company manager, interest in beautiful hairstyles is high on both sides of the border. Polish and Czech women want to look good and take care of their hairstyles. They expect the highest level of service, no matter whether they live on the Czech or Polish side. An interesting fact is that Polish women seem to be more busy, usually in a hurry and want the services to be performed quickly. Czech women come to the salon with a book, newspaper or iPhone and do not rush the employees.

6. What service is the most popular?

Hairdressing and beauty treatments are, in a sense, seasonal services: they are most popular in the summer, before holidays and before Christmas. Both parts of Cieszyn are small towns, so business is fairly stable during the rest of the year.

7. I suppose that a majority of your customers are women. Are there any male customers?

Is there a difference in interest between men in Poland and the Czech Republic?

Sometimes men come for a facial massage. There are not many of them, but sometimes men also use such services. There is a noticeable tendency among men to come to the salon at times when there are no female customers.

8. What differences do you see in doing business in Poland and the Czech Republic (contact with authorities, taxes, insurance contributions, business climate, OHS regulations, other issues)?

OHS regulations are similar, but the attitude of employees is different. Czech regulations and Czech officials are more demanding and more meticulous. In the Czech Republic every change, even in the arrangement of furniture, must be reported.

The company, which operates in Poland, benefits from privileged conditions, as it is located in a family home and therefore does not have to pay rent. It has large rooms at its disposal, in which there are 6 workstations and hair washing stations. Thanks to these convenient conditions, the company does not have to use shift work. In the Czech part of the company, half of the premises are used for beauty services. There are only 3 hairdressing stations plus one for washing hair. To meet the needs of its customers, the company needs shift work.

In the past, it was cheaper to provide hairdressing and beauty services in the Czech Republic due to lower taxes. At that time, many Polish companies moved their operations to the Czech Republic. Currently, tax conditions and labour costs are no longer so different. Below we provide a comparison of the current rates in Poland and the Czech Republic.

1. Tax and employee expenses of a hairdressing company operating in Poland

(data on tax and employee expenses obtained from the Tax Office in Cieszyn).

Tax expenses depend on the amount of income.

Tax rate 12% up to PLN 120,000 of income 32% above PLN 120,000 of income.

The second option is a flat rate of 8.5% of revenue (without the possibility of deducting tax deductible costs).

The flat-rate tax is 19% on income.

In addition, there are what are known as employee expenses, i.e. expenses incurred by the employer when hiring an employee. Apart from gross remuneration, these include:

- health insurance contribution 9% of remuneration,
- pension contribution 9.76% of remuneration,
- disability contribution 6.5% of remuneration,
- labour fund 2.45% of remuneration,
- accident contribution 0.67-3.33% of remuneration, depending on the industry.

2. Tax and employee expenses of a hairdressing and beauty salon operating in the Czech Republic

(data on a company operating in the Czech Republic obtained from the Finanční úřad Třinec).

Hairdressing and beauty services are classified as craft activities in the Czech Republic. Income from such activities is treated as self-employment income for tax purposes. One can either settle actual expenses or opt for lump-sum taxation. In the case of crafts, the flat-rate tax covers 80% of the income earned, but up to a maximum of CZK 1.6 million per year. In the practical terms, this means that if, for example, a company earns an annual income of CZK 600,000 from crafts, it can deduct a flat rate of 80%, i.e. CZK 480,000, as costs and pay 15% tax only on the remaining CZK 120,000, regardless of how much the company actually spent on materials, rent or energy. The lump sum is therefore profitable for most small craftsmen who do not incur very high actual costs of running a business. The employer also incurs the following employee-related costs:

- gross employee remuneration + 24.8% contribution, of which:
- sickness benefit is 2.1%,
- pension contribution is 21.5%,
- state employment policy is 1.2%.

In summary, conducting business in another country is justified if the company can offer its customers a more interesting range of services and high quality. These premises constitute the business motives behind the beauty salon described. It can be concluded that the decision to establish Fabryka Urody in the Czech Republic was the right one; it met customer expectations and has allowed the company to gradually build a good image.

6. Conclusions

The Czech Republic is a country located in the heart of Europe, with excellent transport and logistics infrastructure. For Polish companies, especially those from the southern part of the country, doing business in the Czech Republic is convenient and offers an opportunity for further development. The proximity of the border allows for quick travel and supervision of the company's foreign branch. In addition, the Czech tax system is transparent and stable. The Czech Republic is a country with one of the most stable economies in the region, with a currency (the Czech koruna) that remains strong. Inflation (around 2%) is lower than in Poland, and public debt is one of the lowest in the European Union.

The economic climate is conducive to investment and business development. Companies can engage in planning, and the stability of the currency protects against exchange rate risk, especially when it comes to international partnership. A perfect example of this is the beauty

salon 'Fabryka Urody' (Beauty Factory), which operates in the towns of Cieszyn and Český Těšín. Entering the Czech market with an offer proved to be a very good idea. Both hairdressing and beauty services were met with great interest from Czech customers. This was possible due to the recognition of purchasers' needs and the adaptation of the offer to their expectations and preferences. These efforts are reflected in the company's strong financial results and its ever-improving image.

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THE ROLE OF ERGONOMICS AND DRIVER SAFETY IN ENHANCING COMPETITIVENESS IN THE TRANSPORT SECTOR

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Purpose: The purpose of this conceptual paper is to analyse how ergonomics and driver safety contribute to the competitiveness of the transport sector by improving work efficiency, reducing operational risks and strengthening the employer's market position.

Design/methodology/approach: The article adopts a conceptual research approach based on a structured review of scientific literature and selected industry reports (e.g. EU-OSHA, Deloitte). The study does not include original empirical research but develops a conceptual framework explaining the relationships between ergonomic working conditions, driver safety and competitiveness indicators in road transport companies.

Findings: The analysis indicates that ergonomically designed driver workplaces and safety-oriented management practices contribute to lower accident rates, reduced sickness absence, improved service quality and higher employee retention. These factors strengthen operational efficiency and support competitive advantage in the transport sector.

Research limitations/implications: As a conceptual study based on secondary sources, the paper does not provide quantitative empirical verification. Future studies should include empirical research among transport companies to measure the economic and operational effects of ergonomic interventions.

Practical implications: Transport companies may strengthen their competitive position by investing in ergonomic cab design, modern driver-assistance technologies and safety management culture.

Social implications: Improved safety standards contribute to the protection of workers' health, reduce accident risks for other road users and support sustainable development goals related to decent working conditions.

Originality/value: The article conceptualises ergonomics and driver safety as **strategic determinants of competitiveness**, rather than merely operational costs.

Keywords: ergonomics; driver safety; competitiveness; transport sector; occupational safety; human factor in transport.

Category of the paper: Conceptual paper / Literature review.

1. Introduction

Driver work represents one of the most physically and mentally demanding occupations within the transport industry. Drivers spend extensive hours in confined vehicle cabins, often under harsh weather conditions and continuous time pressure. Such conditions require constant concentration, precise motor coordination and high physical endurance, resulting in cumulative strain that significantly impacts drivers' health, well-being and overall road safety. Consequently, ergonomics and occupational safety have become central topics in contemporary research on improving working conditions in road transport.

Ergonomics in driving concerns a comprehensive set of factors: the design of the driver's workplace, optimal arrangement of vehicle controls, visibility, seating comfort, as well as environmental influences such as noise, vibrations, microclimate and lighting. Safety measures, in turn, include preventive strategies, implementation of driver-assistance technologies, adequate training, and systems aimed at reducing the likelihood and severity of accidents (Szulc, 2022). A holistic approach to ergonomics and safety therefore ensures not only physical protection, but also supports cognitive efficiency and stress reduction.

Technological advancement is profoundly transforming road transport and driver support systems. Telematics and GPS-based fleet management allow real-time monitoring of vehicle performance, improving logistics efficiency and safety management. Advanced Driver Assistance Systems (ADAS), such as blind-spot detection, adaptive cruise control, lane-keeping support and autonomous emergency braking enhance comfort, reduce error-related incidents and contribute to road risk mitigation. Furthermore, mobile platforms used for communication, navigation and load planning optimize workflows, reduce operational costs and improve delivery accuracy. These innovations strengthen the driver's position within an increasingly digitalized transport environment.

Beyond their operational importance, ergonomics and safety emerge as strategic determinants of competitiveness in the transport sector. Companies that invest in safe and ergonomic working environments experience lower absenteeism, reduced turnover of professional drivers and enhanced service reliability. The growing shortage of qualified drivers in Europe intensifies the need for transportation enterprises to build a positive employer brand based on well-being and safety culture. As customers increasingly expect punctuality and risk-free logistics, safety performance becomes a relevant criterion in the selection of carriers. Thus, ergonomically optimized workstations and robust safety standards contribute directly to quality of service, cost optimization and business sustainability.

Table 1.*Conceptual relationship between ergonomics, driver safety and competitiveness*

Area	Key factors	Impact on transport companies
Ergonomics	Seat design, control layout, vibration reduction, cab lighting	Reduced fatigue, improved driver performance
Driver safety	ADAS systems, fatigue detection, driver training	Reduced accident risk and operational interruptions
Organizational effects	Lower absenteeism, driver retention, employer branding	Increased operational efficiency
Market outcomes	Reliability of deliveries, service quality	Improved competitiveness

Source: own study.

This article investigates key aspects of ergonomics and driver safety, presenting current developments and technological solutions that support drivers in road transport. It emphasizes their role as crucial elements shaping operational efficiency and long-term competitiveness of transport companies.

2. Ergonomics of the driver's work

Ergonomics, as defined by the International Ergonomic Society, is the science that studies the interaction between humans and other system components, and the practice of using theory, principles and data to design for improved system efficiency and human well-being (Szule, 2022). The Polish Ergonomic Society, in turn, defines ergonomics as a discipline that strives to optimally adapt tools, machines, equipment, technology, and the organization of work and the environment to the physiological, psychological and social needs of humans (Adamski, 2021). Adherence to ergonomic principles is crucial in many occupations, including the work of a commercial driver. Prolonged driving in one position, in an uncomfortable seat, on uneven roads and in poor-quality vehicles often leads to various ailments, such as sciatica. Based on the recommendations of the International Labor Organization, guidelines for driver's cab ergonomics have been created, which include (Kowalski, 2020):

- proper positioning and adjustment of the seat, steering wheel and pedals,
- good visibility of the dashboard and the markings on it,
- adapting the workstation to the driver's posture,
- providing adequate training, especially when introducing new bus models.

The driver of a motor vehicle, especially in the long-distance transportation sector, spends most of his time in a sitting position, which carries numerous health risks. Therefore, one of the key elements of driver ergonomics is the proper design of the workplace, which takes into account the physiological needs of the user. The driver's seat should be tailored to the individual needs of each driver, with adjustable height, backrest angle and armrest position. Adequate spinal support and lumbar relief are key to preventing chronic back pain, which is one of the most common health problems among drivers (Kowalski, 2020).

It is important that the steering wheel does not obscure the driver's indicators and displays located on the dashboard. The driver's seat significantly affects the driving comfort. The bus driver, when sitting behind the wheel, should be able to adopt a posture that is comfortable for him. The correct posture in the driver's seat is a back that is flat against the backrest, buttocks pumped into the recess in the seat and thighs which should be in contact with the seat. A professional driver's seat should provide both tall and short drivers with a comfortable position behind the wheel, be equipped with the ability to adjust vertically (100 mm) and horizontally (at least 150 mm), be equipped with lumbar supports that allow for adjustments to the thickness and height of the driver have a damping and cushioning system, and be able to be set at different angles, both backrest and seat, not cause back muscle tension and be made of upholstery that is not slippery and soft (Starkowski et al., 2007). Prolonged sitting, particularly in inadequately adjusted chairs, can lead to a number of conditions, including the so-called "chronic back pain syndrome". Studies have shown that improper sitting positions increase the risk of developing back problems, such as discopathies and circulation problems in the lower extremities (Siedlecka, 2006). To counteract these phenomena, vehicle manufacturers are introducing modern ergonomic solutions, such as hardness-adjustable seats that allow the seat to be adjusted to the individual's needs.

Another important element affecting driver comfort and safety is the optimal placement of pedals, steering wheel and information displays. The steering wheel should be horizontally and vertically adjustable so that each driver can find the most comfortable working position. Pedals, on the other hand, should be positioned in such a way that the driver's legs can work in a natural rhythm, which reduces fatigue and the risk of injury (Bartuzi, 2012). Displays should be easy to read and intuitive to use. Modern HUD (Head-Up Display) systems, which display key information on the windshield, significantly improve driver safety, as they minimize the need for drivers to take their eyes off the road (Zajac, 2023). Another important thing is to match the steering wheel to the position of the arms. After adopting the proper posture in the driver's seat, the bus driver should be able to, after fully stretch his arms to place his wrists at twelve o'clock. This allows the hands to be gently bent at the elbows when performing a turning maneuver. Requirements concerning the steering wheel and dashboard are as follow (Starkowski et al., 2007):

- wheel diameter not exceeding 500 mm,
- steering wheel adjustable along the axis of the column (height adjustment) and additionally equipped with independent angle adjustment,
- dashboard made of soft and flexible material to minimize injuries to the body that could, arise during an accident,
- all indicators clearly visible from the driver's seated position,
- arrangement of indicators depending on the function frequency of their use,

- indicators and their descriptions legible and clearly visible from the driver's seated position,
- indicators easy to operate, not requiring the use of considerable force at startup.

When taking a seat behind the wheel, you should also pay attention to the distance of your legs from the brake, accelerator and clutch (depending on the type of transmission). If you need to brake suddenly, your legs should be bent, allowing you to leave room to press down on the brake pedal and make the most of it. In the event of a traffic accident, the upright lower limbs, specifically the knee and hip joints, can be damaged.

Lighting in the driver's compartment is a key component of work ergonomics, affecting both comfort and safety. Properly designed lighting aims to provide the driver with optimal viewing conditions, especially when driving at night or in difficult weather conditions. Good lighting inside the cab allows the driver to easily and quickly find key controls, such as buttons, displays and switches, without having to take his eyes off the road.

Too much or poorly placed lighting can cause glare that distracts the driver, leading to faster eye fatigue and general discomfort. Modern ergonomic solutions for cabin lighting take into account adjustable light levels and the use of special technologies such as ambient lighting, which minimizes glare while providing clear visibility inside the vehicle. Adequate lighting of the dashboard is also an important aspect, and it must be legible but not dazzling, which promotes driver concentration (Kowalski, 2020).

Taking care of the quality of lighting in the cabin is therefore important not only for comfort, but also for reducing visual fatigue, which directly affects driving safety.

The vibrations to which drivers are exposed pose a significant threat to health and comfort, especially for those who drive trucks and buses over long distances. Prolonged exposure to vibrations, which are generated by the engine, road irregularities and other mechanical factors, can lead to a number of health problems, including musculoskeletal ailments, fatigue and conditions related to blood circulation.

The most commonly observed effects of vibration are back pain, especially in the lumbar region, which results from prolonged strain on muscles and joints. Vibration can also lead to damage to intervertebral discs, which over time increases the risk of chronic health problems such as sciatica and osteoarthritis (Nowak, 2021). In addition, prolonged exposure to vibration can affect a driver's ability to concentrate, which directly reduces safety on the road.

Driver ergonomics play a key role in ensuring driver health, comfort and efficiency. Proper workplace design, including adjustable seats, optimally positioned pedals, steering wheel and displays, is essential to reduce the physical strain of prolonged driving. Proper posture, minimization of vibration, and the use of technologies that improve visibility and comfort, such as ambient lighting, all contribute to reducing fatigue, thereby improving road safety.

Improving ergonomic working conditions is not only a matter of occupational health but also an important economic factor. Drivers who operate in comfortable and well-designed cabins experience lower levels of fatigue and higher work efficiency. For transport companies this translates into fewer errors, reduced absenteeism and improved service reliability. Consequently, ergonomic workplace design becomes an important factor supporting competitiveness in the transport sector.

3. Elements of driver safety

Driver safety is a key issue from both individual and organizational perspectives. Due to the nature of their profession, drivers are exposed to numerous risks related to working conditions, physical and mental strain, and external factors such as weather conditions, road infrastructure and time pressure. These hazards can be divided into three main categories.

1. Physical hazards

- fatigue and prolonged sitting: Long hours behind the wheel lead to fatigue, which significantly increases the risk of accidents. Driver fatigue is associated with insufficient sleep, monotony of driving and time pressure. Studies indicate that fatigue may contribute to up to 20% of traffic accidents (Åkerstedt et al., 2000). Prolonged driving, particularly on monotonous highways and without sufficient breaks, reduces concentration and reaction time, increasing the likelihood of errors.
- vibration: Mechanical vibration is another important health risk, especially for drivers of trucks, buses and construction vehicles. Vibrations originate mainly from the engine, suspension system and road irregularities and are transmitted to the driver's body through the seat, floor and steering wheel. Long-term exposure to vibration may lead to musculoskeletal disorders, back pain, joint problems and nervous system disturbances (Griffin, 1990).

2. Mental hazards

- stress and time pressure: Professional drivers often operate under constant time pressure related to delivery deadlines and changing road conditions. Traffic congestion, weather conditions and responsibility for the safety of passengers or cargo increase stress levels. Chronic stress may lead to fatigue, reduced concentration and higher accident risk, as well as health problems such as cardiovascular diseases or mental disorders (Broughton et al., 2007).

- social isolation: Drivers involved in long-distance transportation often spend extended periods away from home and work alone in the vehicle cabin. Irregular working hours and long separations from family may lead to feelings of loneliness and reduced social interaction. Social isolation can negatively affect mental health, job satisfaction and motivation (Johnson et al., 2011).

3. External hazards

- road conditions: Weather conditions, traffic congestion and changing road infrastructure pose constant challenges for drivers. Increasing traffic intensity, particularly in urban areas, contributes to a higher risk of collisions and accidents. Therefore, drivers must remain vigilant and anticipate the behaviour of other road users while following traffic signs and regulations (Evans, 2004).
- safety of transported cargo: Professional drivers are often responsible for transporting valuable goods, which requires proper cargo securing and compliance with weight regulations. Incorrect cargo placement or insufficient securing may pose serious risks both to the driver and other road users (Vilalobos, 2010).

The profession of a driver requires long hours of concentration and involves a high level of responsibility. For this reason, regulations concerning drivers' working time have been introduced in the European Union. According to these rules, the maximum daily driving time is generally limited to 9 hours, and drivers are required to take a break of at least 45 minutes after 4.5 hours of driving. These regulations aim to reduce fatigue-related accidents and improve road safety.

Compliance with working time regulations is essential not only for protecting drivers' health but also for ensuring the safety of all road users. Adequate rest periods improve concentration and reaction time, reducing the risk of accidents and operational disruptions in transport activities.

Driver safety management also has direct economic implications for transport companies. Organizations that invest in preventive safety measures, driver training and modern technologies experience lower accident rates and reduced operational disruptions. This improves delivery reliability and strengthens the company's reputation among logistics partners and clients, thereby supporting long-term competitiveness.

4. The latest technologies to support driver safety as a competitive advantage in the transport sector

With the rapid development of transportation technology, the importance of innovations to improve safety and ergonomics in drivers' work is growing. Today's technological systems and solutions are not only changing the way vehicles are driven, but also affecting the health and

comfort of those working in the transportation industry. Safety is a key issue in the driver's job, and new technologies are making a significant contribution to improving it. Today's vehicles are equipped with a number of assistance systems. The most important systems will be described below.

Blind spot monitoring systems are advanced technologies that improve road safety by eliminating the dangers of a driver's limited field of vision. These systems use sensors, radar or cameras to monitor areas on the sides and rear of the vehicle that are difficult to see from the driver's cabin. When the system detects a vehicle in the blind spot, it alerts the driver with visual, audible or vibrating signals, helping to prevent collisions during lane changes. Studies indicate that these systems significantly reduce the risk of side-impact accidents, improving safety for both drivers and other road users (Davies, 2020).

Adaptive cruise control is an advanced driver assistance system that automatically adjusts a vehicle's speed to match traffic, maintaining a safe distance from the vehicle ahead. The cruise control system's operation is based on sensors, most often radars, which monitor the speed and position of other cars. If the system detects a vehicle traveling slower in the same lane, it automatically reduces speed and, if necessary, applies the brakes. When the road in front of the vehicle is slow, cruise control restores the programmed speed. Studies show that adaptive cruise control not only increases driving comfort, especially on highways, but also reduces the risk of collisions due to insufficient distance between vehicles (Muir, 2019).

The next innovation is the automatic emergency braking system is a key safety-enhancing technology designed to prevent or minimize collisions. The system works by using radar sensors, cameras and lidar to monitor the road ahead. When the system detects the risk of a collision with an obstacle, it first warns the driver visually and audibly. If the driver does not react in time, the brakes are automatically activated, reducing the speed or stopping the vehicle completely. There is no doubt that the use of automatic emergency braking significantly reduces rear-end accidents and effectively protects both drivers and pedestrians (Anderson, Doecke, 2018).

Lane Assist is an advanced driver assistance system that helps keep the vehicle in the designated lane. The system uses cameras that monitor lines on the roadway and reacts when the driver unintentionally approaches the edge of the lane. When it detects a potential lane departure without signaling the maneuver, the system can warn the driver visually, audibly and even gently correct the lane by automatically moving the steering wheel. The system is particularly effective on highways, where the risk of lane departure can lead to dangerous accidents. It should be noted that the lane assistant significantly improves safety. It is a great support for a driver burdened by monotonous driving. It contributes to reducing the number of accidents caused by driver inattention (Bärgman, 2020).

Reversing camera and parking sensors are technologies that assist the driver when maneuvering in tight spaces, increasing safety and comfort. A reversing camera, usually located in the rear of the vehicle, allows the driver to view the area behind the car, minimizing the risk

of collisions with unseen obstacles. Parking sensors, on the other hand, operating on the basis of ultrasound or radar, detect objects in close proximity to the vehicle and warn the driver with audible or visual signals of an approaching obstacle. These systems are particularly useful in crowded urban conditions, where limited visibility and limited parking space can lead to damage to the vehicle or other objects (Smith, 2019).

Head-Up Display is a technology used in modern vehicles that displays key information on the windshield, allowing the driver to keep track of important data without taking their eyes off the road. This system most often shows information such as speed, navigation, road signs or safety system warnings. It allows drivers to react more quickly to changing road conditions, improving safety and driving comfort, reducing the risk of accidents related to lack of attention. A very big advantage of this system is the reduction of the driver's reaction time, which is especially important in emergency situations, such as sudden braking or the appearance of an obstacle (Flannagan, Sivak, 2018).

Mobile apps for drivers are playing an increasingly important role in optimizing the work of professional drivers and in the daily use of vehicles by private individuals. Thanks to apps such as Google Maps, Waze or dedicated fleet solutions, drivers can effectively plan routes, avoid traffic jams, monitor fuel consumption and manage work and rest times in accordance with regulations. These apps also often offer functions for monitoring vehicle health, warning of road hazards, and even support in managing transport orders. Their versatility helps improve driving safety and efficiency, which translates into time and fuel savings, as well as reduced driving stress (Dowling, 2019).

In addition to safety aspects, modern technologies are helping to improve drivers' ergonomics. The following describes innovative solutions that assist drivers in the aspect of improving workplace ergonomics.

The Driver Fatigue Detection System is an advanced technological solution that monitors driver behavior and alerts the driver when it detects signs of fatigue that could lead to an accident. The system uses a variety of methods, such as analyzing steering wheel movements, reaction time, and even monitoring faces and eyes with cameras. When it detects abnormal behavior, such as frequent lane drifting or micro-sleeping, it suggests a rest break to the driver using audible or visual signals. Fatigue detection systems can significantly reduce the risk of accidents caused by drowsiness, especially during prolonged highway driving. They are a great support for drivers and improve their comfort (Schmidt, Heuer, 2019).

Ergonomic control systems and vehicle seating are designed to increase comfort and reduce driver fatigue during prolonged driving. Modern seats offer a wide range of adjustment in many planes, allowing drivers to customize their positions to reduce strain on the spine and muscles. In addition, control systems such as height-adjustable steering wheels, intuitive dashboard button placement and automatic power steering make it easier to operate the vehicle, reducing physical stress and improving ergonomics. Ergonomic solutions in the driver's compartment, as well as a properly designed vehicle interior, can significantly improve the health and

performance of drivers, especially in occupations that require long time behind the wheel (Johnson, Withey, 2020).

Vehicle information and multimedia systems play a key role in enhancing the comfort and safety of drivers and passengers. These advanced systems integrate navigation, communication and entertainment functions, allowing easy access to information about traffic, weather conditions and local points of interest. User interfaces are often designed with intuitiveness in mind, allowing drivers to use system functions without taking their eyes off the road. In addition, many modern systems are compatible with smartphones, making it possible to integrate mobile apps and use social media while driving. Well-designed information systems can increase travel efficiency and reduce driver stress while improving the overall driving experience (Lajunen, Summala, 2021).

The introduction of new technologies into driver work has a significant impact on safety and ergonomics. Assistive systems and innovative ergonomic solutions are helping to reduce accident risks and improve working comfort. As technology continues to evolve, more innovations can be expected to further raise safety and ergonomic standards in the transportation industry. Supporting drivers by investing in modern technology should be a priority for employers and policymakers to ensure a safe and comfortable work environment.

5. Conclusions

Ensuring proper ergonomics and safety for professional drivers is not only a legal and ethical requirement but also a strategic factor influencing competitiveness in the transport sector. With the growing intensity of global transport flows and rising customer expectations regarding timeliness and service reliability, companies are increasingly recognizing that comfortable and safe working conditions directly affect productivity, employee retention and operational performance.

Ergonomic vehicle design, including adjustable seating, optimized control placement and reduced musculoskeletal strain, contributes to improved driver concentration and reduced fatigue. Likewise, advanced technological systems such as adaptive cruise control, blind spot monitoring, lane-keeping assist and automatic emergency braking significantly support the driver by mitigating the risks associated with human error, stress and monotony. Their integration into fleet operations results in fewer accidents, shorter downtime and lower maintenance and insurance costs, all of which reinforce a company's competitive position.

Compliance with regulated working and rest times, a healthy cab environment, and preventive health programs are additional elements helping maintain drivers' physical and mental fitness. In a labour market characterized by a shortage of qualified drivers, organizations

that care for the well-being of their employees become more attractive employers — strengthening employer branding and improving workforce stability.

Future research should focus on empirical verification of the proposed relationships through quantitative studies conducted in transport enterprises, allowing the measurement of the economic impact of ergonomic and safety improvements.

In summary, investment in ergonomics and safety technologies should be perceived as an investment in long-term competitive advantage. Safer and more efficient drivers contribute to higher-quality transport services, reduced operational risk and increased customer trust. Future research should focus on the optimisation of technological implementation, as well as on assessing the direct economic benefits and sustainability impacts that improved driver safety and ergonomics can bring to the transport industry.

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THE ROLE OF INDUSTRY SKILLS CENTRES IN THE DEVELOPMENT OF SECTORAL QUALIFICATIONS IN THE INTEGRATED QUALIFICATIONS REGISTER

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Purpose: The main objective of the article is to identify the importance of Industry Skills Centres (ISC) in the process of shaping and developing sectoral qualifications within the Integrated Qualifications Register (IQR). The specific objectives are: (1) to analyse the mechanisms of integrating ISCs with the IQR and (2) to assess the importance of ISCs for improving the quality of vocational education and adapting competences to the needs of the labour market.

Design/methodology/approach: This article is a review paper. The analysis is based on a review of available materials and documents related to the functioning of ISCs, with particular emphasis on their place in the IQR system. Due to the innovative nature of this solution, the literature on the subject remains limited, and empirical research on the effectiveness of these centres is at an early stage.

Findings: ISCs can serve as institutional hubs that integrate vocational education with the economy by developing and validating sectoral qualifications. The effectiveness of this model depends on the quality of cooperation with industry organisations and the stability of funding.

Research limitations/implications: The available literature on the effectiveness of ISCs is limited, and empirical studies in this area are still in the early stages. This creates vast opportunities for future research projects that could provide deeper insights into the actual impact of ISCs on the development of sectoral qualifications and the IQR system.

Social implications: The conclusions may serve as a basis for designing public policies in vocational education and for improving the validation system for sectoral qualifications.

Originality/value: The article provides cognitive value by situating ISCs within the broader IQR context, thereby enabling a deeper understanding of their role in the vocational education system. The results of the analysis are important for public decision-makers, local government representatives, teaching staff, and the business community, as they highlight the potential of ISCs to integrate education with the labour market and develop modern education programs. The article may also serve as a reference point for further research on the evolution of the qualifications system and the future of vocational education in the context of economic and technological transformation.

Keywords: Industry Skills Centres, sectoral qualifications, Integrated Qualifications Register.

Category of the paper: Review paper.

1. Introduction

The modern knowledge-based economy requires systematic improvement in the quality of human capital and flexible responses from education systems to technological and structural changes. Globalization, digital transformation, and the green economy are driving growing demand for specialized professional skills.

International literature emphasizes that an effective vocational education system should be strongly linked to the needs of the economy and based on transparent mechanisms for validating learning outcomes (OECD, 2022; European Commission, 2020). Research indicates that the development of sectoral qualifications reduces the skills gap and increases the professional mobility of workers (Cedefop, 2021; Powell, Solga, 2010). In this context, Centers of Vocational Excellence (CoVEs) are considered an important tool for modernizing VET systems in Europe (Rauner, Maclean, 2008).

The ISCs are being created in response to the need to strengthen cooperation among schools, universities, lifelong learning institutions, and enterprises. Their mission is not only to organise specialised training and courses but also to introduce and develop sectoral qualifications reflected in the IQR. Thus, the ISCs perform a dual function: on the one hand, they serve as modern educational and technological hubs tailored to the needs of students, learners, and employees; on the other hand, they operate as systemic instruments reinforcing the development of sectoral qualifications and the standardisation of learning outcomes.

ISCs play a significant role in sectors that are key to economic growth, such as information technology, the automotive industry, renewable energy, or logistics—areas where the demand for specialised competencies continues to increase.

The Integrated Qualifications Register, as part of the broader policy framework for lifelong learning, plays a central role in ensuring transparency, comparability, and recognition of qualifications. The inclusion of sectoral qualifications in the register promotes not only greater professional mobility among employees but also enhances the competitiveness of enterprises by facilitating access to qualified staff. Moreover, this process supports public policies related to education, employment, and the development of an innovative economy.

This article attempts to analyse the role of ISCs in the context of developing sectoral qualifications within the IQR. Theoretical considerations are complemented by an analysis of the functions these centres perform within the vocational education system and their relationship with the labour market. The paper combines both a descriptive and an applied approach—on the one hand, it presents the assumptions and institutional framework of ISCs; on the other hand, it identifies potential directions for development and challenges associated with their implementation in practice.

The aim of this article is therefore to identify the importance of Industry Skills Centers (ISC) in the process of shaping and developing sectoral qualifications within the Integrated Qualifications Register (IQR). The specific objectives are: (1) to analyze the mechanisms of integrating ISCs with the Integrated Qualifications Register (IQR) and (2) to assess the importance of ISCs for improving the quality of vocational education and training and adapting competences to the needs of the labor market.

2. Methodology

In preparing this article, the author employed the desk research method (also known as the analysis of secondary data). Desk research is a type of study that involves collecting information and data from available secondary sources, such as publications, reports, scientific articles, statistics, databases, archival materials, and online resources, without requiring primary data collection. It is one of the fundamental research methods used in the social sciences, business studies, and related disciplines.

The article is a review based on a systematic literature review and document analysis. The research process consisted of three stages: 1) identification of scientific publications on VET, sectoral qualifications, and centers of vocational excellence; 2) analysis of legal acts (Act of August 30, 2023, amending the Act on Education Law and certain other acts) and strategic documents (KPO); 3) synthesis of conclusions in the context of the institutional functions of the ISC. The selection of literature included publications from 2008-2024, including studies by the OECD, the European Commission, Cedefop, and Polish research on vocational education. The analysis was qualitative and interpretative in nature.

3. Industry Skills Centres – definition and purpose

Industry Skills Centres are modern educational institutions established to strengthen the quality of vocational education by closely integrating it with labour market needs. Their primary objective is to provide students, trainees, and adults with advanced technological and didactic facilities—including laboratories, workshops, and simulators—that enable the acquisition of practical skills aligned with the latest industrial trends (Ministry of National Education, 2023).

ISCs serve as a bridge between education and industry, expanding access to high-quality training and apprenticeships, and enabling graduates to adapt quickly to the demands of the modern labour market.

According to the Act of August 30 2023 amending the Education Law and certain other acts: *A Industry Skills Center is an educational, training, and examination institution operating at the national level, sectorally oriented in one of the occupational fields specified in the regulations issued under Article 46c(1), integrating schools providing vocational education, continuing education institutions, vocational training centers, higher education institutions, and entities referred to in Article 3(1a) engaged in activities related to that occupational field, and conducting activities that are:*

- a) educational and training in nature,*
- b) supportive of cooperation between schools, educational institutions, and employers,*
- c) innovative and developmental, disseminating knowledge, new technologies, and supporting ecological and digital transformation,*
- d) supportive of career counseling for students and professional activation of students, doctoral candidates, and graduates— addressed in particular to students, doctoral candidates, teachers, academic teachers, and employees in the given occupational field* (Act of August 30 2023, amending the Education Law and certain other acts).

ISCs differ from traditional forms of vocational education in that they operate in close connection with national sectoral organisations, which gives them a unique character and ensures standardisation of educational programs. The governing bodies of ISCs may include local government units, natural persons, legal entities (including sectoral organisations), or relevant ministries. The establishment and operation of an ISC requires a formal agreement between the governing body and the appropriate national sectoral organisation, which further strengthens the link between education and the economy.

A key element of the ISC educational offer is an innovative form of non-school lifelong learning—sectoral vocational training—which encompasses both specialised professional skills and competencies related to digitalisation and ecological transformation (Integrated Skills Strategy 2030). The offer is available to students, university learners, industry employees, and teachers, for whom the ISCs organise dedicated professional development courses. Through these activities, the centres contribute to the development of sectoral qualifications, thereby reinforcing the logic of the Integrated Qualifications Register, which collects and systematises competencies recognised as relevant to the labour market.

The unique nature of ISCs arises from their dual structure: on the one hand, they are highly specialised in a specific occupational field; on the other, their organisational framework is closely tied to the national sectoral organisation representing that field. This integration of education and professional practice with the activities of sectoral organisations makes ISCs strategic hubs of vocational excellence, fully embedded within the national Integrated Qualifications System (IQS).

In accordance with legal provisions, the establishment and operation of both public and private ISCs is possible only after the conclusion of an agreement between the governing body and the relevant sectoral organisation representing the occupational domain. An exception applies when the governing body itself is the sectoral organisation concerned.

According to the regulations, the establishment and operation of both public and non-public ISCs is possible only after an agreement has been concluded between their governing body and an industry organisation representing the professional field in question. An exception is made in situations where the industry organisation itself, with the appropriate scope, acts as the governing body. Industry organisations, as defined by the regulations, are institutions that meet all three of the following conditions: they have nationwide coverage, they conduct statutory activities in a single professional field, and they operate based on laws governing employers' organisations, chambers of commerce, crafts, associations, or professional self-governments.

Each ISC must have a Centre Council, whose composition guarantees broad representation of stakeholders. It is composed of representatives from industry organisations relevant to the field, employers—including those from the small and medium-sized enterprise sector—representatives of local and regional government (e.g., provincial and district labour market councils), the body overseeing the institution, as well as teachers and instructors who conduct classes. This organisational model promotes the development of educational and economic partnerships, ensuring that the educational offer is better adapted to the real needs of the labour market.

ISC's educational and training offer is addressed to a broad audience. It includes vocational school students, university students, doctoral students, teachers, academic teachers, and adults who are professionally active or planning to retrain. A key element of the offer is industry-specific vocational training—a new form of extracurricular continuing education designed specifically for ISC. These training courses cover both specialist skills relevant to a specific industry and digital and green transition competencies. This provides participants with the opportunity to develop qualifications in line with the requirements of the modern economy, and the learning outcomes can be recorded in the IQR as sectoral qualifications.

ISCs also offer a wide range of courses to enhance and supplement professional qualifications, including retraining courses designed to acquire competencies that meet the current needs of a specific industry. An essential aspect of this activity is the possibility of confirming sectoral qualifications with certificates signed by an industry organisation, which strengthens their recognition and value on the labour market.

Another extremely important function of ISCs is the professional development of teaching staff. As the only institutions in the education system, they offer specialised industry training for both teachers of theoretical vocational subjects and instructors of practical vocational training. This enables the improvement of vocational education quality by continually updating teachers' knowledge and skills in line with technological advancements and market trends.

ISCs, therefore, serve not only as continuing education institutions but are also often the initiators of sectoral qualifications, integrating education with the economy and constituting an important element of the qualification system in Poland. (Ministry of National Education).

The decision to establish Industry Skills Centres was included in the National Recovery and Resilience Plan (NRP), under component A: "Resilience and competitiveness of the economy". The specific objective A3 focuses on strengthening the education and lifelong learning system so that it responds to the needs of the modern economy, supports innovation processes, technology transfer, and ecological and digital transformation. As part of the A3.1 reform, plans are in place to prepare personnel to meet the challenges of the modern economy and to increase the capacity of the education system to respond to crises.

Investment A3.1.1 supports the development of vocational training, higher education, and continuing education, with a particular emphasis on cooperation between schools, universities, employers, research and development institutions, and other economic entities. Its aim is also to promote industry-specific and vocational education. One of the key elements of this reform is the establishment of 120 Industry Skills Centres, which will serve as national centres of professional excellence.

The project operator is the Foundation for the Development of the Education System (FRSE), responsible for establishing all ISCs by the end of 2024. According to the schedule, the first 20 centres were established in 2023. The implementation of the project requires close cooperation with nationwide industry organisations, state-owned companies, and vocational school authorities.

The first agreements under the ISC project competition were signed on July 4, 2023, and the selection process is still ongoing in subsequent stages. The funding covers the construction and modernisation of infrastructure, the creation of institutional structures, the employment of specialised staff, and the preparation of training program documentation. The total amount allocated for the implementation of the investment is PLN 1.429 billion, with subsidies for individual centres ranging from PLN 9 million to PLN 16 million for each of the 120 fields (Foundation for the Development of the Education System).

Ultimately, a network of 120 Industry Skills Centres will be distributed throughout the country, and their locations, assigned to individual provinces, are presented on an official map provided by the FRSE and the Ministry of National Education.



Figure 1. Industry skill centers as of October 2, 2025.

Źródło: <https://www.frse.org.pl/kpo-ISC-mapa>, 2.10.2025.

The role of ISCs in the development of sectoral qualifications is also reflected in the international perspective. The concept of centres of vocational excellence aligns with the recommendations of the European Commission, which has been promoting the CoVE model since 2020 as a tool for integrating the education system with innovative economy, green, and digital transformation policies (European Commission, 2020).

In summary, Industry Skills Centres are gradually assuming a multifaceted role in the Polish vocational education system. They are modern institutions that combine educational, research, and development, as well as advisory functions, supporting both pupils and students, as well as teachers and entrepreneurs. Thanks to their strong links with the Integrated Qualifications Register, they are becoming an essential mechanism for improving qualifications in Poland and are integral to the Lifelong Learning (LLL) policy, which responds to the needs of the modern labour market and the challenges of the global economy.

4. What are IQS and IQR?

The Integrated Qualifications System forms the foundation of Poland's national education and labour market policy in the field of competence recognition and certification, regardless of how and where the learning took place. It was established by the Act of December 22 2015, on the Integrated Qualifications System (Journal of Laws, 2024, item 1606) as a framework that integrates qualifications awarded in formal, non-formal, and informal education settings.

The main objective of introducing the IQS was to create a transparent and coherent structure that allows individuals to have their competencies formally recognised and compared both nationally and internationally. The IQS functions as a platform that connects educational institutions, the labour market, and public administration into a unified system based on the principle of lifelong learning (LLL).

Each qualification included in the IQS is referenced to both the Polish Qualifications Framework (PQF) and the European Qualifications Framework (EQF), ensuring the international comparability and transferability of skills and learning outcomes.

The system encompasses two major categories of qualifications:

- Full qualifications, awarded within the formal education system, such as school-leaving certificates, professional diplomas, or academic degrees,
- Partial qualifications, obtained through courses, training, or other non-formal learning activities. These include sectoral and market-based (freemarket) qualifications, which may be incorporated into the system upon the request of eligible institutions, following a formal validation and quality assurance process (Educational Research Institute - National Research Institute).

A key element of the system is the Integrated Qualifications Register – a central electronic database maintained by the Educational Research Institute, a National Research Institute (IBE), which serves as a public source of information on qualifications in Poland. Pursuant to Article 22 of the Act on the Qualifications Framework System, this register collects data on all qualifications included in the system, including a description of learning outcomes, the assigned PQF level, validation requirements, information on certifying bodies, and the legal basis for the recognition of a given qualification (Act of December 22, 2015 on the Integrated Qualifications System).

The IQR, therefore, serves as an information and record-keeping tool, ensuring the transparency, comparability, and credibility of qualifications. It serves as a source of knowledge for citizens, employers, career counsellors, and training institutions, facilitating the recognition of available qualifications and their value in the labour market (Institute for Educational Research – National Research Institute).

In this context, Sector Skills Centres (ISCs) play a key role in the implementation and development of sectoral qualifications within the QSF and QRF. Working in close cooperation with industry organisations, local governments, and educational institutions, ISCs serve as training centres. Thanks to modern technological facilities and integration with the qualifications system, these centres bridge the gap between education and the economy, supporting the development of skills needed in a contemporary, innovative, and sustainable economy (Ministry of National Education; European Commission).

The Integrated Qualifications System and the Integrated Qualifications Register thus form a coherent mechanism for ensuring the quality and recognition of competences. The IQS is responsible for the legal and substantive framework, while the IRQ is the database of information on qualifications. The Industry Skills Centres are responsible for the practical implementation and development of sectoral qualifications in line with labour market requirements. The interaction of these three elements enables the effective integration of education and the economy, strengthening the lifelong learning system in Poland.

5. Sectoral and free market qualifications

The qualification system, which has been operating in Poland since the adoption of the Act on the Integrated Qualification System in 2015, is a key element of education policy and the labour market, ensuring consistency between learning outcomes and the needs of the economy.

In 2024, as a result of an amendment to the ISQ Act (Act of August 30, 2023, amending the Education Law and certain other acts), the system was expanded to include new categories of qualifications: sectoral and free market. This change was designed to enhance the system's flexibility and responsiveness to dynamic economic and technological shifts. Sectoral qualifications cover skills specific to a particular industry or professional field, whereas free market qualifications are cross-cutting and can be applied in multiple areas of the labour market.

The inclusion of sectoral qualifications in the NQF is a process closely linked to the activities of industry organisations and economic institutions with nationwide coverage. It is these entities that identify the competence needs in their sectors, develop qualification descriptions, and cooperate with ministries in the process of incorporating them into the register. As a result, sectoral qualifications enable the standardisation and professionalisation of vocational education and training, and increase the transparency of career paths within a given industry (Ministry of National Education).

Sectoral qualifications are a new category of qualifications in the National Qualifications Framework, introduced to better adapt the vocational education system to the specific nature of individual industries. As indicated by the Ministry of National Education, these qualifications respond to the needs of a specific professional field, reflecting the actual requirements of the

labour market in a particular sector (Institute for Educational Research – National Research Institute). In practice, this means that sectoral qualifications are developed and supervised in cooperation with nationwide industry organisations, such as chambers of commerce, employers' associations, professional associations, and industry self-governments.

In accordance with the Act, a sectoral qualification may be included in the Integrated Qualifications Register after positive verification by the minister responsible for the industry and after consultation with the industry organisation representing the sector. The inclusion of a qualification in the system enables its formal reference to the Polish Qualifications Framework (PQF) and, if it exists, to the Sectoral Qualifications Framework (SQF) relevant to the field.

In practice, sectoral qualifications encompass skills and competences that are not regulated by separate legal provisions but are essential for effective functioning within a specific sector of the economy, such as the automotive, energy, hotel, or IT industries. They are strongly linked to the needs of the labour market and are often developed on the initiative of industry organisations, which have the best knowledge of current trends and skills gaps.

An important aspect of the development of sectoral qualifications is their integration with the activities of Industry Skills Centres, which, from 2023, will be one of the pillars of the modern vocational education system in Poland. ISCs, working in partnership with industry organisations and local governments, act as institutions that implement and develop sectoral qualifications in practice. They provide the necessary technological resources, teaching staff, and infrastructure to deliver training and validate learning outcomes in accordance with the requirements outlined in the qualification description (Ministry of National Education).

The second category introduced in the 2024 amendment to the IQS are free market qualifications, formerly known as market qualifications. Their name was changed to emphasise the broader, more flexible nature of these qualifications and their openness to initiatives from various areas of the economy and society (Institute for Educational Research – National Research Institute).

Free market qualifications encompass knowledge, skills, and competencies that are not industry-specific but respond to the current needs of the labour market. According to the definition of the Ministry of National Education, they may relate, for example, to digital, social, managerial, or language competences, and their development and inclusion in the NQF can be initiated by any entity operating in the field of education, economy, or the labour market (Institute for Educational Research – National Research Institute).

The fundamental difference between sectoral and free market qualifications is therefore the degree to which they are linked to a specific industry. Free market qualifications are more universal and can be applied in various professional contexts, which enhances their adaptability and importance for lifelong learning and the development of cross-cutting competencies.

The same regulations govern the process of incorporating free market qualifications into the NQF as for sectoral qualifications. It includes, among other things, developing a description of the qualification, defining learning outcomes, validation methods, and assigning a level in the Polish Qualifications Framework. Certifying institutions must meet the requirements for the quality and reliability of the competence assessment process, which aligns with the principle of transparency in the qualifications system.

Table 1.

Comparison of sectoral and free market qualifications in the Integrated Qualifications System

Criterion	Sectoral Qualifications	Freemarket Qualifications
Nature of qualification	Industry-specific; linked to a particular occupational field or economic sector.	Universal; responsive to the general labour market and educational needs.
Purpose of inclusion in IQS	Strengthening links between education and industry; standardising competencies within sectors.	Flexible response to evolving labour market needs and non-formal education trends.
Initiating body	National-level sectoral organisation (e.g., chamber of commerce, employers' association).	Any entity operating in education, training, or business (e.g., NGOs, training firms).
Inclusion process	• Submission of application via IQS portal. • Review by IQS stakeholders and sectoral councils. • Expert opinion and recommendation. • Review by the IQS Stakeholders Council. • Final approval by the relevant minister.	• Submission via IQS portal • Environmental consultations. • Review by IQS stakeholders and sectoral councils. • Expert opinion and recommendation. • Review by the IQS Stakeholders Council. • Final ministerial approval.
Scope of application	Sector-specific vocational competencies (e.g., energy, construction, IT, tourism).	Cross-sectoral or general competencies (e.g., project management, digital literacy, interpersonal communication).
Connection with sectoral organisations	Mandatory – must be developed in partnership with a relevant sectoral organisation.	Not required – initiators act independently of industry structures.
Validation and certification	Conducted according to sectoral requirements and aligned with PQF/SQF standards.	Based on defined learning outcomes and validation methods proposed by the initiating body, linked to PQF levels.
Certifying institutions	Entities operating statutorily within a given industry or sector.	Accredited institutions meeting the requirements of the IQS Act; not tied to a specific sector.
Territorial scope	National, with potential recognition within the European Qualifications Framework (EQF).	National, with optional EQF referencing depending on qualification type.
Role in education and the labour market	Integrating education with industry; improving vocational training quality; supporting ISC development.	Promoting lifelong learning; facilitating recognition of skills acquired outside formal education.

Source: own study based on: Act of August 30, 2023, amending the Act – Education Law and certain other acts.

The inclusion of sectoral and free market qualifications in the Integrated Qualifications System is crucial for building a flexible, open, and integrated lifelong learning system. Both categories of qualifications contribute to increasing professional mobility, recognition of competencies, and transparency of educational opportunities in Poland.

Sectoral qualifications ensure that education is aligned with the industry economy, while free market qualifications enhance the system's adaptability and enable a rapid response to changes in the labour market. In this context, Industry Skills Centres act as a bridge—not only do they provide training and validation, but they also co-create qualification descriptions in consultation with industry partners.

As a result, the development of ISCs and the inclusion of sectoral and free market qualifications in the IQR represent a crucial step towards establishing a modern and integrated qualifications system in Poland, aligning with European educational policy standards and competence frameworks (European Commission, 2020).

6. Conclusions

The analysis conducted enables us to conclude that Industry Skills Centres play a growing, systemic role in shaping sectoral qualifications and strengthening the cohesion of the Integrated Qualifications System and the Integrated Qualifications Register. Firstly, ISCs are the missing link between education and the economy: their industry specialisation, embeddedness in partnerships with industry organisations, and the ISC Council translate into greater competence relevance of programs and better alignment of learning outcomes with the real needs of the labour market. Secondly, the inclusion of sectoral qualifications in the IQR – designed and implemented with the participation of ISCs – enhances transparency, comparability, and recognition of competences, which supports professional mobility and facilitates employers' ability to identify skill standards.

The integration of ISCs into the National Recovery Plan provides an investment and organisational framework for the project; however, its long-term effectiveness will depend on stable operational funding (maintenance of infrastructure and staff), resilience to demand volatility, and efficient quality mechanisms (validation and certification). Particularly promising is the positioning of ISCs as centres for validating learning outcomes—both formal and non-formal—which reinforces the idea of lifelong learning and increases access to certification for adults, including those undergoing retraining.

To fully exploit the potential of ISCs, it is necessary to deepen cooperation with enterprises (including SMEs) at the stage of designing qualifications, organising internships/traineeships and joint laboratories, and to constantly update sectoral qualification descriptions in the IQR in response to technological changes (digital and green transformation). A key factor for success is the development of teachers' and instructors' competences – ISCs should remain leading centres for staff development to keep teaching methodologies and technologies up to date.

The effectiveness of ISCs should be measured using a set of indicators, including, among others: the percentage of participants with a confirmed qualification entered in the IQR, employability and salary advancement rates of graduates, employer participation in programs, response time to emerging competency needs, and the diffusion of teaching innovations to vocational schools and universities.

In summary, Industry Skills Centers are an important element in the modernization of the vocational education system in Poland. The achievement of the article's objectives allows us to conclude that ISCs serve as institutional hubs integrating education with the economy through the development and validation of sectoral qualifications. Their role goes beyond training – it includes co-creating competence standards and professionalizing the qualification system. Practical implications: 1) the need for systematic evaluation of the effectiveness of ISCs, 2) strengthening cooperation with industry organizations, 3) ensuring stable financing mechanisms, 4) developing tools for monitoring the quality of sectoral qualification validation. From a public policy perspective, ISCs can be a tool for reducing the skills gap in strategic sectors, but their effectiveness depends on their permanent integration into the qualification system and the genuine commitment of economic partners.

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CREATIVE TOURISM MANAGEMENT IN THE 21ST CENTURY

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Purpose: The main purpose of the paper is to analyze a considerable number of articles and books published at the beginning of the 21st century on creative tourism. The authors aim to identify the main research trends in this field, focusing on the evolution of the concept, its differences from traditional cultural tourism and the management modalities of this type of tourism.

Design/methodology/approach: The methodological approach is qualitative, based on the analysis of specialized literature. The authors resorted to critical and comparative analysis of academic works published after 2000. The article is located at the intersection of creative management and tourism management. The objectives are achieved by structuring the information in three research directions: the staged evolution of the concept, the comparative analysis of forms of tourism and the identification of the pillars of creative management.

Findings: The analysis highlighted three major findings. Creative tourism has evolved in stages, from simple learning activities, to relational networks and co-creation of experiences. Unlike cultural tourism, creative tourism is active, focused on personal development and intangible resources. Effective management in this field must include co-creation, local community empowerment, cultural integration and sustainability.

Research limitations/implications: The study is limited to the analysis of the specialized literature (secondary research), without including a primary research component (interviews or new case studies). The authors envisage for future research the identification of specific success factors for rural destinations (leadership, local entrepreneurship), thus suggesting the need to explore these variables in diverse geographical contexts.

Practical implications: The research provides clear directions for the business environment. Romanian tourism entrepreneurs should adopt these trends (co-creation, practical workshops) to modernize and improve their businesses. Implementing creative tourism can lead to

economic sustainability by directly supporting local artists and artisans. Moving from simply "contemplating" tourist attractions to offering interactive.

Originality/value: The originality of the article lies in the coherent synthesis of the concepts of "creative management" applied in tourism, providing a structured framework for understanding the transition from passive to active consumption. The paper is useful to researchers and students for theoretical foundation and to entrepreneurs as a strategic guide for innovating tourism products.

Keywords: creative tourism, creative tourism management, definitions, differences, trends, 21st century.

Category of the paper: viewpoint, literature and general review.

1. Introduction

Creative management is an advertising, design, and entertainment management practice consisting of guiding and overseeing creative processes within an organization or project, combining creativity with strategic planning to achieve innovative outcomes (Xu, Rickards, 2007; Xu, 2013). It includes key elements such as leadership, problem-solving, project management, and vision setting.

Creative tourism management builds upon these principles and refers to designing and managing tourism experiences that emphasize active participation, creativity, and cultural engagement (Richards, Wilson, 2007; Richards, 2010; Richards, Marques, 2012; Richards, 2012, 2015). It focuses on preserving cultural identity, enriching tourist experiences, and fostering meaningful connections between visitors and local communities.

In recent years, creative tourism has gained increasing attention in both academic research and tourism practice, particularly as a response to the limitations of mass and cultural tourism.

However, despite the growing body of literature, several conceptual and methodological limitations can be identified. First, the existing studies are largely descriptive and fragmented, offering multiple definitions of creative tourism that emphasize different aspects such as participation, creativity, or cultural immersion. This lack of conceptual clarity limits the development of a unified theoretical framework.

Second, a significant part of the literature adopts a normative perspective, presenting creative tourism as inherently beneficial, while insufficient attention is given to potential risks, such as cultural commodification or superficial tourist engagement.

Third, there is a lack of integrated approaches to creative tourism management that combine co-creation, community empowerment, cultural integration, and sustainability into a coherent framework. Moreover, empirical research remains limited, particularly in emerging markets such as Central and Eastern Europe.

Finally, insufficient attention has been paid to performance measurement, key success factors, and the role of innovation and digitalization in shaping creative tourism development.

In response to these limitations, the aim of this paper is to analyze the evolution of the concept of creative tourism, identify the differences between cultural and creative tourism, and examine the key principles of creative tourism management in order to outline the main research trends in this field.

2. Material and Method

The methodology used is qualitative, based on content analysis of secondary sources.

To ensure methodological rigor, the literature review was conducted as a structured and transparent process inspired by the principles of a systematic literature review. The procedure consisted of the following stages:

1. Definition of the research scope.

The review focused on publications addressing creative tourism, creative tourism management, and the evolution of tourism concepts in the 21st century.

2. Identification of data sources.

Scientific publications were collected from major academic databases, including Web of Science, Scopus, and Google Scholar. Additional sources included books and reports from international organizations (e.g., UNESCO).

3. Search strategy.

The search process was based on a combination of keywords such as: “creative tourism”, “creative tourism management”, “cultural vs creative tourism”, “tourism innovation”, and “co-creation in tourism”.

4. Inclusion and exclusion criteria.

The selection of publications was based on the following criteria:

- publications in English,
- peer-reviewed journal articles, books, and conference papers,
- works published between 2000 and 2023,
- direct relevance to the concept and management of creative tourism.

Publications not directly related to tourism or lacking scientific rigor were excluded.

5. Selection process.

The initial search yielded a broad set of publications, which were subsequently screened based on titles and abstracts. In the next step, full-text analysis was conducted to identify the most relevant sources.

6. Data analysis and synthesis.

The selected literature was analyzed using qualitative content analysis. The findings were categorized into three main research areas:

- (1) the evolution of the concept of creative tourism,

- (2) the comparison between cultural and creative tourism,
 - (3) the principles and practices of creative tourism management.
7. Interpretation and synthesis of results.

The final stage involved synthesizing the findings and identifying key trends, theoretical approaches, and practical implications for tourism management.

The initial search resulted in over 100 publications. After screening and applying inclusion criteria, 38 key sources were selected for in-depth analysis. The selection was based on relevance, scientific quality, publication date (2000–2023), and theoretical contribution to the field of creative tourism.

The literature selection process is presented in Figure 1, illustrating the stages of identification, screening, eligibility, and final inclusion of sources.

Literature Selection Process (PRISMA-style)

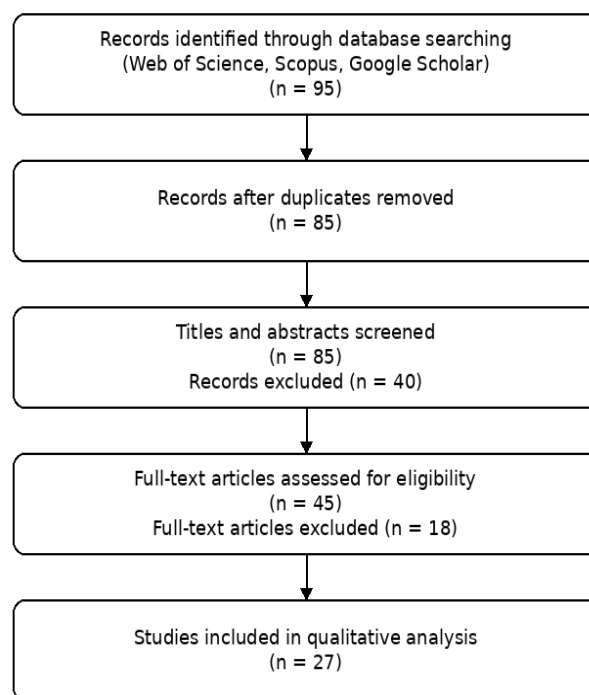


Figure 1. Literature selection process (PRISMA-style).

Source: Own study.

3. Results and Discussion

The analysis of the literature on creative tourism management reveals three main research dimensions: the evolution of the concept, the distinction between cultural and creative tourism, and the principles of creative tourism management. However, beyond descriptive categorization, a more analytical perspective highlights important patterns and relationships.

3.1. Evolution of the concept of creative tourism

The evolution of creative tourism reflects a broader shift from passive consumption toward active and participatory experiences. Early definitions emphasized learning activities and skill development, while later approaches incorporated co-creation and relational networks.

This progression, summarized in four stages, indicates a transition from product-oriented tourism to experience-based and network-driven models. In particular, the emergence of “creative tourism 4.0” highlights the growing importance of social interaction, collaboration, and value co-creation.

From a critical perspective, however, this linear evolution may oversimplify the diversity of tourism practices. In reality, different stages often coexist, depending on the level of destination development and local capabilities. Therefore, the concept of creative tourism should be understood as a dynamic and context-dependent phenomenon rather than a strictly sequential process.

3.2. Cultural tourism versus creative tourism

The comparison between cultural and creative tourism reveals a fundamental shift in the logic of value creation. Cultural tourism is primarily based on passive consumption of tangible heritage, whereas creative tourism emphasizes active participation, intangible resources, and personal transformation.

This distinction suggests that creative tourism aligns more closely with contemporary consumer expectations, particularly the demand for authentic and personalized experiences. Moreover, intangible resources such as creativity, narratives, and local knowledge are more flexible and scalable than traditional cultural assets.

However, the dichotomy between cultural and creative tourism should not be overstated. In practice, these forms often overlap, and many tourism experiences combine elements of both. Furthermore, the emphasis on creativity may lead to the commodification of culture if not managed carefully.

Therefore, instead of treating these concepts as mutually exclusive, it is more appropriate to consider creative tourism as an extension or evolution of cultural tourism, rather than its replacement.

3.3. Creative tourism management

The analysis identifies four key pillars of creative tourism management: co-creation, community empowerment, cultural integration, and sustainability.

Co-creation represents a shift from service delivery to experience design, where tourists actively participate in value creation. This approach enhances engagement and satisfaction but requires higher organizational capabilities and flexibility.

Community empowerment plays a central role in ensuring that local stakeholders benefit from tourism development. However, the literature often assumes positive outcomes without critically addressing potential challenges, such as unequal distribution of benefits or limited local capacity.

Cultural integration strengthens the authenticity of tourism experiences, but it also raises concerns about cultural appropriation and the loss of traditional meanings when adapted for tourism purposes.

Sustainability is frequently presented as an inherent feature of creative tourism, yet empirical evidence supporting this claim remains limited. In many cases, sustainability depends more on management practices than on the tourism model itself.

Overall, the effectiveness of creative tourism management depends on the ability to balance these four pillars while adapting to local conditions. This highlights the need for more integrated and context-sensitive management frameworks.

3.4. Synthesis and implications

The findings suggest that creative tourism represents a shift toward more interactive, experience-based, and knowledge-driven tourism models. However, its development is not uniform and depends on contextual factors such as destination characteristics, local resources, and institutional capacity.

From a theoretical perspective, the study highlights the need for more integrated frameworks that combine different dimensions of creative tourism management.

From a practical perspective, tourism stakeholders should focus on developing capabilities related to co-creation, stakeholder collaboration, and innovation, while avoiding the risks of cultural commodification and superficial experience design.

Conceptual framework of creative tourism management

Based on the literature analysis, a conceptual framework of creative tourism management is proposed (Figure 2). The model integrates four key pillars: co-creation, community empowerment, cultural integration, and sustainability.

Co-creation constitutes the central element of the model, as it transforms tourists from passive consumers into active participants in experience creation. This process is supported by community empowerment, which ensures the involvement and benefits of local stakeholders.

Cultural integration enables the embedding of tourism experiences within local traditions and heritage, enhancing authenticity and meaningful engagement. At the same time, sustainability acts as a cross-cutting dimension, ensuring that tourism development is economically viable, socially inclusive, and environmentally responsible.

The interaction between these elements leads to the creation of innovative and experience-based tourism products, which contribute to the competitiveness and long-term development of tourism destinations.

The proposed conceptual framework is presented in Figure 2 and illustrates the relationships between key dimensions of creative tourism management.

Conceptual Framework of Creative Tourism Management

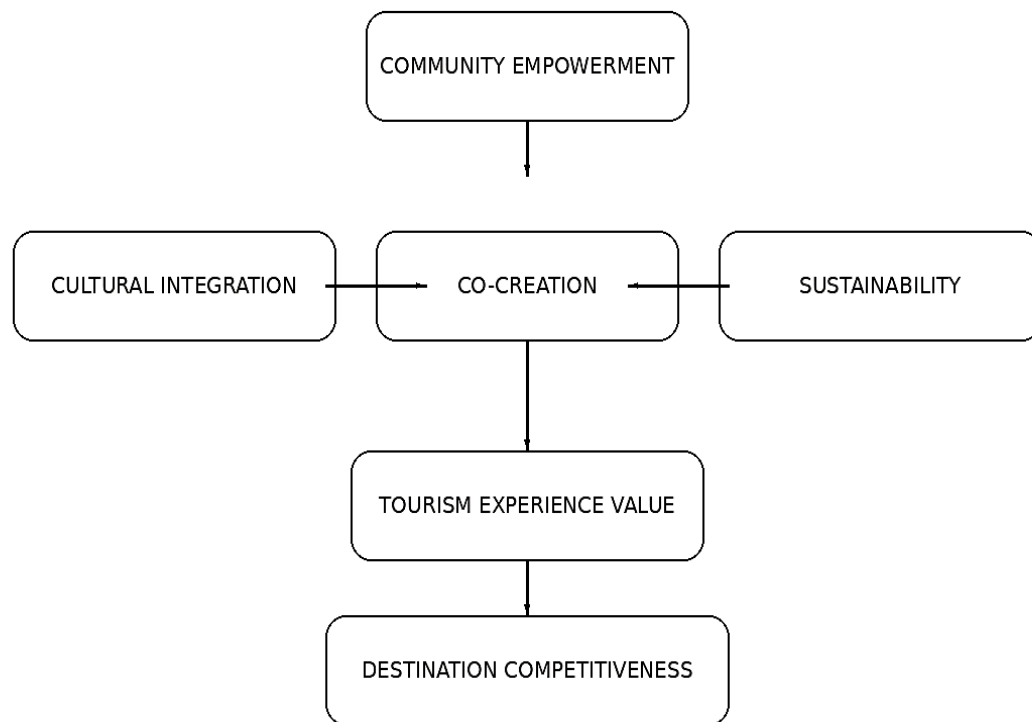


Figure 2. Conceptual framework of creative tourism management.

Source: Own study.

4. Summary

This study aimed to analyze the evolution of the concept of creative tourism, identify the key differences between cultural and creative tourism, and examine the main principles of creative tourism management. Based on a structured literature review, several important conclusions can be drawn.

First, the findings confirm that creative tourism represents a significant shift from passive, product-oriented consumption toward active, experience-based and participatory models. This transformation reflects broader changes in tourist expectations and highlights the growing importance of co-creation and personalization in tourism experiences.

Second, the study demonstrates that creative tourism should not be treated as a separate category replacing cultural tourism, but rather as its extension and evolution. The relationship between these two forms of tourism is complementary rather than substitutive.

Third, the analysis identifies four key pillars of creative tourism management: co-creation, community empowerment, cultural integration, and sustainability. Their interaction forms the basis for developing innovative and competitive tourism products, as illustrated in the proposed conceptual framework.

The main theoretical contribution of this study lies in the integration of dispersed literature into a coherent analytical framework. The proposed model organizes key dimensions of creative tourism management and highlights their interdependencies, contributing to a more structured understanding of this concept.

Furthermore, the study provides a critical perspective on existing research by identifying conceptual inconsistencies and methodological limitations, thus extending the current discourse beyond purely descriptive approaches.

Despite its contributions, the study has several limitations. First, it is based exclusively on secondary data, which limits the ability to empirically verify the identified relationships. Second, the selection of literature, although structured, may not fully capture all relevant publications, particularly those published in languages other than English. Third, the proposed conceptual framework has not been empirically tested, which limits its applicability in specific contexts.

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THE ROLE OF ARTIFICIAL INTELLIGENCE IN THE PERSONALIZATION OF TRAINING PROCESSES IN THE CONTEXT OF SOCIETY 5.0

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Purpose: The article aims to concisely present the role of artificial intelligence in personalizing training processes in the light of the Society 5.0 paradigm.

Methodology: A method of analysis and critique of the literature was applied. Searches were conducted using predefined queries in scholarly databases: Google Scholar, Scopus, and Science Direct. The academic sources were supplemented with industry literature and verified online sources relevant to the topic.

Findings: Artificial intelligence is a key mechanism for the personalization of training processes, enabling the design of flexible, adaptive, and inclusive learning systems aligned with the concept of Society 5.0. Integrating AI into training systems makes it possible to develop knowledge and skills—and thus professional competencies. At the same time, ethical and technological challenges indicate the need for further research and responsible implementation practices.

Practical implications: Organizations should build interoperable ecosystems of data on learning and employee training in order to monitor progress in real time, audit personalization decisions, and iterate training and development programs more quickly.

Social implications: Personalizing the training process with the use of AI lowers educational, geographic, and architectural barriers, supporting diverse employee groups, including those at risk of exclusion (inclusiveness). At the same time, transparent data—governance rules, continuous human oversight, and regular audits of learning algorithms are necessary. From an organizational perspective, this fosters a learning culture and occupational mobility.

Originality: The article's originality stems from combining the personalization of training processes with the Society 5.0 model and an interoperable data infrastructure. Drawing on international literature, it enriches the existing body of knowledge on human capital in enterprises, signaling the author's contribution to the development of the field of management and quality sciences. The article is addressed primarily to researchers and scholars working in management. In addition, it is valuable for managers and HR professionals directly concerned with implementing AI-based technologies in training processes.

Keywords: Society 5.0, employee training, artificial intelligence.

Category of the paper: General review.

1. Introduction

In Society 5.0, the physical and digital spheres are tightly interconnected, which is intended to enhance employee safety, well-being, and development (Nakanishi, Gonokami, Takahashi, 2020). This concept envisages a transformation not only of industry but also of living environments and societal habits (Deguchi et al., 2020). Human-centrism—placing the human being, rather than technology, at the center—emphasizes welfare, psychophysical safety, needs, and opportunities for individual development (Del Giudice, Scuotto, Papa, 2023; Grudowska, Zieliński, 2022; Khullar et al., 2024). In this perspective, artificial intelligence (AI) supports equalizing educational opportunities, reducing geographical barriers, and fostering lifelong learning (Hamid, Ab Wahid, 2024; Foresti et al., 2020). Personalized educational platforms based on big-data analytics make it possible to tailor curricula to changing labor-market demands and to individual development pathways (Chen, 2023; Maghsudi et al., 2021; Xiao, Yi, 2020).

Organizations transitioning to skills-based models use AI to identify competency gaps and recommend micro-development pathways, which—according to industry and policy reports—accelerates reskilling and shortens the “half-life of skills” (OECD Digital Education Outlook, 2023; Workplace Learning Report, 2024; Deloitte, 2025). In parallel, ethical (privacy, impartiality, data security) and technical (data interoperability) challenges arise (Uddin et al., 2025).

In Polish-language literature on AI-enabled personalization of employee training, English-language contributions still predominate and the number of peer-reviewed studies remains limited. In market practice, the level of AI adoption by firms in Poland is still low. According to the latest Eurostat data, in 2024 only about 5.9% of enterprises reported using AI solutions, placing Poland among the lowest in the European Union (Eurostat, 2025).

The aim of this article is to review research from 2020–2025 on the implementation of AI in the personalization of employee training and to provide concise answers to two questions:

1. What are the possibilities for using AI to personalize employee training systems?
2. What additional effects accompany the introduction of AI into the training process?

2. Methods

A qualitative, problem-oriented non-systematic literature review was employed. This approach is appropriate when the aim is to conceptually map the field and integrate dispersed mechanisms (LLM tutoring, Knowledge Tracing, Reinforcement Learning, VR) with the Society 5.0 framework and interoperability infrastructure (xAPI/Caliper/LTI), rather than to produce a quantitative synthesis of effects (cf. Snyder, 2019).

The review was limited to 2020-2025 and focused on scholarly articles, trade press, and industry reports. Because the first wave of mass remote learning occurred during the COVID-19 pandemic, publications from 2020-2022 serve primarily as theoretical background. The main horizon of the review covers 2023-2025, reflecting rapid advances in artificial intelligence and its cross-sector implementation. The 2020-2025 window captures the technological inflection that began in 2020, including the emergence of large language models and the application of reinforcement learning, virtual reality, and extended reality.

Searches were conducted using predefined queries across three academic databases: Google Scholar, Scopus, and ScienceDirect. A non-systematic review was then performed based on the keywords *Society 5.0*, *employee training*, and *artificial intelligence* in various combinations, with Boolean operators (AND, OR, NOT) and special characters. Google Scholar initially returned 90 records containing combinations of these terms. Scopus yielded 629 items, which were reduced to 138 after restricting to the *Business, Management & Accounting* subject area. ScienceDirect produced 914 sources, narrowed to 162 under the same subject constraint. In the next stage, the content of shortlisted materials was screened for topical relevance, followed by an in-depth analysis of the retained literature; principal findings are reported in the results section. The scholarly corpus was complemented by trade literature and vetted online sources.

This method enabled the collection and critical synthesis of the latest evidence on the effectiveness of AI for personalizing training processes, and its alignment with the Society 5.0 framework and interoperability standards.

3. Results

Studies show that applying artificial intelligence to employee training is associated with a higher level of personalization and better learning outcomes compared with traditional training approaches (Alasfour, Alsmael, 2025; Kestin et al., 2025; Hrytsenko et al., 2024).

Findings from the literature review indicate that AI enables the personalization of corporate training by continuously identifying training gaps (Chen, 2023), tailoring the sequence of tasks, the difficulty level, and the type of support to the learner's profile, and dynamically adjusting training content and pacing (Rane, Choudhary, Rane, 2023; Pandya, 2024; Alasfour, Alsmael, 2025). This is based on analyses of learning behaviors, preferences, progress, individual aspirations and career goals, as well as current competence levels (Tusquellas, Santiago, Palau, 2025; Sha Ri Na, 2023).

Knowledge Tracing models (including Bayesian Knowledge Tracing, Deep Knowledge Tracing, and Self-Attentive Knowledge Tracing) estimate a worker's current knowledge or skill state and predict the probability of a correct response at the next step in learning.

Newer approaches—explainable Knowledge Tracing (xKT)—also clarify why the model assesses mastery of a given skill at a particular level, which leads to a more appropriate selection of content and its level of advancement (Abdelrahman, Wang, Nunes, 2023; Sarsa, Leinonen, Hellas, 2022; Bai et al., 2024; Su et al., 2023).

Reinforcement Learning helps the system accurately select the next learning step (e.g., which module or exercise to launch), thereby accelerating and improving training progress (Lan, Baraniuk, 2016; Cai et al., 2021; Memarian, Doleck, 2024; Mon et al., 2023). Contextual Bandit algorithms—methods that choose the best next activity based on the user profile and current context—support personalized selection of learning actions and increase the relevance of recommendations (Lan, Baraniuk, 2016; Cai et al., 2021; Memarian, Doleck, 2024; Mon et al., 2023).

Large Language Models (LLMs) act as co-tutors: they ask guiding questions, offer hints and clear explanations, and structure the flow of learning. Studies show that, compared with traditional approaches, this leads to better outcomes and higher engagement (Kestin et al., 2025; Vanzo, Chowdhury, Sachan, 2025; Labadze, Grigolia, Machaidze, 2023). In addition, these systems can forecast future skill needs and build personalized development pathways accordingly (Madhumithaa et al., 2025).

In virtual reality (VR), training is adaptive—the system continuously adjusts difficulty and support, controls learning pace, and monitors specific behaviors. This reduces errors and facilitates transfer of skills to real workplaces (Tashev et al., 2023; Hrytsenko et al., 2024). At the organizational level, AI implementations are associated with cost reductions (travel, trainer time, materials, etc.) and with the automation of content development and formative assessment, which shortens delivery and scaling time for training (Masrek, Anuar, Mazlan, 2025; Smith, Taylor, Underwood, 2024; Pesovski et al., 2024). Continuous progress monitoring and immediate feedback further increase learning productivity and make it easier to adjust development pathways during the program (Hrytsenko et al., 2024; Chen, 2023). Consequently, this shortens the time required to reach the target competence level and boosts employee engagement, motivation, and on-the-job effectiveness (Shvardak, Popovych, 2025; Hrytsenko et al., 2024; Aldyandra, 2024; Barrera Castro et al., 2024; Tapalova, Zhiyenbayeva, 2022; Chen, 2023).

The review indicates that effective and scalable personalization requires access to consistent “learning traces” and interoperability across tools used in the Learning & Development ecosystem. The sources examined identify the xAPI standards (IEEE 9274.1.1–2023/xAPI 2.0) and Caliper Analytics (1EdTech) as key technical mechanisms for normalizing event logging, as well as LTI 1.3 for secure integration of tools with Learning Management Systems (e.g., Moodle, Canvas, Blackboard) while maintaining data continuity. Applying these standards enables continuous outcome monitoring and the auditability of personalization decisions at the organizational level (Hernández-de-Menéndez et al., 2022; Experience API overview, 2024; 1EdTech/IMS–Caliper, LTI).

“Learning traces” are understood as digital records of employee activity generated during interactions with materials, tools, and people. Data sources include: learning platforms (e.g., module and quiz logs, simulators, mobile apps, MOOCs); immersive environments—virtual/augmented/mixed reality (e.g., hand trajectories, collision paths, controller pressure, reaction time); support tools (e.g., chatbots/LLMs: type of intervention, effectiveness after a hint); and devices/sensors (e.g., eye-tracking, haptic controllers, location beacons). Consistent recording of these data in interoperable standards (xAPI/IEEE 9274.1.1–2023, Caliper Analytics) enables real-time progress monitoring and powers personalization algorithms and “next-step” recommendations (Hernández-de-Menéndez et al., 2022; Experience API overview, 2024; 1EdTech/Caliper; da Silva Soares Jr. et al., 2023; Liu, Cui, 2025; Abdelrahman, Wang, Nunes, 2023; Ban, Qi, He, 2024).

4. Discussion

The findings of the literature review confirm that applications of AI in employee training lead to a higher level of personalization and better learning outcomes compared with traditional approaches. This aligns with the Society 5.0 paradigm, which emphasizes a human-centric fusion of the physical and digital spheres (Alasfour, Alsmaeel, 2025; Kestin et al., 2025; Hrytsenko et al., 2024; Uddin et al., 2025; Smith, Taylor, Underwood, 2024; Chigbu, Makapela, 2025). In this view, AI does not replace the human being; rather, it strengthens learners’ agency and autonomy, ensuring inclusion and transparency of system decisions. Addressing the first research question posed in the Introduction, the key mechanisms – Knowledge Tracing (including xKT), Reinforcement Learning, Contextual Bandits, LLM tutoring, and VR-operate by continuously estimating an employee’s proficiency, accurately selecting the “next step”, and providing real-time explanations and guidance. This configuration supports optimal cognitive load and faster mastery, which explains the observed advantages over traditional training conditions (Abdelrahman, Wang, Nunes, 2023; Sarsa, Leinonen, Hellas, 2022; Bai et al., 2024; Lan, Baraniuk, 2016; Cai et al., 2021; Memarian, Doleck, 2024; Mon et al., 2023; Kestin et al., 2025; Vanzo, Chowdhury, Sachan, 2025; Tashev et al., 2023; du Plooy, Casteleijn, Franzsen, 2024). Results from meta-analyses/reviews suggest that intelligent tutoring systems and adaptive platforms increase learning outcomes and employee engagement, while the latest randomized controlled trials with LLM tutors indicate significant knowledge gains relative to comparison conditions (Kestin et al., 2025; du Plooy, Casteleijn, Franzsen, 2024). We interpret this as the effect of better “next-step” selection and immediate feedback, consistent with the logic of personalization within the Society 5.0 paradigm.

With respect to the second research question, there are additional, concrete organizational benefits: cost reductions (materials, travel, trainer time), automation of content preparation and formative assessment, and shorter time needed to reach the required competence level. This occurs thanks to immediate feedback and continuous monitoring of progress (Masrek, Anuar, Mazlan, 2025; Smith, Taylor, Underwood, 2024; Pesovski et al., 2024; Hrytsenko et al., 2024; Chen, 2023). The scale of these effects, however, depends on human oversight, the quality and completeness of data, and system interoperability. In relation to the second question, AI systems—by aggregating data on the course of training—enable continuous program optimization: identifying skill gaps, evaluating the effectiveness of interventions, and forecasting development needs, which supports a closer alignment of competencies with job roles and the organization's dynamic requirements. A practical precondition for scale remains an interoperable data infrastructure (e.g., xAPI/Caliper/LTI) that enables combining evidence from multiple tools and auditing personalization decisions.

The magnitude of adaptive effects in VR depends on the fidelity of simulation and the quality of sensory channels: precise motion tracking (head, limbs, whole body), haptics that reproduce resistance and texture, eye tracking that allows monitoring of attention/procedures, and spatial audio synchronized with head movements all increase presence and make feedback more realistic, which helps reduce errors and improves transfer to the workplace. At the same time, richer sensing yields more accurate learning traces (trajectories, reaction times, gaze patterns) that power personalization models and effectiveness audits; without adequate signal quality, adaptation and evaluation may be distorted (see Cyrek, 2025). Proper calibration and hardware comfort condition data reliability; poor tracking or haptics can artificially increase cognitive load. Events from VR (trajectories, collisions) should be recorded in xAPI/Caliper to enable session comparison and personalization audits. Eye-tracking and facial expression data are sensitive and thus require data minimization, purpose limitation, and clear access rules (audit logs).

Masrek, Anuar, and Mazlan (2025) cite examples of platforms/tools that, in their view, offer cost-effective and innovative solutions. From an organizational standpoint, the greatest value of these tools is the shortened time needed to professionally prepare training materials and deploy them on appropriate platforms. Solutions that convert text (e.g., training scripts, blog posts, PDFs) into short video modules reduce time-to-content and facilitate iteration (Lumen5, 2024). Likewise, AI-supported translation and copy-editing enable rapid adaptation of courses to multiple languages and communication styles (DeepL Translator/Write, 2024), which is crucial for distributed teams. Video with synthetic narrators/avatars (Synthesia, 2024) scales the production of training clips without a recording studio, offering ready-made avatars and multilingual voice tracks. This increases accessibility and deployment speed, though it requires clear ethical and licensing rules. On e-learning platforms it is possible to create interactive and adaptive training courses that monitor learner progress (Articulate 360, 2024). Writing-assistance tools (QuillBot, 2024) support the creation and refinement of written

training materials—assignments, quizzes, scripts, and summaries. These tools fit the Society 5.0 paradigm because they deliver individualized, multimedia, multilingual resources to trainees more quickly.

Analysis of learner behaviors and data exploration make it possible to quantify effects (e.g., time on task, rate of progress, share of correct responses) and dynamically adjust pathways and content based on feedback, thereby reinforcing personalization mechanisms (Sha Ri Na, 2023).

At the same time, AI implementation entails challenges: data protection, mitigation of algorithmic bias, and provision of adequate technological infrastructure (Rane, Choudhary, Rane, 2023; Pandya, 2024; Aldyandra, 2024; Madhumithaa et al., 2025). To keep the Society 5.0 vision human-centric, clear ethical principles are necessary—data privacy and security, system transparency, human oversight, and respect for learners' agency (Chigbu, Makapela, 2025; Smith, Taylor, Underwood, 2024). Authors emphasize the need to balance technological innovation with ethical requirements so that integrating AI into personalized and adaptive educational environments is both responsible and effective (Rane, Choudhary, Rane, 2023; García-López, Trujillo-Liñán, 2025). In practice, this means regular algorithm audits (monitoring for bias, side effects, and feedback quality) and the establishment of concrete ethical frameworks for learning analytics (García-López, Trujillo-Liñán, 2025).

5. Summary

This literature review covering 2020-2025 indicates that AI-based solutions raise the level of personalization in employee training and are associated with better outcomes than traditional approaches. Beyond the didactic effect, organizations see benefits such as cost reductions, automation of content development and assessment, and shorter timelines for delivering and scaling programs. The effectiveness and auditability of these solutions increase when an organization maintains an interoperable learning-data infrastructure (xAPI/Caliper) and applies human oversight to interactions with AI models. From the Society 5.0 perspective, AI-driven personalization supports inclusive competence development and accelerates reskilling, provided data governance and bias risks are managed responsibly.

This article has several limitations. First, the literature review relied on scholarly databases – Google Scholar, Scopus, and ScienceDirect—which may have constrained the number and quality of retrieved works. Second, the search used specific keyword combinations with Boolean operators, which may have led to the omission of relevant publications and, consequently, narrowed the spectrum of other authors' perspectives.

The article focuses on English-language literature published mainly between 2020 and 2025 and only to a limited extent engages earlier work. Narrowing the review to the pandemic and post-pandemic period increases comparability across AI model generations but may omit prior studies. There is also a risk of selection bias stemming from including only those publications the author considered most valuable.

The analysis presented is secondary (literature-based) and does not include primary data. Although it synthesizes findings from multiple studies, it does not provide new empirical evidence. Despite these limitations, the article can serve as a foundation for further practice-oriented research.

The literature points to the need for additional studies and long-term evaluations in real-world settings (i.e., workplace environments), further development of personalization models, and assessment of how data interoperability (xAPI/Caliper/LTI) affects the quality and auditability of personalization (Bai et al., 2024; Bhutoria, 2022).

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MANAGING ACCESSIBILITY IN THE HEALTHCARE SERVICE LIFE CYCLE – SYSTEMATIC LITERATURE REVIEW

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Theoretical background: Contemporary healthcare systems are defined in management sciences as complex adaptive systems (CAS), in which service availability is a critical determinant of public safety and clinical outcomes (National Academy of Engineering [NAE], 2008). Traditional service management frameworks, in particular the evolution from the process-centric ITIL v3 model to the value-oriented ITIL 4, provide the theoretical foundation for optimising these services (2019). However, the healthcare sector faces unique challenges, such as organisational silos, resource shortages and new legal imperatives arising from the European Accessibility Act (EAA).

Purpose: The main objective of this study is to analyse and evaluate the integration of availability management (AM) practices into the medical service lifecycle. The study focuses on how management decisions at the design and planning stages affect operational efficiency, reduce patient waiting times, and eliminate functional barriers for people with special needs (Sever, 2024).

Methodology: The study used a Systematic Literature Review (SLR) following PRISMA guidelines. The analysis covered peer-reviewed publications from 2014-2025 from the Scopus, Web of Science and PubMed databases, as well as our own bibliographic data, focusing on the intersections of ITIL theory and operational management in medicine (Toleman et al., 2023).

Findings: A review of the literature reveals a significant implementation gap (know-do gap) between theoretical management standards and their practical application in healthcare organisations (Morris et al., 2011). Organisational silos and a lack of management commitment (67% of managers are unaware of the implications of EAA) are the main barriers to proactive planning. The results suggest that a shift towards a "patient life cycle" orientation and co-creation enables a better match between resources and demand and improves the accessibility of these services to patients at many levels.

Practical and social implications: Above all, the authors emphasise a holistic approach to ensuring accessibility throughout the life cycle of a healthcare service. Moving away from isolated measures and incorporating the service life cycle into the analysis improves not only accessibility but also the effectiveness of healthcare services. A broader view of the processes of creating health services enables systemic optimisation in ensuring patient health, rather than merely improving medical procedures (suboptimisation).

Originality/value: The issue of accessibility should be viewed systematically. In terms of services, especially medical services, this identifies significant potential for re-engineering to improve effectiveness, costs, and, of course, accessibility. The article's originality manifests in two aspects: on the one hand, it links the accessibility of medical services to the service and patient life cycles; on the other hand, it recognises their role in co-creation. The literature on the subject fails to connect these two aspects. In particular, accessibility issues should be considered holistically rather than in a point- or segmental manner, as healthcare services are often delivered over time and are correlated with other aspects of patients' lives.

Keywords: accessibility management; medical service life cycle; healthcare; operational efficiency; organisational barriers; European Accessibility Act.

Category of the paper: Research paper.

JEL: I11; I18; M11; L84.

1. Introduction

This article is a systematic literature review on availability management (AM) in the medical service life cycle. The work integrates the classic service management framework (ITIL v3/ITIL 4) with modern co-creation methodologies and the legal requirements of the European Accessibility Act (EAA).

The main objective of the article is to identify and assess the impact of an integrated service lifecycle management model on the operational efficiency of healthcare entities and the availability of the services they provide, with particular emphasis on organisational barriers and the needs of people with functional limitations.

The study focuses on how management decisions made at the planning and design stages of processes translate into greater accessibility of these services for patients and greater comfort during service provision.

Justification for choosing the health services sector

The decision to limit the analysis to healthcare services rather than general services is dictated by their unique operational and social characteristics, as well as their great importance to society and to each individual. Four key factors are worth noting here:

- A. Criticality and ethical imperative: In medicine, the "unavailability" of a service (e.g., no free beds, patient data system failure) directly threatens life and health, which distinguishes it from the commercial sector (World Health Organisation, 2024). Availability management is based on the principles of *beneficence* and distributive justice (O'Sullivan et al., 2022).
- B. Systemic complexity (Complex Adaptive Systems): Healthcare is defined as a "system of systems" in which independent agents (doctors, patients) respond to changes in a non-linear manner, often using informal workarounds, which makes process management much more difficult than in linear services (National Academy of Engineering [NAE], 2008).

- C. Population specificity and inclusiveness requirements: This sector serves the most excluded groups. In Poland, people with special needs account for 35-50% of the population, and in the 85+ age group, as many as 70-75% of people declare functional limitations. (Central Statistical Office, 2024). Global reviews show that people with disabilities and other structurally marginalised groups experience systemic barriers at all levels – from the cost and organisation of services, through logistics, to stigmatisation and lack of accessible information (Gréaux et al., 2023; Hemihemi et al., 2020; Scheffler et al., 2015; Chiarenza et al., 2019). Even when systems formally ensure accessibility (infrastructure, services), the way services are organised and the prevailing logic of efficiency can lead to a mismatch between services and the real needs of people in difficult situations, as shown, for example, in oncology and primary health care (Horrill et al., 2025; Scheffler et al., 2015; Mazibuko et al., 2024).
- D. Legal framework of the European Accessibility Act (EAA): Directive 2019/882 imposes mandatory accessibility requirements on healthcare providers, with non-compliance resulting in penalties of up to 5% of annual turnover and the risk of losing public contracts (European Commission, 2025; Act on the Accessibility of Products and Services, 2025). Legal analyses emphasise that the effectiveness of the EAA will depend on whether Member States adopt an approach that truly harmonises standards and covers both technical requirements (e.g. compliance with WCAG 2.1) and enforcement mechanisms (Drabarz, 2020; Michtner, Pinzolit, 2025; Jankowska, 2021). Studies of current accessibility of digital services (e.g., VOD platforms) point to significant gaps in keyboard navigation, contrast, compatibility with screen readers, and media alternatives, underscoring the scale of implementation challenges for healthcare entities (Michtner, Pinzolit, 2025).

In this context, accessibility management in the healthcare service lifecycle must combine an operational perspective (ITIL/AM) with regulatory requirements (EAA) and "design for all" and universal digital design approaches (Drabarz, 2020; Michtner, Pinzolit, 2025; Jankowska, 2021).

Research gap

Given the importance of healthcare service management, it is also worth noting gaps in the scientific literature in this area. Despite numerous studies on the medical and organisational aspects of treatment, there is a clear gap in the management literature in three areas:

- Implementation (Know-do gap): There are no specific guidelines for medical facility managers on how to adapt the service management framework step by step in everyday clinical practice.
- Lack of a holistic approach to processes: Most studies focus on the management of a selected element (e.g., only drug logistics or only doctors' working time), ignoring accessibility as a coherent process that spans from the moment the Patient enters the system until the end of care.

- **The human factor in management:** The impact of medical staff resistance to new process management methods on the final availability of services has not been sufficiently researched.

There is therefore considerable potential for improving medical service delivery processes in terms of both organisation and cost.

To prepare empirical research that could fill the gaps identified above, it is worth reviewing, inventorying, and systematising the existing scientific achievements in this area, especially in the fields of management and quality sciences.

Research questions

As part of a systematic review of the literature, answers were sought to the following research questions.

RB1: How has the approach to service management evolved? RB2: What role does accessibility play in service management?

RB3: To what extent can the concept of service life be used to ensure availability?

Research hypothesis

To maintain methodological correctness, a research hypothesis was also formulated.

H1: Implementing a holistic model of medical service lifecycle management increases patient accessibility, especially for those with special needs.

The article does not propose a quantitative measure of the impact's strength, but only presents arguments supporting the hypothesis.

2. Search strategy and PRISMA model

The research process, based on a systematic review of the literature, was systematised and developed using our own bibliography and search results from scientific bibliographic databases (WoS, Scopus, PubMed), supported by AI tools such as Consensus, Notebook LM, Perplexity, Scopus AI, Gemini, and ChatGPT. The following summary includes the search strategy, the PRISMA selection criteria, and the assignment of identified literature to help answer the research questions and support the verification of the research hypothesis.

The search strategy was based on a multi-stage approach combining classic service management nomenclature (ITIL) with modern concepts (Health 4.0, Co-creation) and legal requirements (EAA). Databases were Web of Science, Scopus, PubMed. Time frame 2014-2026 (updated with the latest records from 2026 available in the Scopus database). Detailed keywords in the area of:

- Management and processes: Availability Management, Service Lifecycle, ITIL 4, Service-Dominant Logic, Operational efficiency.
- Sectors and technologies: Healthcare 4.0, Digital health platforms, Welfare technology, Medical Things (IoMT).
- Accessibility and inclusivity: Accessibility barriers, European Accessibility Act (EAA), Patient wait time, Gender-affirming care access, Inclusive Design.
- Methodologies: Co-creation, Service Design, Value co-creation, Design Thinking.

PRISMA model (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).

The flow of information through the various phases of a systematic literature review is presented below.

Stage 1: Identification

At this stage, all records found in the databases using the defined keywords (availability management, service lifecycle, healthcare operations, co-creation) were counted.

Total number of records identified in the databases: 3,596 (Scopus database 3,034, Web of Science (WoS) 559, PubMed: 3, records identified from other sources 15). Manually added items from the so-called grey literature, EU reports on the EAA, government websites, e.g. European Accessibility Act, and WHO reports cited in the bibliography. Total: 3611 records.

Stage 2: Screening

At this stage, the number of articles was reduced the most. Duplicates were removed: 650 items. The WoS and Scopus databases largely index the same journals. It is estimated that approximately 20-30% of the results overlap. Number of records after removing duplicates: 2961.

Review of titles and abstracts (Screening) excluded 2811. The reason for the mass exclusion was that keywords such as "lifecycle" or "availability" in medicine yield many results unrelated to management, e.g.:

- The biological life cycle of parasites/viruses (instead of the life cycle of a service).
- Availability (bioavailability) instead of organisational availability.
- Technical availability of servers without a medical context.
- Articles on agriculture or freight transport (e.g. records on "freight rates" or "agribusiness").

Number of records that qualified for full-text evaluation: 150.

Stage 3: Eligibility

At this stage, the content of 150 selected articles was analysed in detail with respect to research questions and inclusion criteria. Full-text articles evaluated: 150, Articles excluded at this stage: 44. The reasons for exclusion were an overly general approach, lack of reference to organisational barriers, articles older than the assumed scope (unless they were key theories such as ITIL/SDL), and lack of access to the full text.

Stage 4: Inclusion

Final number of articles included in the synthesis (and bibliography) was 120. This is a collection of articles that were directly used to write the text, to verify the hypothesis, and to answer the research questions PB1, PB2, and PB3.

The selected literature has been assigned to specific research questions, combining the theoretical basis with the latest scientific research results from 2025–2026, supplemented with older analyses.

PB1: How has the approach to service management evolved?

The answer to this question is that there has been an evolution from processes (ITIL v3) to value ecosystems (ITIL 4, SDL) and network platforms. In particular: ITIL transformation and service logic:

- Barcikowski (2016) and Harjanto (2024): The foundation for the transition from lifecycle (v3) to value chain (v4).
- Schmidt, R., Zimmermann A. (2026). The latest study (using Alexa as an example) shows how *Service-Dominant Logic* (SDL) works in networked assistant platforms. This is key to understanding how health services can benefit from external ecosystems.

Health 4.0 and Innovation Ecosystems:

- Al-Jaroodi et al. (2020). Defines Health 4.0 as the integration of IoT and management processes.
- Hoveskog et al. (2026). A case study (Polestar) showing how a peripheral supplier can become a key player in a mature innovation ecosystem – an analogy for medical entities entering digital health networks.
- Dal Mas et al. (2023). Challenges of digital transformation in healthcare.

PB2: What role does accessibility play in service management?

The answer may be that accessibility is a critical operational (time and resources) and legal ethical (equality and EAA) parameter.

Operational and measurable availability:

- Cavalcanti et al. (2022). Analysis of factors influencing wait time – a key indicator of availability.
- Nucamendi-Guillén et al. (2026). A mathematical logistics model (Location Routing Problem) that minimises customer waiting time by optimising routes and locations – hard evidence of the role of management in availability.
- Levesque et al. (2013). Conceptualisation of the 5 dimensions of availability (including Approachability and Affordability).

Barriers and specific groups (Inclusiveness):

- Puckett et al. (2018). Identification of systemic barriers to healthcare access for transgender people – evidence of the need for inclusivity management.
- Frishammar et al. (2023). Barriers to seniors adopting digital platforms.

- Drabarz (2020) & Michtner (2025): The role of the European Accessibility Act (EAA) and gaps in digital accessibility.
- Gréaux et al. (2023). Global overview of barriers for persons with disabilities.

PB3: To what extent can the concept of service lifecycle be used to ensure accessibility?

The answer is that, with the help of co-creation in the early stages of the life cycle and staff training, accessibility can be ensured by using service lifecycle concepts: Co-creation and Design:

- Teig, G.-S., Gjerstad (2026). A key study shows that technologists (suppliers) and health managers must *co-create* solutions for welfare technology to be useful in primary health care.
- Jiang et al. (2026) indicate that reputation and trust are key to value co-creation behaviours on platforms, which applies to e-patients. The article provides the latest evidence on what factors (e.g., *prosocial motivation, relational embeddedness*) motivate users to share knowledge and co-create value on digital platforms.
- Voorheis et al. (2025). Applying *Service Blueprinting* to Integrated Care Design. The article directly discusses the application of Service Blueprinting (service process mapping) and Journey Mapping (patient pathway mapping). These are fundamental tools in service lifecycle management, allowing "pain points" and accessibility barriers to be identified before a service is implemented.
- Östberg et al. (2026). The role of engagement and motivation in co-creation ecosystems in rural areas is important for accessibility outside metropolitan areas.

Competencies in the life cycle:

- Hsu & Sung (2026). Using *service-learning* to build cultural competence and empathy in medical students – preparing staff to serve diverse patient groups is part of service lifecycle management (human resources).

Verification of Hypothesis (H1)

Hypothesis H1: *The implementation of a holistic model of medical service life cycle management increases its accessibility for patients, especially those with special needs.*

Based on the compiled literature, the hypothesis has been validated (qualitatively confirmed):

1. Technological Argument: Articles from 2026 (Teig, Gjerstad-Sørensen, Gjerstad, 2026; Schmidt, Alt, Zimmermann, 2026) prove that the isolated implementation of technology (without holistic *co-creation*) leads to failure. Only the cooperation of technologists with medical staff at the *design* stage (the beginning of the life cycle) guarantees usability and final accessibility.

2. Operational Argument: Nucamendi-Guillén and Cavalcanti demonstrate that optimising logistics and location processes (elements of cycle management) directly reduces waiting times, thereby increasing temporal accessibility.
3. Social Argument: Research on barriers faced by marginalised groups (Puckett et al., 2018; Horrill) indicates that "inaccessibility" results from systemic mismatches. A holistic approach (including *cultural competence* according to Hsu and *Service Design* according to Voorheis) enables these barriers to be systematically eliminated rather than only on an ad hoc basis.

3. Accessibility management in services: experience to date

Significant progress has been made in the provision of individual services, such as transport. Means of transport, especially public transport, are primarily equipped with facilities ensuring accessibility for people with physical disabilities – low-floor buses and trams, lifts and platforms at vehicle doors, spaces for people in wheelchairs or with prams or large luggage, seats for older adults, pregnant women or people with small children, etc.

There are more and more parking zones designated for people with disabilities, and parking spaces reserved for families with children (e.g., near shops). Voice announcements about the route are becoming standard in public transport and trains. Markings for blind or visually impaired people are installed on transport routes, pavements and crossings to indicate stairs, thresholds, platform ends, etc. Appropriate Braille inscriptions appear on handrails, lift and stair control buttons, vending machines, ATMs, ticket machines, etc. Traffic lights at pedestrian crossings are also equipped with audible signals and other features. Installation of information screens with the option to enlarge images or fonts via touchscreen, or to activate audio description mode.

Significant progress is being made in the field of accessibility, wherever it can be ensured through quick, one-off investments – the installation of equipment and the arrangement of space described above ensure accessibility in various aspects. However, there are several services for which ensuring accessibility requires actions that continue throughout the service's entire duration, which can be many years or even the service's entire life cycle. The management of such services, especially in terms of accessibility, is very often carried out in a fragmented manner. Examples of such services include:

- 1) Financial services (bank account management, loans, credits, leasing, etc.).
- 2) Telecommunications services (telephones, internet access, cloud access to virtual drives, applications, etc.).

- 3) Medical services (diagnostics, treatment, rehabilitation).
- 4) IT services (implementation, maintenance and development of IT systems in organisations).

In financial services such as bank account management, loans, or credit, the focus on accessibility is most often concentrated on the stages of contract conclusion, informing customers about changes to terms of service and contract annexes, etc. Measures to ensure accessibility most often take the form of simplifying the language used in these documents and providing translations, e.g. into sign language, audio description or Braille.

The situation is similar in telecommunications services, where customers can receive similar support to that available in financial services.

A common feature of these services is the lack of customer involvement in their creation or configuration. The customer obviously has a choice between service providers, but at this stage, the customer's active role usually ends. The services offered are limited.

4. The evolution of availability management paradigm in ITIL v3 vs ITIL 4

The transition from ITIL v3 to ITIL 4 in 2019 represented a fundamental change in service delivery philosophy, evolving from a process-based structure to flexible, value-oriented practices (Harjanto, 2024).

4.1. ITIL v3: Service Lifecycle

The ITIL v3 model was based on a linear approach divided into five stages: Strategy, Design, Transition, Operation and Continuous Improvement (Barcikowski, 2016). Availability Management (AM) was defined here as **a process** within the *Service Design* phase responsible for ensuring that the infrastructure and support resources are at a level that guarantees fulfilment of the availability targets agreed in the Service Level Agreements (SLAs). For example, the work of Wang et al. on availability management and SLAs emphasises that service availability is defined in SLAs, and ITIL processes (including AM) are used to achieve these availability levels (Wang et al., 2018).

Key characteristics of AM in ITIL v3:

- **Process approach: roles, sequence of activities** - In works implementing ITIL v3, AM is treated as a formalised process with defined activities, procedures, and responsibilities, documented in the form of an "availability management plan" together with policies, standards, and service recovery procedures (Zeng, 2008). This supports the aforementioned thesis about the validity of the "process approach" and assigned operational roles.

- Reactive measures: Monitoring and analysis of incidents and problems causing unavailability (Zeng, 2008).
- Proactive activities: Planning and designing redundancy mechanisms to eliminate single points of failure (SPoF). Zeng's case study demonstrates the use of availability engineering and block modelling to design high-availability solutions, including the identification of critical elements and the selection of an architecture that minimises downtime risk (Zeng, 2008).

4.2. ITIL 4: Service Value System

ITIL 4 has transformed the rigid lifecycle into a flexible Service Value System (SVS) that promotes a holistic approach to ITIL 4 management. It is a flexible, integrated system focused on value creation. Availability management is no longer a process confined to the design phase but has become **a practice** that permeates the entire service delivery value chain (Harjanto, Aji, 2024; Ayuh, Chernovita, 2021).

The main changes introduced in ITIL 4:

1. From Processes to Practices: A practice is a set of organisational resources (people, technology, processes, partners) designed to perform work (Palumbo, 2016; Grindell et al., 2022; Ciasullo et al., 2022).
2. *Value Co-creation*: Value is no longer "delivered" to the Patient but is co-created through interaction between medical staff and the Patient (Batalden et al., 2015). In healthcare, co-creation and coproduction of services mean patient-professional partnerships, mobilisation of patient resources, and participation in the design of care pathways. Systematic reviews show that co-approaches (coproduction, co-design, co-creation) promote better-tailored interventions, a sense of ownership and a greater chance of implementation, although evidence of hard health outcomes is still limited (Grindell et al., 2022; Palumbo, 2016; Palumbo, Manna, 2018; Ciasullo et al., 2022; Palumbo, 2021).
3. Four Dimensions Model: AM must consider (1) Organisations and people, (2) Information and technology, (3) Partners and suppliers, and (4) Value streams and processes (Palumbo, 2016; Grindell et al., 2022; Ciasullo et al., 2022).
4. Guiding Principles: Introduction of 7 principles, such as (Palumbo, 2016; Grindell et al., 2022; Ciasullo et al., 2022; Richter, Lantow, 2021):
 - a. Focus on Value: All activities should be linked to creating value for customers and stakeholders.
 - b. Start where you are: Do not start from scratch; leverage what already exists by assessing current processes, services, and tools.
 - c. Progress iteratively with feedback: Break the work down into smaller, more manageable pieces, continuously gathering feedback to adapt and improve quickly.

- d. Collaborate and promote visibility (Collaborate and promote visibility): Collaboration between teams and knowledge sharing (visibility) are key to better results.
- e. Think and work holistically: Look at the system as a whole – at all its parts and their interrelationships, not just at individual elements.
- f. Keep it simple and practical: Avoid unnecessary complexity; focus on simple, practical solutions that deliver value.
- g. Optimise and automate: Use technology to automate repetitive tasks and optimise processes to increase efficiency.

Many concepts, methods and tools developed to improve IT project management are being implemented in other fields of knowledge. This was the case with the concept of Agile developed by programmers Ken Schwaber, Jeff Sutherland and 15 other signatories of the Agile Manifesto (Manifesto for Agile Software Development...). This concept revolutionised the way multiple projects are managed. Today, a similar situation applies to the ITIL standard for IT service management with the transition from version v3 to v4.

5. Availability Management (AM) in healthcare

In a medical context, this evolution represents a shift from technical equipment maintenance (v3) to strategic patient pathway management (v4). In the medical context, this evolution means a shift in emphasis from technical maintenance of equipment to strategic patient pathway management based on integrated, patient-centred care pathways (an integrated, process-based system for managing the Patient's journey through the system, rather than solely technical maintenance of resources) (Gartner et al., 2022; Sanseverino et al., 2024). It is crucial to identify critical business functions – such as ensuring accessible booking appointments for people with disabilities or immediate access to Electronic Medical Records (EHR) in emergencies – because these are what determine an organisation's readiness to provide equal/accessible and safe care (Mudrick et al., 2020; Rotoli et al., 2023; Halkides et al., 2022).

An important aspect of accessibility management is co-creation in healthcare. Unlike manufactured products, services are always co-created by the professionals providing them and the users of those services (Batalden et al., 2015). Coproduction (co-creation) in healthcare is a practice of collaboration between clinicians, researchers, policymakers, health system managers, and other professionals, working in genuine partnership with patients and the public to improve health outcomes (Dingelstad et al., 2025). The adoption of co-creation processes is critical at all stages of healthcare planning and policy, care and treatment, education, research, publication, and funding processes (Fusco et al., 2020; Fusco et al., 2023; Smith et al., 2022). Research shows that effective co-creation requires a process with a well-

defined goal (Masterson, 2024; Litchfield, 2025). The implementation of co-delivery with peer support enables service users' engagement to be placed at a higher level of the "co-creation ladder" (Fusco et al., 2020; Åkerblom, Ness, 2022). Co-creation builds on the principles of person-centred care and communication, where the knowledge and experience of care users are valued and respected on an equal footing with professionals' knowledge (Grindell et al., 2022; Litchfield, 2025; Knowles et al., 2021; Farr et al., 2021). This requires a collaborative environment with clear goals and genuine, early involvement of all stakeholders. In balancing multiple perspectives, co-creation is often an iterative process, requiring a culture of openness and honesty, as well as humility and understanding for all involved.

An analysis of the medical sector's preparedness for upcoming legal changes reveals a significant gap in terms of competence and infrastructure. Consultations conducted in 2024 by the All-Poland Alliance of Trade Unions (OPZZ) in cooperation with Healthcare Employers revealed critical barriers in non-public medical facilities (Fundacja Widzialni, 2024; All-Poland Alliance of Trade Unions & Healthcare Employers, 2024). These results correlate with data presented by the Widzialni Foundation, according to which as many as 67% of managers surveyed entities lack basic knowledge of the obligations arising from the European Accessibility Act (EAA).

Particularly worrying is that 82% of management staff have not participated in any accessibility training in the last 2 years. The lack of a systematic approach is manifested, among other things, by the absence of dedicated budgets for digital audits (WCAG compliance) and by a reactive model of removing barriers, initiated only in response to direct patient complaints. The implementation of the EAA, which expires in June 2025, therefore requires immediate intensification of educational and auditing activities in the private sector. Analysing the above description, a detailed analysis of the key barriers hindering the process of adapting medical facilities to accessibility standards can be made:

1. Knowledge and awareness gap – Low level of knowledge about accessibility/health literacy in organisations and the resulting need for basic education and staff engagement (Fundacja Widzialni, 2024; Ogólnopolskie Porozumienie Związków Zawodowych & Pracodawcy Ochrony Zdrowia, 2024; Pelizzari et al., 2025).
2. Deficit of technical and organisational resources - Institutions often lack the technical resources (IT infrastructure, accessibility audit tools, WCAG-compliant content management systems) and organisational resources (dedicated accessibility personnel, change implementation procedures, adaptation budgets) necessary to implement accessibility requirements effectively (Nascimento et al., 2023, Kooij et al., 2018, Granberg, 2025). This problem is particularly acute in small and medium-sized institutions, which constitute the majority of non-public healthcare entities in Poland.

3. Lack of systematic analysis of barriers. Most facilities do not conduct systematic analysis of accessibility barriers or formally identify the needs of patients with special needs. This means that decisions regarding infrastructure or process adaptations are made on an ad hoc basis, often in response to specific complaints or incidents, rather than as part of strategic, data-driven planning (Jonsson et al., 2023; Roy, Shoshi, 2025).
4. Lack of user participation. Facilities rarely involve patients, including those with special needs, and community organisations in the process of designing accessibility solutions (Henni et al., 2022). Meanwhile, international best practices clearly indicate that effective accessibility implementation requires co-creation of solutions with end users, in accordance with the principle of "Nothing About Us Without Us" (Albert et al., 2023).
5. Lack of applied research. There is also a lack of national applied research that would comprehensively identify factors facilitating and hindering the adaptation of health services to EU standards and indicate possible implementation scenarios for the non-public sector. A review of Polish literature and databases (BazEkon, CEJSH, Google Scholar) did not reveal any publications on the implementation of the EAA in Polish healthcare facilities published after 2023. Existing studies are primarily legal (analysis of the provisions of the directive) or technical (WCAG guidelines) in nature, but do not provide knowledge about organisational processes, stakeholder cooperation models or change management methods in the context of accessibility implementation. This research gap has serious practical consequences. Institutions do not have access to reliable, evidence-based guidance on how to effectively implement EAA requirements in a manner adapted to the realities of the Polish healthcare system, budgetary constraints, and the organisational specifics of the non-public sector (Jonsson et al., 2023; Roy, Shoshi, 2025).

In addition to the barriers described above, the literature on the subject also points to the gaps already mentioned in the introduction:

- The implementation gap (*Know-do gap*). A significant discrepancy between theoretical management standards and their practical adaptation by medical managers (Morris et al., 2011; World Health Organisation, 2006; Westerlund et al., 2019). Scoping and systematic reviews in the field of e-health and accessibility for people with disabilities highlight the discrepancy between the growing number of pilot interventions and their permanent integration into systems (Kaboré et al., 2022). Interventions are often not mapped to identified barriers, have unclear funding, and rarely include groups with complex, intersectional situations (Gréaux et al., 2023; Doherty et al., 2020; Marcus-Quinn, 2022; Zhou, Parmanto, 2018).
- Lack of process holism. Most studies focus on optimising isolated fragments (e.g. medicine logistics), overlooking accessibility management as a coherent *end-to-end* process (Eastwood, 2025). Most research on accessibility focuses on individual segments of the chain (e.g., telemedicine, rehabilitation, access to a general

practitioner), while relatively few studies treat accessibility as a managed, cross-cutting process covering successive points of contact between the Patient and the system (Anawade et al., 2024; Scheffler et al., 2015; Mazibuko et al., 2024).

- Human factors and cultural resistance. The impact of specific resistance among medical staff to formalised management methods on the final level of service availability (Wears, Sutcliffe, 2020). Research on the implementation of digital solutions and equity-oriented healthcare indicates that staff concerns, lack of resources, organisational stress and dominant discourses of efficiency ("doing more with less") hinder the adoption of solutions that enhance accessibility, despite formal institutional commitments (Horrill et al., 2025; Gréaux et al., 2023; Marcus-Quinn, 2022; Chiarenza et al., 2019).

A review of the literature also shows that the tendency to create organisational silos in hospitals (divisions into medical, administrative, and technical departments) hinders cooperation and leads to bottlenecks, drastically reducing the actual accessibility of services (Eastwood, 2025; Trachsel, Fallegger, 2017).

Qualitative research on access to oncology services shows an apparent mismatch (Al-Jaroodi et al., 2020, Khelassi et al., 2019, Kotzias et al., 2022)¹ (between the way services are designed (priority of operational efficiency, segmentation, standardisation) and the complex needs of marginalised people; this results in barriers to booking appointments, interrupted care pathways and experiences of stigmatisation (Horrill et al., 2025).

Similarly, reviews of global barriers for people with disabilities point to staff unpreparedness, poor coordination, and the failure to adapt appointments and procedures to functional limitations as key determinants of inequality in access, alongside financial and transport barriers (Gréaux et al., 2023; Hashemi et al., 2020; Mazibuko et al., 2024).

6. A new approach to the concept/ model of healthcare management: Health 4.0

The idea of the Health 4.0 model stems from the Industry 4.0 concept (Schwab, 2016; Wang, Wang, 2016; Lampropoulos, 2019), which describes integrated production systems that use cyber-physical systems, the Internet of Things (IoT), artificial intelligence (AI), and data analytics. The transfer of these ideas into healthcare began in 2010-2015 and gained importance amid the digitisation of medical services and the personalisation of therapy.

¹ mismatch - a lack of alignment/discrepancy between expectations and reality, between a person and their environment, or between behaviour and values and remote patient monitoring.

The main areas of development for Health 4.0 are related to:

1. Integration of digital health ecosystems: interoperable information systems, electronic medical records (EMR/EHR), Hospital Information System (HIS) solutions, medical device systems with built-in intelligence (Al-Jaroodi et al., 2020; Khelassi et al., 2019; Kotzias et al., 2022; Osama et al., 2023).
2. Digitisation of care: telemedicine, m-health, wearable devices, big data analytics, AI in diagnostics and therapy (Aceto et al., 2020; Jayaraman et al., 2019; Osama et al., 2023).
3. Modularity and adaptability: flexibility of care management processes, digital collaboration between facilities, and data standardisation (Kotzias et al., 2022; Li, Carayon, 2021; Al-Jaroodi et al., 2020).

This enables the integration of prevention, diagnosis, treatment, and rehabilitation processes, i.e., the entire cycle of medical service provision, as well as the service's life cycle, combined with the Patient's life cycle.

The integration of advanced technologies (AI, Machine Learning - ML, Internet of Things - IoT, robotics, data analytics, cloud computing) with medical service management processes enables:

- a) data exchange between systems through interoperability and open data standards (e.g. HL7 FHIR, DICOM)^{2,3} (Kotzias et al., 2022),
- b) integration of healthcare ecosystems – hospitals, outpatient facilities, laboratories, research institutes – and placing the Patient at the centre of the network (Li, Carayon, 2021),
- c) real-time data analysis – AI/ML for assisted diagnostics, demand forecasting, patient flow management, resource optimisation (staff, rooms, equipment) (Al-Jaroodi et al., 2020),
- d) remoteness and telecare – real-time monitoring, teleconsultations, home care using wearables and medical IoT (Al-Jaroodi et al., 2020),
- e) personalisation of care – adaptive treatment plans based on genomic data, phenotypic data and patient preferences (Li, Carayon, 2021),
- f) security and compliance – cybersecurity, data privacy, regulatory compliance (e.g., GDPR) (Sisodia, Jindal, 2021),
- g) improvement of management processes: predictive resource management, cost optimisation, and quality and efficiency indicators (e.g., KPIs) (Al-Jaroodi et al., 2020).

² **DICOM** manages medical *images* (X-rays, MRIs) and their metadata, while **HL7 FHIR** (Fast Healthcare Interoperability Resources) handles broader clinical/administrative data (patient records, labs). **DICOM** manages medical *images* (X-rays, MRIs) and their metadata, while **HL7 FHIR** (Fast Healthcare Interoperability Resources) handles broader clinical/administrative data (patient records, labs).

The potential benefits of Health 4.0 include increased availability and quality of medical services, reduced waiting times, better resource utilisation, increased patient engagement, and personalised treatment. All this can be achieved in an adaptive, personalised and patient-oriented manner.

Health 4.0 management models have shown that the actual involvement of patients in the service management process – not just in individual clinical decisions – increases the efficiency of resource use and better aligns services with user expectations (Laurisz et al., 2023; Tang et al., 2025).

Levesque and colleagues have developed a comprehensive conceptualisation of healthcare access that describes the broad dimensions and determinants integrating demand- and supply-side factors (Levesque et al., 2013). In this model, access is defined as the ability to identify health needs, seek healthcare services, reach them, obtain or use them, and actually meet service needs. The model conceptualises five dimensions of accessibility: - Approachability – the ability of people to identify that services exist that can meet their health needs – Acceptability – social and cultural factors that determine people's ability and willingness to seek, reach and accept services - Availability and accommodation – the ability of services to reach patients and adapt service delivery to Patient needs - Affordability – the ability of patients to bear the costs of services and the time spent obtaining them - Appropriateness – the suitability of services to patient needs and the quality of services provided In this model, five population-related capabilities interact with the dimensions of availability to generate access: ability to perceive, ability to seek, ability to reach, ability to pay, and ability to engage (Levesque et al., 2013).

7. Conclusion

Based on a review of the literature, this article presents the premises for interest in healthcare service management, adopting a broader perspective that considers the service life cycle. It presents the origins and assumptions of the concepts, models, methodologies and tools used in service management, particularly in ensuring their availability. This answers the first research question.

In the context of the second research question, the growing role of accessibility as a cardinal factor in medical service management has also been demonstrated. On the one hand, this is enforced by national and European Union legislation, such as the Act on the Accessibility of Products and Services, 2025, and the European Accessibility Act (EAA) Directive 2019/882. On the other hand, service management concepts such as Health 4.0, participatory design, integration of patient service processes throughout their life cycle, and a holistic approach to

the provision of medical services are being developed. They place the Patient (recipient/customer/human being) at the centre of attention.

The examples presented show that integrating medical service management processes improves efficiency and accessibility. This is evidenced by the implementation of elements of the Health 4.0 model, which integrates medical processes (prevention, diagnosis, treatment and rehabilitation with the service life cycle and patient life cycle.

The issue of accessibility manifests throughout the entire duration of the medical service, where this service should be considered an integrated patient care process in the area of prevention through diagnosis, therapy and rehabilitation. This is the answer to the third research question.

Taking into account the entirety of the argument and the arguments presented, it can be concluded that the research hypothesis has been substantiated. The term "confirmed" has been deliberately avoided here, as it is challenging to formulate deterministic judgements in the social sciences. At the same time, fundamental hypothetical-deductive falsificationism (Popper, 1977) cannot be used, as according to this concept, a single observation of an anomaly would thoroughly falsify any hypothesis, and, as we know, scientific laws in the social sciences assume an internal margin of error³.

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³ The rationale for this judgement can be found in Jokiel G. (2006).

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PROSPECTS FOR THE COMPETITIVENESS OF THE VX VOIVODESHIP IN LIGHT OF GENERATION Z YOUTH RESEARCH

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Objective: The aim of this article is to present the main conclusions of a study conducted in 2025 on the situation of Generation Z in the labour market in one of the voivodeship of the eastern region of Poland (VX). The study focused on identifying the factors motivating and hindering the professional activity of Generation Z in the region and proposing measures to increase talent retention.

Project/methodology/approach: the research was conducted using Individual In-depth Interviews (IDI) with 20 representatives of Generation Z and 35 employers hiring Generation Z employees. These interviews were conducted in person without the use of remote communication. In addition, a Focus Group Interview (FGI) was conducted with 7 career counsellors from the region.

Findings: The main conclusions from the research concern the difference in values and attitudes towards work presented by Generation Z compared to previous generations (Millennials, Generation X, Baby Boomers). Several paradoxes were identified regarding declared vs. actual attitudes towards:

- the role of work in human life and work-life balance,
- the use of digital technology,
- Generation Z's entrepreneurship,
- cooperation in multigenerational (intergenerational) teams.

The identified paradoxes are significant for shaping the work environment in many organisations and require further in-depth research. The key research findings are the identification of realistic assessments of the same phenomena by young people and by employer representatives from earlier generations. The shift in perspective on these phenomena (described in the paradoxes above) also changes the approach and assessment of these phenomena by these same respondents.

Practical implications: The article provides a deeper understanding of the identified contradictions in the opinions and thinking of different generations. It debunks misleading stereotypes and beliefs about the degeneration of successive generations. It also points to the reasons for the erosion of trust in systemic solutions and Generation Z's lack of faith in social advancement. Based on this research, the approach to recruitment and shaping career paths for young people from Generation Z can be significantly changed.

Originality/value: The research findings reveal hidden internal contradictions in the attitudes and behaviours of young people from Generation Z in the workplace. They also challenge widespread stereotypes about the entitlement and laziness of Generation Z youth.

Keywords: Generation Z, work-life balance, paradox.

Category of the paper: Research article – presenting research results.

1. Introduction

At the request of one of the authorities in VX, research was conducted on activating the potential of young people in the region's labour market.

The main objective of the research was to identify the motivating factors and barriers to the professional activity of Generation Z in the region and to propose measures to increase talent retention.

The scope of the research conducted as part of this project was very broad. It ranged from determining the demographic conditions of young people in the regional labour market, through diagnosing the problems and challenges for young people in the face of digitalisation, the pandemic, and the VUCA/BANI world, to identifying the most effective processes for young people to acquire knowledge and skills. This article focuses on the factors supporting and barriers to the educational and professional activity of Generation Z, and in particular on the paradoxes identified in this area. Among them, the following are discussed:

- 1) The paradox of the role that work and the hierarchy of values related to the work ethic play in the lives of young people. On the one hand, there is a prevailing belief among Generation Z that work serves the pursuit of life passions, manifested in high flexibility of working hours, freedom of decision-making, and opportunities to change jobs and lifestyles. On the other hand, Generation Z values stability and job security or a good atmosphere in the work environment (Nichols, Smith, 2025).
- 2) Related to the previous issue is the work-life balance paradox. The assessment of the importance of this factor depends on the role represented by the respondent. The assessments of employers and employees in this area initially differed significantly. Interestingly, however, these assessments were flexibly modified in situations where there was a change of perspective, e.g. in a retrospective analysis of one's own behaviour (especially among employers).
- 3) The paradox of Generation Z's proficiency in using digital tools. On the one hand, Generation Z's natural ability to use these tools is noted, and they are referred to as digital natives for whom the virtual world is a natural environment that has existed since the beginning of their lives. On the other hand, it turns out that digital tools requiring in-depth knowledge, more effort and time to master their functionality pose a great challenge for Generation Z.

- 4) The Generation Z entrepreneurship paradox. On the one hand, decision-making independence, courage and assertiveness are important to Generation Z, but on the other hand, research has identified a low level of entrepreneurship, especially in terms of running a business on their own.
- 5) The paradox of cooperation in age-diverse (multigenerational) teams. It consists in the declarative appreciation of the benefits of knowledge diffusion between generations, e.g. digital skills from Generation Z to older generations and the diffusion of substantive knowledge and experience in the other direction. At the same time, Generation Z points to difficulties in communication and issues of dignity, such as respect and appreciation from older colleagues. Older generations, on the other hand, emphasise the soft skills deficits among Generation Z representatives, such as communication, empathy, loyalty, etc., which have been exacerbated by the pandemic.

There are definitely more paradoxes concerning Generation Z. Seyfi, Hall, and Strzelecka identify the Generation Z sustainable tourism paradox (2025), P. No formulates the paradox of connectivity, or the relationship between social media use and perceived loneliness among Generation Z (No, 2026), and Kang J.H. and Badal C identify the fashion consumption paradox among Generation Z students between sustainable and fast food fashion (2025). A significant number of scientific articles presenting Generation Z paradoxes can be found in the literature. Google Scholar alone has published 6070 publications after searching for the keywords "paradox and Generation Z" since 20025. Based on these observations, it can be argued that Z is a generation of paradoxes. The paradoxes described above can be interpreted as a manifestation of cognitive dissonance – a tension that arises when an individual holds contradictory beliefs or when their behaviour is inconsistent with their declared values (Festinger, 1957, pp. 1-3). In such situations, people seek to reduce dissonance by changing their attitudes, reinterpreting their behaviour or selectively perceiving information, which may explain the discrepancies observed in the study between the declarations and practices of Generation Z and employers, e.g. in the area of work-life balance or wage incentives (Festinger, 1957, pp. 17-22).

These issues will be described and analysed in more detail in the article.

Nationwide and global studies (Deloitte, 2024; Hausner, 2023; Hays, 2024; Maleszczyk, 2021, 2021; ManpowerGroup Polska, 2024; PwC, Well.HR & Absolvent Consulting, 2020; PwC, Well.HR & Absolvent Consulting, 2022; Richmond, 2024; Wyższa Szkoła Humanitas, 2023, etc.) indicate that Generation Z values flexibility, skills development and an organisational culture consistent with ESG values. A review of the literature shows that regional analyses of young people in the labour market are limited, hence the undeniable role of this article – to fill the gap in this area and integrate the perspective of young people from Generation Z and their employers.

2. Description of the sample and research methods

The research methodology involved conducting a minimum of 40 individual in-depth interviews (IDI), i.e. 20 with representatives of Generation Z and 20 with entrepreneurs employing Generation Z workers. In addition, a Focus Group Interview (FGI) was conducted with a minimum of 6 career counsellors from the region. In the course of the research, the following were conducted:

- 35 in-depth interviews with employers (IDIs) from 11 industries, from all districts of VX, in the following company size structure: 31% micro, 34% small, 23% medium and 11% large.
- 20 individual interviews with representatives of Generation Z, with 10 IDIs conducted with young people aged up to 25 who are in employment (3 women, 7 men) and another 10 IDIs with unemployed people who are completing their education (8 women, 2 men).
- One FGI with career counsellors for people aged up to 30 (7 counsellors).

All interviews were conducted between January and June 2025.

Questions on related issues concerning working conditions were placed in different parts of the interview. This "cross-referenced" arrangement of questions made it possible to verify the consistency of the respondents' views and narratives.

3. Research results

The presentation of the research results was subordinated to a discussion of the five main paradoxes identified.

3.1. The paradox of the role of work in the lives of young people and the hierarchy of values related to the work ethic

The research results confirmed the common opinion that Generation Z sees work as a separate sphere of life and does not associate it with their passions and private interests. This does not mean that work is less important to them than their private life, but it cannot absolutely dominate their lives. The research identified one of the fundamental problems in the motivation of the younger generation and its educational and development strategies. It is the paradox identified above, which consists in the difference in the perception of work and employees by employers and the young Generation Z. On the one hand, this concerns the belief among Generation Z that employers do not appreciate them, want to exploit them and take over their lives through work. On the other hand (employers), Generation Z employees are perceived as lazy, demanding, uncommitted, inflexible, etc.

Based on extensive research material, it is possible to create a schematic profile of a Generation Z person in the labour market – from the perspective of young people, employers and career counsellors. Below are two images of the same group – how they see themselves and how they are perceived.

Generation Z about themselves – how young people from V X see themselves.

1. What motivates them?

- Salary – they want to earn a decent wage and expect salaries of PLN 5,000-10,000 net, even if they do not have much experience. This is the most important motivating factor.
- Work atmosphere and respect – they want to be treated as partners and with dignity, they cannot stand hierarchical management and mobbing.
- Development and learning – they expect opportunities to learn from their superiors, participate in training courses and have clear career paths.
- Work-life balance – work should be one element of life, not its centre. They value flexible hours, no overtime and the possibility of remote working.
- Appreciation – they care about recognition: verbal, financial (bonuses), team-based (shared success).

2. What do they not tolerate and why do they resign from their jobs?

- Too low wages.
- Discrepancies between expectations and reality.
- Lack of opportunities for development.
- Difficult relationships with superiors.
- Overwork, poor atmosphere and unpaid overtime.
- Lack of appreciation and flexibility.
- Work that is not satisfying or does not fit their lifestyle.

3. How they would like to motivate others (as leaders – the question was: Put yourself in the shoes of a team manager – how would you encourage your peers and colleagues to engage in their work?)

- Focus on open communication, partnership, community and integration.
- Ensure flexibility, reward commitment and have a real impact on the organisation of work.
- Emphasise cooperation and respect rather than hierarchy.
- They see value in analysing the team's potential and setting goals together.

The structure of the identified motivators corresponds well with self-determination theory. Deci and Ryan distinguish three basic psychological needs: autonomy, competence and relatedness, the satisfaction of which promotes intrinsic motivation and well-being (Deci, Ryan, 2000, pp. 231-233). High salary expectations and the need for "decent wages" are combined here with the need for competence (development, learning), relatedness (atmosphere, respect, appreciation) and autonomy (work-life balance, flexible working hours). When these needs are

chronically unmet, the likelihood of withdrawal, decreased engagement and employee turnover increases (Deci, Ryan, 2000, pp. 236-239).

Generation Z through the eyes of employers and career counsellors – how they are perceived

1. Their strengths:

- Technological proficiency and knowledge of social media.
- Creativity, fresh perspective, innovation.
- Flexibility and adaptability, especially to new digital tools.
- Assertiveness and ability to set boundaries – they can say "no" and fight for their rights.
- Work-life balance – they respect their time and strive to live in harmony.
- Openness to teamwork, especially with peers, but also across generations.

2. Their weaknesses and deficits:

- Lack of professional experience.
- Deficit in soft skills, especially in communication and customer relations.
- Lack of independence and initiative, passivity, expectation of clear instructions.
- Entitlement – high financial expectations not matched by skills.
- Low sense of responsibility, short-term planning perspective.
- Problems adapting to the "offline" world, outside of digital comfort.
- Frequent "ghosting" – disappearing without a word, lack of feedback.

3. What are their requirements?

- High salaries, stability, clear employment rules.
- No overtime, task-based work, flexible hours.
- A friendly working environment with benefits (coffee, meals, multisport).
- Lack of development often leads to resignation. They look for new challenges if they do not have them.

The responses of career counsellors in the FGI coincide with the distribution of responses from employers. This confirms the opinion about the high demands of young people of Generation Z in terms of, on the one hand, financial security and, on the other hand, work flexibility, prioritising private life, and professional satisfaction (more in the sense of a sense of security and stability than climbing the career ladder).

Table 1.

Summary of the profile of Generation Z on the labour market

Aspect	How Generation Z sees itself	How employers/advisors see Generation Z
Priorities	Money, development, atmosphere, work-life balance	Money, flexibility, quick gratification
Motivators	Respect, appreciation, flexibility, influence	Transparency of conditions, benefits, remote work
Deficits	They tend not to see them – focused on needs	Lack of experience, soft skills, responsibility
Working style	Partnership-based, community-oriented, relationship-focused	They expect comfort and quick rewards

Cont. table 1.

Requirements	High, often inadequate for the region's capabilities	Difficult to meet at the outset
Perception of work	Work is part of life, not its meaning	Aversion to hierarchy, short planning horizon
Communication style	Openness, honesty, empathy	Sometimes difficulty in relationships with superiors and customers

Source: own study based on our own research results.

The clash between Generation Z's self-portrait and the stereotype formulated by employers can be interpreted in the spirit of social identity theory – the tendency to favour one's own group and use simplified "us-them" categories in assessing others (Tajfel, Turner, 1979, pp. 33-37). Such categorisations reinforce labels such as "entitled" and "lazy" in relation to young people and "exploitative" in relation to employers, even when detailed data show a much more nuanced picture of attitudes and motivations. At the same time, Generation Z's expectations regarding job stability, respect, development and participation in decisions can be interpreted as a form of psychological contract, i.e. unspoken mutual commitments between the employee and the employer (Rousseau, 1995, pp. 9-15). Violation of this contract – for example, through a lack of appreciation or unpredictable employment conditions – often leads to disappointment and the decision to leave.

This contradiction may be more understandable after analysing the other identified paradoxes. Especially where respondents were asked to take a different point of view. That is, employers were asked to assess the role of Work Life Balance in their lives (described in section 3.2). Generation Z, on the other hand, was asked to take on the role of a team manager. In the latter case, there was a significant shift in preferences from monetary to non-monetary motivational factors. When asked about the most satisfying working conditions and the main reasons for leaving their jobs, Generation Z respondents primarily pointed to decent wages and financial aspects (12 responses out of 20 respondents). However, when asked how they would encourage their peers and colleagues to engage in their work in a managerial role, they most often pointed to non-wage factors such as:

- interpersonal relationships and good communication skills,
- dignity and integration aspects,
- creating community-based partnerships based on trust, honest conversation, and appreciation of employees' ideas as team members.

First and foremost, these were bonuses (7 responses) and benefits (2 responses) for completed projects. Only one respondent indicated the use of pay rises.

3.2. The paradox of work-life balance perception

Work-life balance (WLB) is a concept that is both fashionable and well regarded by all respondents. Declaratively, all entrepreneurs strive to apply work-life balance as widely as possible in their companies. Unfortunately, practice shows that in various situations, employees struggle to achieve a balance between their private and professional lives.

The difficulties described fit well into the classic concept of work–family role conflict. Greenhaus and Beutell distinguish three main sources of conflict: time, workload and conflicting behavioural demands (Greenhaus, Beutell, 1985, pp. 77-80). Respondents' statements about "being constantly on call" or having to work overtime illustrate the overlap between time and workload demands. In turn, the work/family border theory emphasises the importance of setting boundaries between work and private life – people who strive for clear segmentation are particularly sensitive to violations of these boundaries (Clark, 2000, pp. 756-760), which corresponds with Generation Z's declarations about not wanting to "take work home with them." This can be seen as an expression of the desire for a clear segmentation of these spheres, while many employers – also for cultural reasons – tend to operate in a model where they overlap.

Interestingly, even for employers, achieving this balance proves very difficult. This refers to the paradox of the difference in the perception of work and employees by employers and the young Generation Z, already characterised in the first paradox.

Responses to the question about the direct attitude towards the increasingly popular concept of Work Life Balance among Generation Z respondents showed a positive attitude towards WLB. Above all, they point to cherishing the time devoted to their rest, relaxation, hobbies and pleasures. They understand this balance as separating the sphere of work from the private sphere. They would prefer to work from 8 a.m. to 4 p.m., Monday to Friday. If overtime is necessary, it must be paid. This applies equally to both employed and unemployed people.

"Everyone should have this rule: as soon as I leave work, I'm not interested in it until the next day".

"It's popular and okay to separate work from private matters. I don't stay after hours, I put my laptop away".

Employers also rated the concept of work-life balance very positively. All respondents consider it to be right – both in relation to their employees and to themselves. It can be said that, at the level of declarations, all respondents agree. However, in practice, this principle is not widely applied. Several employers openly admitted to upsetting this balance in their lives, where work predominates.

"I've been striving for this for 20 years and so far I haven't succeeded".

"I mean, as a boss, I look at it with great hope that I will achieve it one day. Because, unfortunately, for me, work comes before life and this balance is somewhat disturbed".

This also applied to 5 out of 20 Generation Z respondents, mainly working people:

"Okay, but not everyone can afford it. I sometimes have to be available outside of working hours, so I don't follow this rule. Young employees should also understand the need for flexibility sometimes".

"It's important, but because of my job, I have to be available by phone all the time".

"It's important, but work is my whole life, I work after work".

"Important, 50/50, I follow this rule".

"Impossible to fulfil, it is only possible in certain industries".

Interestingly, employers also declare that they admire people who maintain a work-life balance and will, of course, support such behaviour in their own companies. However, practice does not entirely match these declarations.

Examples of quotes from interviews with employers:

"It's very important, but difficult to implement – it's easy to say".

"Young people have a problem with this because it's not a job that we measure in terms of time, but in terms of tasks [...] and sometimes simple tasks stretch to the limit".

"It all depends on whether the person is able to organise their own working time and whether they are disciplined".

Clearly, life verifies certain ideas (even if they are absolutely correct).

Entrepreneurs' opinions change in a similar way in response to questions about Generation Z's deficits and then about their strengths. The table below summarises Generation Z's deficits and strengths.

Table 2.

Strengths and weaknesses of Generation Z in the eyes of employers

Weakness	Quote	Strength	Quote
Lack of experience	"They lack experience. They didn't have a chance to gain experience, so that's the biggest problem".	Innovation and fresh perspective	"In my opinion, definitely the innovativeness of solutions, because they certainly come up with ideas that an older employee or someone who is not familiar with technological developments, for example, would not think of".
Poor communication skills	"Well, lack of professional experience, first and foremost, in my opinion. Poor communication. These are the two most important reasons, the deficits that young people have". "Mostly human contact [...] communicating not only with their peers, but also with people who are 50, 60, 70 years old".	Assertiveness and the ability to set boundaries	"What I can learn from young people is to be a little more relaxed and worry less"; "They have a more laid-back attitude than my generation".
Entitlement and unrealistic expectations	"I think young people definitely have this problem that they think they are entitled to everything from the start. They approach work with a little humility, especially at the beginning".	Care for work-life balance	"The advantage is undoubtedly that they know how to maintain a balance between work and private life. So they don't take their work home with them, which is something the older generation often fails to do".

Cont. table 2.

Lack of independence and proactivity	"I think that a big disadvantage is their lack of proactivity [...] and a lack of independence in solving problems".	Openness, flexibility and the ability to adapt to change – especially in the technological sphere	"Creativity in social media is something that can be learned from the younger generation"; "They are proficient in modern technologies".
Lack of responsibility	"Young people have no sense of responsibility for themselves or their job position".	Courage and self-confidence Generation Z	"I think courage is definitely an important trait in a group of people who make all kinds of bold decisions".

Source: own study based on our own research results.

A comparison of entrepreneurs' answers to these two questions can lead to some rather surprising conclusions. The deficits identified turn out to be advantages of Generation Z.

Lack of experience, which is viewed negatively, promotes innovation and a fresh perspective, and these qualities are considered advantages of Generation Z.

The low rating of communication skills may be linked to assertive boundary setting (i.e. Generation Z fighting for their interests).

Similarly, Generation Z's assessment of entitlement and unrealistic expectations may be the result of their fundamental attitude of caring about work-life balance.

On the one hand, entrepreneurs criticise Generation Z for their lack of independence and creativity, while on the other hand, they praise them for their openness, flexibility and adaptability. These opinions may relate to different areas/aspects of Generation Z's behaviour, but one cannot help but feel that these judgements are contradictory. Similarly, characteristics such as lack of responsibility on the one hand and courage and self-confidence on the other can lead to cognitive dissonance.

It seems that when it comes to opinions about the strengths of Generation Z, employers have changed/adopted the perspective of young people and recognised that their attitude has positive qualities that they themselves envy in Generation Z employees. If work is not the most important area of life for Generation Z, then, according to the respondents, the quality of that life must have sources outside of work. They themselves notice their sometimes excessive dedication in a professional context.

Respecting their time and resistance to working overtime (especially without additional remuneration for those hours) is also seen as an assertive attitude that should be appreciated in Generation Z. This opinion may stem from the previous professional experiences of the employers surveyed, in the form of excessive, underappreciated dedication to work, which has remained in their memory as not very positive memories.

3.3. The paradox of Generation Z's proficiency in using digital tools

In light of interviews with employers and young people from Generation Z, as well as FGI with career counsellors, it should be noted that:

- 1) The development of technologies and IT tools facilitating remote communication, which is a positive phenomenon in itself, but their impact on establishing and maintaining social contacts is assessed differently.
- 2) The wide range of expansion of digital solutions in many aspects of life – here, the research shows some inconsistency. Employers' opinions on the impact of digitalisation on the social skills and work engagement of the younger generation are rather pessimistic. However, this is not confirmed by interviews with members of Generation Z, who are quite sceptical about digital tools and themselves note the dangers they pose to them by destroying social relationships, for example with their peers.
- 3) Similar conclusions can be drawn from the statements of career counsellors. On the one hand, they emphasise the importance of technology at work (especially remote working tools), while on the other hand, they point to threats such as the superficial digital skills of Generation Z and digital fatigue among young people.

Remote work has its advantages and disadvantages. Typically, respondents pointed to savings in time and money on commuting, clothing, etc. Among the disadvantages mentioned in the responses, the most common were issues related to social isolation, depression and alienation within the team.

As can be seen, statements emphasising the negative aspects of remote work/study prevailed.

Interestingly, few respondents (5 responses in the Generation Z group) mentioned the low quality of remote meetings, especially training sessions, and the possibility of participating in several parallel meetings at the same time or developing the habit of performing several different activities simultaneously.

Examples of responses regarding the low quality of remote classes:

"learning is not learning",

"learning has gone downhill",

"you can do several things at once while at work",

"online classes were terrible in my opinion",

"remote learning wasn't exactly thrilling at first either".

Employers recognise that young employees are highly adept at navigating the digital world, which translates into rapid adaptation to changes and technological innovations.

"I think they are definitely much more ready for change and decision-making. It seems that they are able to access information quickly".

"What could we learn from them? Certainly how to use the whole digital world and navigate this virtual world".

On the other hand, respondents pointed out many negative aspects of remote working.

"The digital world is time-consuming. On the one hand, it helps, but on the other, it hurts".

The development of communication technology is a natural phenomenon, and no one is opposed to the introduction of new tools and working methods. The main concern of the respondents-employers is whether these tools will dominate the way we work and even eliminate Generation Z's ability to collaborate in the real world. They also point to the distraction and "overstimulation" of young people by an excess of information, events and topics. In their opinion, this makes it difficult to focus on specialised issues and so-called deep work.

The most frequently mentioned shortcomings are:

1) Difficulties with concentration.

"Young people are very susceptible to all kinds of misinformation that appears on social media".

"In every free moment, I see that employees, for example, are eating lunch and scrolling through something on their phones all the time".

2) Distraction and overconfidence are the most frequently mentioned negative consequences of digitalisation.

"The digital world adds a bit of nonchalance and confidence that I can do anything because I have AI and I can write something, so it kind of replaces thinking".

3) Communication problems are another important aspect of the impact of technology.

"I think that people of this generation, who have been raised mostly in the digital world, have problems communicating in the real world".

4) Career counsellors noticed another feature in the form of digital fatigue among young people [3 indications]. The increasing amount of time spent in front of a computer is simply tiring. Especially since remote communication has not yet reached a level where it could completely replace personal contact in the real world.

The counsellors surveyed recognise the positive aspects of digitalisation (e.g. access to knowledge, the possibility of remote working), but also point to the risk of superficial knowledge (6 responses among 7 FGI participants) and growing dependence on AI (4 responses).

"They have access to tools, but often do not understand their depth – these are superficial competences".

On the one hand, Generation Z are so-called "digital natives", especially where the use of IT tools is intuitive and easy to use. In literature, people born after the spread of information technology are referred to as "digital natives" for whom the digital environment is a natural context for socialisation (Prensky, 2001, p. 1). However, more recent analyses challenge the assumption that simply growing up in the digital world guarantees deep technological competence. Kirschner and De Bruyckere show that the myth of the "digital native" leads to overestimating the skills of young people and tolerating superficial use of technology and alleged multitasking, which in fact reduces efficiency and concentration (Kirschner, De Bruyckere, 2017, pp. 136-139). The "overstimulation" and difficulty concentrating

described in the study can also be interpreted in the light of cognitive load theory, according to which information overload exceeds the capacity of working memory and leads to shallower processing (Sweller, 1988, pp. 257-260).

However, tools that require a significant amount of time to master pose a natural cognitive barrier for Generation Z.

The most common competency gaps among Generation Z identified by advisors are:

Soft skills and communication skills [6 responses].

MS Office skills [5 responses].

Knowledge of foreign languages [3 responses].

However, the question arises as to whether, in the era of dynamic development of artificial intelligence, it will be necessary to master the existing complex IT tools. Will the ability to use, for example, Excel (formulas, macros, visual basic, etc.) become a thing of the past, just like website programming, which nowadays no longer requires programming skills? This question remains open today – perhaps Generation Z is right to give up on mastering the functions of "outdated tools" such as MS Office?

3.4. The Generation Z entrepreneurship paradox

Analysing the answers to the question about Generation Z's strengths (see Table 2), one might think that this is a creative, well-educated, assertive generation, i.e. one with the qualities necessary for entrepreneurs. However, considering employers' responses to the question about Generation Z's weaknesses (also included in Table 2), one may get the contradictory impression that Generation Z lacks entrepreneurial traits.

In this situation, it is worth broadening the analysis to include the distribution of Generation Z representatives' responses to questions about:

- 1) Knowledge of start-ups established in the region by young people.
- 2) Knowledge of people running their own businesses.
- 3) Willingness to start their own business.
- 4) Intentions to change their place of work and life.
- 5) Main sources of innovation in the region.

Ad 1. Only four respondents declared that they were familiar with start-ups. However, references to:

- a) clothing boutiques,
- b) nail and eyelash salons,
- c) car repair shops, carpentry companies, shops,
- d) entertainment at events and for children as start-ups rather indicates a lack of knowledge about the nature of such companies.

This observation indicates a low level of interest among the younger generation in starting businesses or following developing industries in the area. This may further translate into the level of entrepreneurship among young people of Generation Z in the region. Of course,

20 interviews cannot be used as a basis for such a sweeping conclusion, but it is symptomatic, especially since the responses of entrepreneurs to the same question also reveal few examples of knowledge of start-ups in the province. Employers are unable to cite specific examples, and most of them openly admit that they do not know of any start-ups.

"I've encountered the most in the e-commerce and IT industries. Others are just attempts, but these are not really initiatives of young people, but rather people who have tried other things somewhere else".

"Hmm... When it comes to start-ups, I don't know any".

Ad 2. Among the Generation Z respondents, only half say they know people who run a business. Some of them cannot specify exactly what they do or what industry they work in ("they run a business, but I don't know what it is", "I think so, probably construction").

Ad 3. Only 4 out of 20 respondents representing Generation Z seriously declared their intention to start their own business. Their plans concerned standard businesses such as a confectionery, a dietitian's office, a psychological counselling centre or gardening. The rest do not plan such activity – 8 responses, a further 5 responses are unspecified dreams of owning a business, or 3 declarations of willingness, but with the proviso that they are not suited to it.

Examples of respondents' answers:

"I am more of an employee than a manager and administrator of everything, managing everything with my brain during operations. All the paperwork and stress associated with it terrifies me".

"Yes, but maybe not now, I don't even know what kind of company it would be".

"Yes, but I'm afraid to take out a loan".

"I used to, but I came to the conclusion that it's not for me".

Ad 4. In the opinion of almost half of the respondents, the capital city of VX is a city with prospects because it is developing rapidly – 9 out of 20 Generation Z respondents indicated this.

However, when asked about the possibility of moving to another city or country, they do not rule out such options. They see more promising places for themselves in the country, such as Warsaw or other urban agglomerations – 11 responses. Among those who declared that they would stay in the capital city of VX or their home town in the region, there were 7 people.

However, it is worth noting a certain syndrome, especially among those who do not want to move to other cities. They recognise the greater prospects offered by cities in other parts of the country or even abroad, but the fear of changing their lives prevails.

Examples of respondents' answers:

"I considered leaving because the beauty industry is valued abroad, but my friends and family would probably not be able to cope".

"I am a local patriot and I don't know if I would feel comfortable somewhere else, besides, there are secure job prospects here".

"Travelling broadens the mind, but I myself have not considered leaving my city".

Ad 5. The question about the main sources of innovation in the region was addressed to employers. The responses of employer respondents indicate a high degree of uncertainty, with respondents unable to provide specific examples. Their statements reveal doubts as to whether VX can be considered innovative. General associations with digitalisation, EU programmes and broadly understood access to technology prevail. Only a few respondents indicated specific examples of companies or sectors in which young people undertake innovative activities.

Examples of statements by employers:

"I can see a few industries, I mean companies from the technology sector, I mean IT, I think that's the most intuitive thing that comes to mind".

"To be honest, I don't know, I haven't thought about it. Somehow, I wasn't really interested in it".

In terms of sources of talent for the regional labour market, the study did not identify any sources. The respondents' answers regarding their lack of knowledge of any specific examples of start-ups from VX are pessimistic. They find it difficult to identify specific sources of innovation. It was also not possible to determine, based on the respondents' answers, the direction in which the region's innovation policy should go.

A noticeable phenomenon is the fact that respondents are unable to indicate in which industries, areas and directions the prospects for this development in the region are being built. Most of them do not plan to start their own businesses. This may indicate a low propensity for entrepreneurial behaviour, especially among respondents who declare their willingness to remain in the region.

Based on these statements, it can be assessed that the level of entrepreneurship among young people of Generation Z is low. Various factors may influence this, but the most common theme in the respondents' statements is a conservative/comfortable attitude towards work.

The low level of entrepreneurial intentions among Generation Z described above can be interpreted using the theory of planned behaviour. Ajzen assumes that the intention to act depends on attitudes towards behaviour, subjective norms and perceived behavioural control (Ajzen, 1991, pp. 188-191). The respondents' statements reveal rather cautious attitudes ("it's not for me" [], "I'm scared of paperwork"), weak pro-entrepreneurial norms (little knowledge of start-ups in the region) and low perceived control ("I'm afraid to take out a loan", feeling of incompetence). According to entrepreneurial intention models, this configuration favours choosing secure employment over starting one's own business (Krueger, Reilly, Carsrud, 2000, pp. 415-419).

3.5. The paradox of cooperation in multigenerational teams

Respondents' ambivalent attitude towards working in intergenerational teams is noticeable. Both the advantages and disadvantages of such a solution are recognised. Declaratively, working in such teams is necessary. However, practice shows that difficulties prevail and

dominate in the work of such teams. The anticipated accelerating pace of technological development may widen the cultural gap between Generation Z and the next Alpha generation, and the older Generation X, Generation Y and Millennial generations.

The ambivalent attitude towards working in multigenerational teams is consistent with the results of reviews of research on generational differences at work. They point to different values, career expectations and communication styles among different age groups, which can lead to both conflicts and complementarity of resources in mixed teams (Lyons, Kuron, 2014, pp. 141-145). In terms of social capital, working in such teams can build so-called bridging social capital – bonds connecting groups that differ in age, experience and perspective (Putnam, 2000, pp. 22-24). However, this requires trust and norms of reciprocity; a lack of these tends to reinforce stereotypes (“young people are demanding”, “older people are arrogant”), which are strongly reflected in the empirical material collected.

The question about the most important advantages and disadvantages of working in intergenerational teams yielded many seemingly contradictory answers, which, however, may confirm the opinion of the authors cited above.

Work does not play a dominant role in the lives of Generation Z. This may be one of the sources of conflict with older generations, who have a different attitude towards work and life values. Generation Z do not understand this and feel uncomfortable in their relationships with older colleagues or managers. On the other hand, they also feel that their older colleagues do not understand their world and their needs. This arouses their fears and frustration and reinforces their defence mechanisms in the form of rigidly invoking the provisions of the Labour Code (e.g. "overtime is okay, but only if it is paid extra, as stipulated in the Labour Code").

Among the positive aspects of working in multigenerational teams, respondents, both Generation Z representatives and employers, pointed to:

Stimulation of innovative ideas.

The diffusion of substantive knowledge from older employees to younger ones.

At the same time, the flow of knowledge, especially technological knowledge, in the other direction, i.e. from Generation Z to employees representing older generations.

Examples of respondents' statements:

"Older people can certainly teach young people a lot. However, I believe that young people also teach older people a lot" (Generation Z).

"Older people know more, younger people bring a fresh perspective, but stereotypes that young people are demanding, etc. can be a problem" (Generation Z).

"In my opinion, definitely innovative solutions, because they definitely come up with certain ideas that an older employee or someone who is not familiar with technological developments, for example, would not come up with" (employer).

"Such people have a fresh perspective on various problems, they are creative, they are also open to change, they adapt quickly to technology, these new technologies, and I have the impression that they are more flexible than older people" (employer).

"Well, the spontaneity of young people is definitely an advantage, their ability to adapt to new things" (employer).

Among the negative aspects of working in multigenerational teams, Generation Z respondents mentioned the arrogance of older generations, a different culture due to different upbringings, and they also pointed to lower physical fitness and poorer skills in modern technology.

Many voices (almost half of the respondents – 9 out of 20) representing the younger generation point to the problem of communication between these age groups.

Examples of statements from Generation Z respondents:

"A different way of thinking, these are different generations raised differently, sometimes older people are resistant to knowledge, different perspectives can be a plus".

"Older employees do not understand that younger people are fighting for their rights [...] older employees have loans and redundancy for them would be the end of the world".

"They put themselves above others, which isn't very nice".

"If it's possible not to mix these teams [...], then I'm all for it, because it usually leads to conflicts and nothing good".

"The language is changing, so it's harder to communicate. There are people who are ashamed to talk to older people as colleagues at work".

On the other hand, employers expressed opinions regarding:

- lack of resistance to criticism,
- different work pace and different lifestyles,
- misunderstandings resulting from generational differences (e.g. in communication, dress code, hierarchy),
- difficulty in understanding each other's expectations and ways of expressing emotions.

Examples of comments:

"If someone criticises you once or twice, instead of adapting or thinking that maybe it's wrong, they just prefer to give up".

"The pace of work of the two generations may diverge".

"Older people do not understand social media, young people are annoyed that older people do not understand new technologies".

"The problem with written communication – we perceive the same text differently with and without an emoji".

Employers' statements reveal a desire for such teams to function as well as possible, as they see the advantages of positive factors outweighing the limitations. On the other hand, the statements of young people from Generation Z reveal a much stronger sense of reluctance and fear about working in such teams than appreciation of the positive aspects.

Career counsellors note that intergenerational cooperation can be difficult and burdened with stereotypes on both sides. They point to:

- differences in attitudes towards work and responsibilities,
- a lack of mutual understanding and respect for different experiences,
- entitlement and inflexibility on the part of some young employees,
- the young generation's sense of technological superiority and depreciation of the experience of older people,
- but also the need to learn from each other and the necessity to keep up with changes, including by older people.

Examples of statements by career counsellors:

"It is often the case that: 'because in your day it was different, and now it is different', so it is a kind of excuse that today everything can be done more easily, and let's assume you have some old methods".

"The difference was noticeable on many different levels [...] between peers, adults and minors, between me as a coach – a person from Generation X".

As you can see, generational differences cause a lot of problems in multigenerational teams. Respondents recognise the challenges, but do not deny the possibility of good cooperation – however, it requires effort on both sides. It is essential to build bridges of understanding – through openness, education and awareness of cultural differences between generations.

4. Conclusion

The research conducted yielded quite interesting results. They are not one-sided, as most reports on Generation Z tend to be. The clash of opinions between young people and employers and career counsellors brought a new quality to the analysis of the situation – it identified several contradictions in judgements about Generation Z. Interestingly, these contradictions did not concern differences in the opinions of individual generations, but appeared in the statements of entrepreneurs and young people from Generation Z themselves. This was particularly evident when they were asked questions that required a change in perspective. That is, when Generation Z was asked to take on the role of a team manager, and employers were asked to assess the role of work-life balance in their lives.

The paradoxes identified and described above obviously require further in-depth research into their causes and origins, as well as their further implications.

They clearly show that we cannot remain shackled by stereotypical thinking about the degeneration of successive generations. Plato was the first to express the opinion that "all authority is falling in our times — today's youth respect neither gods, nor people, nor the state, nor blood, nor the customs of their ancestors" (Plato's Defence of Socrates).

Aristotle complained that "when he sees young people, he doubts the future of civilisation" and he was not alone in his opinion.

The power of empathy, or the ability to understand other people's situations and emotions, allows for broader insight and deeper understanding of a problem. In the case of Generation Z, it is worth looking at the world from their point of view, and most of the traits criticised by previous generations such as baby boomers, Generation X and millennials will prove to be justified.

Generation Z has lost faith in classic social advancement. There is also a noticeable erosion of trust in systemic solutions, e.g.:

- all prestigious positions are occupied by representatives of older generations,
- a vague vision of starvation pensions,
- declining influence on the political situation – longer life expectancy in an ageing society and a demographic catastrophe are reducing the number of Generation Z voters,
- the deconstruction of social roles, work ethic and professional prestige caused by the rapid development of technology (robotics and AI) taking over/automating work processes in an increasingly wide range of professions.

This erosion of trust in systemic solutions is part of a broader diagnosis of declining social capital and weakening trust in institutions in late modern societies (Putnam, 2000, pp. 27-31). At the same time, research on the i Generation / Generation Z generation points to an increase in the frequency of depressive and anxiety symptoms and a growing sense of lack of control over one's own future, linked, among other things, to the rapid digitisation of life, the pressure of social comparisons and economic uncertainty (Twenge, 2017, pp. 101-110). In this context, the metaphor of "Generation Z depression" reflects the real psychosocial burdens that may be behind this cohort's strong focus on the private sphere at the expense of the traditionally understood work ethic.

The cause of Generation Z's "depression" is also quite accurately identified by A. Grant (Grant, <https://www.youtube.com...>; Rusak, Generation Z...), who explains that Generation Z grew up watching financial and political institutions fail to deliver on their promises of stability and wealth. This has translated into a deep mistrust between employees and employers.

These factors trigger defence mechanisms in Generation Z in the form of a focus on their private lives, not necessarily related to gainful employment.

It can also be argued that as Generation Z grows up, their priorities and life opportunities will also evolve, which will translate into further progress in the development of our civilisation. However, experiences in non-human communities (Calhoun, 1973) may raise fears about whether this thesis is valid.

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INVISIBLE CAPITAL: ECONOMIC CONTRIBUTIONS OF MIGRANTS AND INTERNATIONAL STUDENTS IN TÜRKIYE AND POLAND

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Purpose: The purpose of the paper is to examine the economic and social contributions of international students and migrants to local development in Türkiye and Poland, with a focus on explaining why large parts of these contributions remain unmeasured and “invisible” in public policy and statistical reporting.

Design/methodology/approach: The study employs a comparative and interdisciplinary approach integrating theories of human capital, social capital and diaspora economics. It uses secondary statistical data, institutional analysis, and desk research. The paper compares migration structures, labour market participation, entrepreneurship patterns and student mobility in both countries.

Findings: The findings show that international students and migrants generate significant value through consumption, entrepreneurship, labour market participation and human capital accumulation. However, their contributions remain partially invisible due to informal employment, temporary legal status and gaps in national indicators. The visibility of this “invisible capital” increases when countries provide clear legal pathways, language support, qualification recognition and strong local-level governance.

Research limitations/implications: The main limitation is restricted access to consistent data on informal employment and long-term integration outcomes. Future research could include micro-level surveys, firm-level productivity analysis or longitudinal studies tracking graduates’ trajectories.

Practical implications: The results provide guidance for policymakers on how to increase the economic visibility of migrants and students through legal reforms, formalisation measures, city-level integration platforms and entrepreneurship support schemes.

Social implications: The study highlights how better utilisation of migrant and student potential can enhance social cohesion, demographic renewal and innovation ecosystems while reducing negative public perceptions.

Originality/value: The paper proposes a unified framework linking the contributions of migrants and international students under the concept of “invisible capital”, offering a new analytical tool for understanding local development processes in two contrasting policy environments.

Keywords: migration, international students, invisible capital, Türkiye, Poland.

Category of the paper: Research paper.

1. Introduction

The acceleration of globalization in the 21st century has extended beyond flows of goods and capital to bring human mobility to an unprecedented scale (Ferreira Pantoja, 2023). This process has accelerated the cross-border circulation of knowledge, skills and cultural values, thus transforming the phenomenon of migration from being merely a movement of people into a strategic element in the contexts of economic development, human-capital accumulation and social renewal. This paradigm shift is manifested in the replacement of one-way, loss-oriented concepts such as “brain drain” with a discourse of “brain circulation”, grounded in mutual benefit (Docquier, Raport, 2012; OECD, 2020). In this new terrain, international student mobility and migrant flows play a key role in shaping the global talent pool and in the transformation of local economies (Jordan, 2020).

As countries endeavour through internationalization strategies in higher education to attract high-quality human capital, international students contribute not only through direct economic inflows – such as tuition fees, accommodation and living expenses – but also by forming a potential talent reservoir capable of strengthening innovation capacity and global networks over the long term. Meanwhile, whether driven by necessity or economic motives, migration movements reshape the demographic and sectoral structure of labour markets. Migrants not only help close critical labour-shortage gaps in low and medium-sized sectors but also bring dynamism to local economies through entrepreneurial activities, thereby contributing to employment and productivity growth (OECD, 2021; UNESCO, 2023).

Considering these global trends, Türkiye and Poland emerge as significant case studies – countries that have evolved from a “transit country” identity to a “destination country” position and now sit at the intersection of both flows. Türkiye, in the aftermath of the Syrian conflict since 2011, has become the country hosting the largest number of refugees globally by offering temporary protection to more than 3.5 million individuals. At the same time, via aggressive internationalization policies in higher education, it has become a regional education hub with over 300 000 international students as of 2023 (YÖK, 2023). Poland, for its part, accepted more than 1.5 million Ukrainian asylum-seekers following the Russia-Ukraine war that began in 2022, thereby becoming Europe’s largest host of asylum-seeker populations. In addition, through its affordable and quality English-language programmes, Poland has gained substantial attraction among international students from Eastern Europe and Central Asia (Duszczyk, 2023).

Yet, those central actors of this demographic transformation – international students and migrants – remain often “invisible” in local economies. Despite revitalising urban economies through micro-entrepreneurships, informal employment contributions, intercultural mediation and consumption expenditures, their multi-dimensional contributions are insufficiently represented in official statistics, development plans and public policy discourse.

This phenomenon, conceptualized as “invisible capital”, refers to the set of economic and social values generated by these groups which are difficult to measure, indirect and frequently unregistered (Duszczek, Kaczmarczyk, 2022).

Underlying this invisibility are two structural reasons. The first is that a significant portion of these groups’ economic activities take place in unregistered sectors or under temporary/unstable legal statuses. The second, more critical reason, is that public policies often approach these groups not as an “opportunity” but from the perspective of social- welfare costs, labour- market pressures or burden on the public budget. Yet, the extant literature demonstrates how, under appropriate policy frameworks, migrants and international students can act as catalysts in the regeneration of local economies and enrichment of human- capital stocks (Dustmann et al., 2010; Chiswick, Miller, 2015).

This study thus aims to systematically render visible the aforementioned “invisible capital”. The cases of Türkiye and Poland provide a rich comparative analytical ground thanks to their different historical trajectories, institutional capacities and migration- management philosophies. The contrast between Türkiye’s focus on humanitarian security and social-policy orientation and Poland’s pragmatism, derived from its EU membership and its direct linking of migration to economic development and labour- market needs, offers a valuable opportunity for policy- transfer and effectiveness analysis (Brown et al., 2015).

On this basis, the key research questions addressed are as follows:

1. What types of contributions do international students and migrants make to local- economy components (employment, entrepreneurship, consumption, innovation) in Türkiye and Poland, and through which mechanisms do these contributions take place?
2. Why are these contributions not systematically rendered visible within national development policies and official discourse, and how does a cost- focused narrative prevail?
3. Which structural, legal and societal factors hinder the emergence of “invisible capital”, or conversely, support the conditions that make it visible?

In seeking answers to these questions, this study adopts an interdisciplinary perspective, integrating the human- capital theory from economics, the social- capital theory from sociology and the diaspora- economy approaches from international relations to propose a multi- dimensional analytical framework. The originality of the study lies in situating migration and international- student mobility not solely within social- integration or security paradigms, but as an inseparable human component of sustainable development.

In this regard, the study proposes a model that brings together migrant and student groups in the same analytical plane and investigates the synergy between them. Moreover, by comparing the experiences of the two countries, the study aims to contribute to the “policy- learning” process. Türkiye’s higher- education- oriented internationalization

strategies and Poland's rapid labour- market integration mechanisms – complementary as they are – may illuminate the way toward an ideal policy synthesis.

This study aims to make visible, through both quantitative and qualitative indicators, the role of international students and migrants in local development; to situate these contributions within a theoretical framework; and ultimately, to develop inclusive, sustainable and human- centred policy recommendations for both countries. In doing so, the “invisible capital” will transcend being merely a metaphor and instead be treated as a new explanatory variable in the literature of development economics and social policy.

2. Methods

This study employs a comparative, interdisciplinary research design to examine the invisible economic and social contributions of migrants and international students in Türkiye and Poland. The methodological approach integrates quantitative and qualitative data sources, institutional analysis, and theory-driven interpretation to uncover the mechanisms through which “invisible capital” is produced and the conditions under which it becomes visible.

2.1. Research design and approach

A cross-country comparative analysis was selected as the core methodological framework. Türkiye and Poland represent two distinct yet increasingly convergent migration regimes: Türkiye as a country shaped by humanitarian inflows combined with international-student mobility, and Poland as an EU member state characterized by economically oriented migration and rapid labour-market integration. These contrasting configurations enable the identification of structural, institutional, and policy factors that shape both the production and visibility of invisible capital.

The research draws on three complementary analytical perspectives:

1. Human-capital theory (Becker, 1964; Schultz, 1961), used to assess skill acquisition, educational mobility, and labour-market incorporation.
2. Social-capital theory (Putnam, 1993; Levitt, 1998), providing a lens for understanding networks, trust mechanisms, and transnational exchange.
3. Diaspora-economy and migration-development approaches (Dustmann et al., 2010; Chiswick, Miller, 2015), which help explain how migrants and students contribute to entrepreneurship, innovation and local economic regeneration.

These theoretical anchors guide the selection of indicators and the interpretation of findings.

The study relies on secondary quantitative and qualitative data from the following sources:

- Official national statistics: Göç İdaresi Başkanlığı (Presidency of Migration Management) (Türkiye), Statistics Poland, YÖK (Council of Higher Education), Ministry-level datasets.
- International datasets: OECD, UNESCO, ILO, World Bank.
- Scientific and policy literature: peer-reviewed articles, working papers and sectoral policy evaluations focusing on migration, labour markets, and higher-education mobility.
- Institutional and municipal reports: documentation from Turkish and Polish ministries, city-level integration programs (e.g., Welcome to Poland), and NGO reports.

These data sources were selected to capture both formal, measurable economic contributions and informal, under-reported activities that constitute the core of “invisible capital”.

2.2. Analytical methods and scope of the study

The analysis combines multiple methodological techniques:

1. Descriptive and comparative statistics. Cross-country comparison of labour-market participation, sector distribution, entrepreneurship patterns, international-student spending, and retention rates. Evidence was synthesized using national and international datasets.
2. Institutional and policy analysis. Systematic evaluation of migration and higher-education policies in Türkiye and Poland, with attention to legal pathways, labour-market regulations, credential-recognition mechanisms, and municipal integration frameworks.
3. Thematic and structural analysis. Qualitative examination of policy documents, program descriptions, and academic studies to identify recurring mechanisms of invisibility (e.g., informality, temporary status, administrative fragmentation).
4. Triangulation. Results from statistical indicators were cross-validated with qualitative findings and theoretical expectations to increase consistency, ensure robustness, and reduce bias inherent to single-method research.

The empirical scope includes:

- Labour-market participation and the formal/informal employment divide.
- Migrant and student entrepreneurship and firm creation.
- Direct expenditures of international students (tuition, housing, living costs).
- Human-capital accumulation (skills, qualifications, retention).
- Social-capital formation (networks, community integration, transnational ties).
- Local-governance arrangements (municipal programs, NGO partnerships).

3. Conceptual and theoretical framework

The growing scale of human mobility on a global level has emerged as a fundamental dynamic reshaping both the economic structures and socio-cultural fabric of contemporary societies. Within this mobility axis, international students and migrants stand out as two critical groups that embody the transnational circulation of human capital. The concept of an international student, as defined by UNESCO (2023), refers to individuals temporarily residing in a country other than their country of origin for the purpose of higher education and enrolled in a higher education institution. These individuals are not merely recipients of educational services; rather, they serve as active carriers of knowledge, skills, and cultural capital. According to OECD (2021) reports, international student mobility is framed globally as a “circulation of talent”, functioning as a mechanism that facilitates the internationalization of skilled labour supply and the transfer of human capital across countries. In this context, the potential of students to remain in the host country after graduation holds strategic significance for the internalization of human capital accumulation. However, the restrictive approaches adopted in many countries regarding post-graduation employment and residency policies often result in this potential being converted into “invisible capital”, in other words, being lost without being fully harnessed as a productive capacity (Chowdhury, 2023).

The concept of a migrant, as defined by the United Nations Department of Economic and Social Affairs (Hajro, Žilinskaitė, 2024), includes individuals residing in a country other than their country of birth for at least one year. Migrants may move for economic, political, environmental, or humanitarian reasons; thus, the nature of migration and the legal status of migrants can vary significantly across countries. The role of migrants in economic systems is not limited to increasing labour supply; they also play a vital role in entrepreneurship, consumption, innovation, and demographic balance. According to World Bank (2023) data, migrants help fill labour shortages in low- and middle-income sectors, ensuring production continuity and directly contributing to regional economies by increasing local demand for goods and services. Nevertheless, when migrants live under temporary protection or irregular status, their economic activities often occur in the informal sector, hindering the visibility of their contributions in official statistics. This reality is directly linked to what Anderson (2010) conceptualizes as “invisible labour,” a reference to the hidden labour mechanisms underpinning modern economies.

Although international students and migrants fall into different categories, both groups possess the potential to transform economic and social systems through the mobility of human capital. Within this framework, the core concept of this study – “invisible capital” – refers to the economic, social, and cultural value generated by these groups in ways that are not fully captured by statistical measurements. Invisible capital transcends traditional economic indicators and encompasses the value created through individuals’ knowledge, networks,

cultural assets, and channels of social interaction. The theoretical foundation of the concept is grounded in Becker's (1964) and Schultz's (1961) human capital theories, and Levitt's (1998) notion of "social remittances" (the transfer of ideas, behaviours and social capital by migrants to their communities). A common premise across these approaches is the argument that economic development depends not only on physical or financial capital but also on the human capacity to generate knowledge, build networks, and transmit culture.

Human capital theory posits that individuals' levels of education, skills, and experience play a decisive role in productivity and are key to addressing disparities in development across countries (Becker, 1964). Viewed from this perspective, international students can be seen as natural agents of the knowledge economy; the skills they acquire during their education enhance the host country's innovation capacity and create competitive advantages in international labour markets. Polish research confirms that improving the structure of human capital associated with the influx of educated people makes it possible to increase the competitiveness of local labour markets and stimulates modernisation processes (Wosiek, 2015). The social capital approach, as emphasized by Putnam (1993), argues that individuals improve economic performance indirectly through social networks, trust mechanisms, and shared norms. In this sense, the connections established between migrant and student communities and the local population can be viewed as "bridging social capital", which fosters intercultural understanding, knowledge exchange, and social cohesion.

Polish researcher (Łukaszewska-Bezulska, 2015) point out that migrants create unique "social bridges" that increase access to information, labour markets and institutional resources. In turn, Borgiasz-Stepaniuk (2018) shows that social capital is one of the key factors in the effectiveness of local development ecosystems, also in the context of transnational mobility.

Levitt's (1998) concept of social remittances highlights the transnational character of invisible capital. Migrants and international students transfer not only financial resources but also knowledge, values, and behavioural norms back to their countries of origin. This process, often referred to as "reverse brain circulation," affirms the multidirectional nature of international knowledge flows. In this regard, invisible capital describes a dynamic process through which knowledge and skills acquired in one country are incorporated into both local development and global reproduction cycles via transnational networks.

This conceptual framework considers international students and migrants not only as components of population movements but also as multilayered human actors in development processes. Invisible capital serves as a term to describe the immeasurable yet influential contributions these groups make to local innovation, entrepreneurship, employment, and social solidarity. Therefore, this study aims to systematically analyse the invisible dimensions of human capital accumulation at the intersection of international migration, education policies, and economic development (Djajić et al., 2019).

4. Results

International migration and student mobility have generated strategic transformations that profoundly affect the socio-economic structures of Türkiye and Poland. Although the two countries have historically operated under different migration regimes, they have recently confronted similar demographic and economic realities. Türkiye – alongside an influx of students from Asia and Africa – has become the country hosting the largest refugee population in the world; Poland, meanwhile, has emerged as one of the leading recipient countries for migrants within the European Union. In this context, both countries offer a basis for comparative analysis with respect to the mechanisms through which “invisible capital” is produced via migration and international student policies, as well as the conditions under which it can be rendered visible (Baş, Eti, 2020; Bryła, 2019).

4.1. Migration and international student dynamics in Türkiye

Türkiye’s migration experience displays a multilayered structure that historically intertwines its identities as both a “transit” and a “destination” country. The mass displacement triggered by the civil war in Syria in 2011 rapidly placed Türkiye at the centre of the global refugee regime. As of 2024, more than 3.5 million Syrians reside in Türkiye under temporary protection (Göç İdaresi Başkanlığı, 2024). This population has increased labour supply – particularly in labour-intensive sectors such as agriculture, construction, textiles, and services – thereby supporting continuity of production. However, because a substantial share of this contribution occurs within the informal economy, its economic effects are not fully captured in official statistics (Süygün, Kaplan, 2021). Table 1 presents a summary of the migrant and international student population in Türkiye, illustrating the scope of these “invisible” contributions.

Table 1.

Migrant and international student profile in Türkiye (2023)

Indicator	Number	Main countries of origin	Principal economic sectors
Syrians under temporary protection	3.5 million+	Syria	agriculture, construction, textiles, services
International students	301,000+	Syria, Iran, Azerbaijan, African countries	higher education, accommodation, retail
Registered migrant workers	1.2 million	Syria, Afghanistan, Pakistan	manufacturing, construction, services

Source: Göç İdaresi Başkanlığı (2024); YÖK, (2023).

Syrian-owned enterprises have forged extensive commercial networks in cities such as Gaziantep, Şanlıurfa, Mersin, and Istanbul, contributing significantly to both employment generation and the revitalization of regional trade. In Gaziantep in particular, more than 3000 firms established by Syrian entrepreneurs in the textiles and food industries have catalysed the emergence of new supply chains, backward and forward linkages, and ancillary service

markets, thereby expanding local labour demand and fostering sectoral diversification. These firms often fill gaps in product niches and cross-border intermediation – leveraging language skills, market knowledge, and transnational ties to source inputs and access customers across the Middle East. Nevertheless, only 35% of these businesses operate within the formal registry, which produces a substantial measurement gap: output, employment, and tax contributions are systematically underreported, and standard indicators fail to capture spillovers such as knowledge transfer, procurement multipliers, and neighbourhood-level business dynamism. The resulting invisibility does not merely hinder academic assessment; it also constrains evidence-based policy design around formalization, access to finance, and business-development services that could raise productivity and integration outcomes (Karaduman, Çoban, 2019).

The profile of international students in Türkiye is likewise markedly diverse. According to the Council of Higher Education (2023), of the more than 301,000 international students, approximately 42% originate from the Middle East, 28% from Central Asia, 15% from Africa, and 10% from the Balkans. This heterogeneity enriches campus ecologies and urban knowledge ecosystems, as students channel differentiated cultural capital, language competencies, and field-specific skills into host institutions and local labour markets through internships, part-time employment, and collaborative projects. Publicly funded schemes such as Türkiye Scholarships serve as important instruments for widening access and strengthening educational diplomacy, while also deepening alumni networks that can later facilitate trade, research collaboration, and technology transfer. However, the absence of robust institutional mechanisms to support post-graduation retention – spanning work-permit pathways, recognition of qualifications, and targeted career services – results in a pronounced loss of human capital. Potential contributors to innovation capacity and internationalization strategies often exit shortly after graduation, turning what could be a durable asset into “invisible capital”, i.e., value that is produced but not effectively embedded in local development trajectories (Samuk, 2019).

4.2. Migration and International Student Dynamics in Poland

Poland, long characterized by a relatively homogeneous social structure and low levels of immigration, has undergone a marked transformation since the mid-2010s, driven by both labour migration and refugee inflows. Following Russia’s invasion of Ukraine in 2022, Poland admitted more than 1.5 million Ukrainian asylum seekers, becoming the primary host of forcibly displaced persons in Europe. In response, the Polish Government enacted dedicated legislation granting Ukrainians expedited access to residence and work authorization, as well as to health care and education services (Poland’s Special Act of 12 March 2022 on Assistance to Citizens of Ukraine, which provided fast-track legal residence, work permits and access to public services for Ukrainian war refugees). This policy architecture – combining rapid legal regularization with access to core public goods – has facilitated swift labour-market entry,

mitigated skills bottlenecks in key sectors, and reduced the fiscal and social frictions typically associated with large, sudden inflows (Bryła, 2019).

Beyond emergency reception, Poland's migration regime increasingly aligns with a human-capital and competitiveness logic. Employers in manufacturing, construction, logistics, retail, ICT, and business services have leveraged the expanded supply of foreign workers to stabilize production cycles and support export-oriented growth. Simultaneously, international student mobility has emerged as a complementary channel of talent attraction. The proliferation of English-medium programs, comparatively affordable tuition, and the signalling benefits of degrees recognized across the European Union have positioned Poland as a significant academic hub in Eastern Europe. These developments have not only diversified the student body but also strengthened university-industry linkages, particularly in STEM fields and applied research, thereby contributing to regional innovation ecosystems (Kaczmarczyk et al., 2009).

Local governance has been pivotal in operationalizing integration. Municipalities such as Warsaw, Kraków, and Wrocław have institutionalized multi-stakeholder platforms – often under “Welcome to Poland” umbrellas – that deliver language instruction, career counselling, credential recognition guidance, and social orientation. Civil society organizations complement these services with legal aid, psychosocial support, and community-building initiatives. This multi-level governance model, anchored in city-level experimentation and partnership with NGOs and universities, has proven to be a critical success factor for migrants' socio-economic incorporation, enhancing employability, retention, and social cohesion outcomes (Fihel et al., 2012). Table 2 provides key statistics on the migrant and international student population in Poland, highlighting their main countries of origin and economic sectors.

Table 2.

Migrant and international student profile in Poland (2023)

Indicator	Number	Main countries of origin	Principal economic sectors
Ukrainian asylum seekers	1.5 million+	Ukraine	Manufacturing, services, ICT, retail
International students	105,000+	Ukraine, Belarus, India, Türkiye	Higher education, technology, R&D
Registered foreign workers	1.1 million	Ukraine, Belarus, India	Manufacturing, construction, logistics

Source: Statistics Poland (2023); OECD (2023).

Poland's international student profile exhibits distinctive characteristics shaped by geographic proximity and cultural affinities. Of the more than 105,000 international students, approximately 45% originate from Ukraine, 15% from Belarus, 12% from India, and 8% from Türkiye. The expansion of English-medium programs, the relative affordability of tuition, and the advantage of EU-wide recognition have collectively positioned Poland as a major academic hub in Eastern Europe (Komornicki et al., 2025).

An equally noteworthy feature of Poland's migration governance is the active role of local authorities and civil society organizations. In cities such as Warsaw, Kraków, and Wrocław, municipal “Welcome to Poland” programs encompass language training, career counselling, and social orientation services. This multilayered governance model has been a critical success factor in migrants' integration into the economic system (Szomburg et al., 2018).

4.3. Comparative analysis of economic contributions and their invisible dimensions

In the cases of Türkiye and Poland, the economic contributions of migrants and international students materialize along four principal channels: (I) labour-market participation, (II) the entrepreneurship ecosystem, (III) consumption expenditures, and (IV) the accumulation of human and social capital. While headline indicators tell part of the story, a substantial share of value creation remains “invisible” – i.e., produced through informal or indirect mechanisms that elude conventional statistics and policy dashboards.

The sectoral pattern underscores a higher concentration of migrant labour in low-wage, labour-intensive segments in Türkiye (agriculture, construction, textiles), whereas Poland shows greater absorption into services, manufacturing, and ICT. These structural difference conditions wage trajectories, formalization prospects, and the scale of productivity spillovers (Figure 1).

Polish estimates confirm the scale of this phenomenon. Strzelecki et al. (2022) show that immigration from Ukraine accounted for an average of approximately 0.5 percentage points of annual GDP growth between 2013 and 2018, which represented as much as 13% of Poland's total cumulative economic growth during that period.

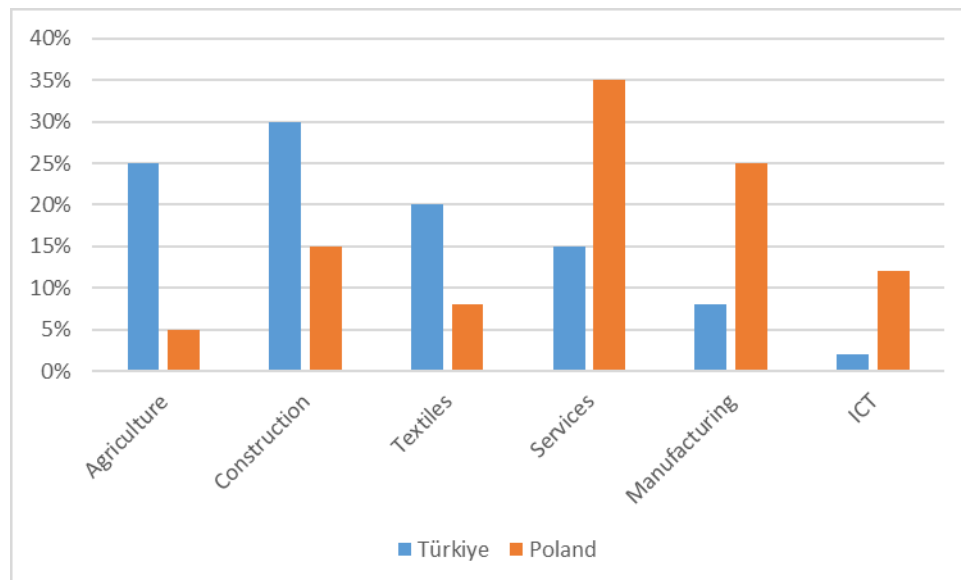


Figure 1. Employment distribution of migrants in Türkiye and Poland (%).

Source: Compiled from ILO (2023).

From a labour-market perspective, migrant employment in Türkiye is predominantly informal, while Poland exhibits a more institutionalized structure. Approximately 65% of Syrian migrants in Türkiye are informally employed, compared with 25% informality among Ukrainian migrants in Poland. This gap reflects divergent regulatory regimes and enforcement capacities. In Türkiye, informality depresses measured output, tax intake, and social-insurance contributions, thereby obscuring actual value added; it also constrains upskilling and firm-level productivity gains. In Poland, broader use of work permits, and municipal integration services has accelerated legal labour-market entry, improved compliance, and enabled more accurate accounting of contributions. The policy implication is clear: formalization pathways (e.g., streamlined permits, wage subsidies tied to registration, portable social insurance) are decisive in converting de facto contributions into de jure, countable growth.

Entrepreneurship patterns also diverge. In Türkiye, Syrian entrepreneurship is concentrated in traditional commerce and small-scale manufacturing, embedding migrants in local supply chains and neighbourhood retail. In Poland, Ukrainian entrepreneurs more frequently operate in technology and digital services, linking to higher-productivity segments and exportable services. While Türkiye counts ~15,000 registered Syrian-owned firms, Poland reports 25,000+ Ukrainian-owned businesses. Sectoral composition matters: digital-services ventures typically scale faster, generate knowledge spillovers, and require formal market interfaces (banking, IP, procurement), thus becoming visible in national accounts. By contrast, traditional micro-enterprises catalyse place-based revitalization and dense local procurement webs yet remain undercounted if registration and bookkeeping are limited. Targeted instruments – startup visas, incubators with bilingual mentoring, micro-credit coupled with formalization coaching – can raise productivity and the visibility of contributions in both contexts (Deniz, 2017; Yaşa, 2023; Awdziej et al., 2022).

Table 3.

Comparative analysis of the economic contributions of international students

Indicator	Türkiye	Poland
Annual tuition revenue	USD 1.2 billion	USD 750 million
Accommodation expenditures	USD 300 million	USD 200 million
Living expenses	USD 600 million	USD 400 million
Post-graduation retention rate	12%	35%
Labour-force participation rate	18%	42%

Source: OECD, Education at a Glance (2023); compiled from national data.

International students contribute sizable direct expenditures in both countries. Aggregate annual spending is estimated at USD 2.1 billion in Türkiye and USD 1.35 billion in Poland (tuition, accommodation, living costs). Yet the post-graduation retention gap (12% vs. 35%) implies that Poland converts a higher share of temporary inflows into long-term human capital. Retention amplifies downstream effects – startup formation, R&D participation, and firm-level internationalization – thereby shifting contributions from short-run demand stimulus to durable productivity gains.

Both countries host comparable potentials for human- and social-capital deepening, but institutional architectures shape realisation. As Wosiek (2015) emphasises, insufficient linkage between human capital and institutional structures leads to the emergence of ‘development inconsistencies’ that reduce long-term economic benefits. In the context of migration, this means that the lack of an appropriate institutional framework may prevent the full realisation of the educational and professional potential of migrants and foreign students. In Türkiye, much of the value flows through informal networks – peer mentoring, diaspora business ties, and community-based knowledge exchange – powerful but weakly measured. In Polish research, Isański (2015) points out that migrants act as “transnational brokers” who, thanks to their dual anchoring — in their country of origin and in their host country — contribute to the diffusion of knowledge and the growth of social capital on both sides of the border. In Poland, structured programs (municipal language courses, career guidance, credential-recognition support, university–industry co-ops) channel skills into the formal economy and make outcomes legible to policymakers. As Polish research shows, local language and mentoring programmes significantly increase the educational and professional opportunities of foreigners, and their absence results in long-term losses in terms of human capital utilisation (Krawczyk, 2023). Convergence is possible: Türkiye could upscale university-anchored co-op schemes and post-study work routes tied to shortage occupations, while Poland could strengthen pathways from temporary protection to stable status and promote entrepreneurship support beyond ICT into advanced manufacturing and green services (Holtgrave et al., 2019; Lajqi, Krasniqi, 2017).

Polish research (Isański, 2015) also shows that migrants act as transnational intermediaries whose social relations enable the flow of knowledge, resources and norms of behaviour between countries. This means that integration policies should strengthen not only economic competences, but also social capital infrastructure. The cases of Türkiye and Poland demonstrate that the visibility of migrants’ and international students’ economic contributions is directly linked to the institutional architectures, legal frameworks, and governance models adopted by host countries. In Türkiye, a centralized and short-term policy orientation has left much of these contributions “invisible”, whereas Poland’s multi-actor, long-horizon strategic planning has rendered them measurable and manageable. In this regard, making invisible capital visible is not solely a matter of administering migration as a demographic phenomenon; it is equally contingent on building institutional capacity that can unlock the economic potential of these groups. Both country experiences indicate that the integration of migrants and international students into economic systems becomes a meaningful development dynamic only within a multi-stakeholder, transparent, and long-term policy framework (Ullum, 2024; Baser, Feron, 2021; Oz, 2021).

5. Comparative analysis: policy effectiveness, opportunities, and the drivers that make invisible capital visible

Over the past decade, Türkiye and Poland have adopted markedly different policy paradigms to manage large-scale population movements (Samuk, 2019). This section undertakes a comparative assessment of those approaches and outlines a framework for integrating “invisible capital” into development processes by rendering it measurable, governable, and ultimately productive.

In broad terms, Türkiye’s regime has been centralized and humanitarian-security oriented, prioritizing short-term stabilization and emergency management. By contrast, Poland has increasingly coupled protection with economic integration and long-horizon planning, underpinned by multi-actor governance and EU-funded municipal programs. These choices shape not only the visibility of migrants’ and international students’ contributions, but also the quality of those contributions – i.e., whether they manifest primarily as short-run demand stimulus or as durable additions to human capital, productivity, and innovation capacity (Baş, Eti, 2020).

5.1. Comparative appraisal of policy paradigms

Before presenting Table 4, it is useful to foreground the institutional and political–economic logics that shape outcomes across Türkiye and Poland. Although both countries have confronted large, rapid inflows of migrants and a steady rise in international student numbers, their governance architectures diverge along three interrelated axes: (I) policy purpose and legal design – whether frameworks primarily stabilize humanitarian needs or proactively convert mobility into development assets; (II) implementation capacity and locus of action – whether integration is orchestrated centrally with limited municipal discretion or co-produced by cities, universities, employers, and civil society under multi-actor compacts; and (III) time horizon and measurability – whether interventions prioritize short-term accommodation or build durable pathways (formal employment, credential recognition, post-study work, entrepreneurship support) that generate auditable indicators in tax, social insurance, R&D, and firm creation. These axes condition not only sectoral allocation (e.g., concentration in low-wage, informal segments versus diffusion into manufacturing, ICT, and knowledge-intensive services) but also the visibility of contributions in official statistics and policy dashboards. Put differently, the same underlying stocks of human and social capital can yield very different development payoffs depending on legal certainty, administrative frictions, local program density, and public narratives around competition, burden, and solidarity. Table 4 synthesizes these contrasts, linking legal orientation to labour-market formality, international-student retention, municipal capacity, and the social cohesion climate that ultimately enables – or suppresses – the translation of “invisible capital” into measurable, investable growth.

Table 4.

Comparative overview of migration and international-student governance in Türkiye and Poland

Dimension	Türkiye	Poland
Legal Framework & Policy Orientation	temporary-protection centred; humanitarian-security axis	economic-integration oriented; pragmatic and labour-market driven
Employment Structure	high reliance on informal economy; concentration in agriculture, construction, and low-skill services	higher formal-employment share; spread across manufacturing, industry, and ICT
International-Student Integration	limited post-graduation job-search and work-permit pathways	flexible post-study work options and temporary residence permit for graduates
Local Governance Capacity	centralized management; constrained municipal budgets and initiative	active, multi-stakeholder municipal programs supported by EU funds
Public Perceptions & Social Cohesion	salience of economic competition and fiscal-burden narratives	solidarity rooted in historical/cultural proximity; parallel concerns over long-term integration

Source: Own work based on Göç İdaresi Başkanlığı (2024); YÖK (2023); ILO, (2023); Statistic Poland, (2023).

A more rigorous framing underscores that cross-national differences in the visibility of migrants' and international students' contributions are not epiphenomena of scale, but predictable outcomes of institutional design, administrative capacity, and policy time horizons. In comparative political-economy terms, Poland's regime resembles a developmental incorporation model: legal certainty (clear eligibility, time-bound processing, status portability) reduces transaction costs, raises the expected returns to formal participation, and thereby internalizes externalities (taxation, social insurance, innovation spillovers) that would otherwise remain latent. Türkiye's configuration, by contrast, approximates a humanitarian stabilization model: rapid reception and basic service delivery mitigate short-run welfare risks, yet the absence of robust post-entry pathways (credential recognition, post-study work, employer-linked permits, entrepreneurship interfaces) sustains informality equilibria in which much of the generated value is produced but not recorded. The consequence is a measurement problem (under-counted output, employment, and firm creation), a policy-learning problem (weak feedback loops for program improvement), and an investment problem (limited bankability of human-capital gains). Seen through this lens, "invisible capital" is not merely a metaphor; it is an analytically tractable stock whose conversion into measurable growth depends on legal predictability, municipal governance density, and the calibration of incentives at the firm, campus, and community levels (Kaczmarczyk et al., 2009).

5.2. Critical success factors for making invisible capital visible

Before presenting the comparative matrix, it is important to delineate the institutional logics that systematically condition whether migrants' and international students' contributions remain latent or become measurable assets. Although Türkiye and Poland have both confronted rapid inflows and rising student mobility, they diverge along three analytically salient axes: (I) the normative purpose and legal design of their regimes – humanitarian stabilization under temporary protection versus development-oriented incorporation that explicitly links status to

labour-market access and post-study transitions; (II) the locus and thickness of implementation, ranging from centrally orchestrated delivery with constrained municipal discretion to multi-actor ecosystems where cities, universities, employers, and civil society co-produce services, data, and outcomes; and (III) the time horizon and measurability of interventions, that is, whether policies prioritize short-term accommodation or build durable pathways (formal employment, credential recognition, entrepreneurship interfaces, and retention instruments) that yield auditable indicators in taxation, social insurance, firm creation, and R&D participation. Read through this lens, Table 4 does not merely juxtapose legal provisions; it maps causal chains linking regulatory certainty and local governance density to sectoral allocation, formalization rates, post-study retention, and the translation of “invisible capital” into investable, productivity-enhancing development stocks (Lajqi, Krasniqi, 2017).

1) Inclusive and Clear Legal Frameworks:

- Mechanism: predictable work- and residence-permit regimes reduce uncertainty, shrink informality, broaden the tax base, and increase social-insurance coverage.
- Practice contrast: Poland’s streamlined access to work authorization for Ukrainians accelerated labour-market registration and benefits uptake.
- Risks: protracted processing times and ad-hoc exemptions in Türkiye sustain informality traps, depress wages, and obscure true output.
- Policy levers: digital permitting, status portability, time-bound processing SLAs, and employer compliance incentives tied to registration.

2) Language Training and Professional Recognition:

- Mechanism: host-language proficiency and rapid credential recognition raise job matching quality, reduce overqualification, and speed productivity gains.
- Practice contrast: Poland’s accelerated recognition pathways and municipal language programs outpace Türkiye’s more fragmented provision.
- Policy levers: modular language curricula linked to occupations, fast-track licensing in shortage fields, micro-credentialing, and bridging courses.

3) Strength of Local Ecosystems and Multi-Stakeholder Governance:

- Mechanism: cities, universities, NGOs, and firms co-produce integration through services (orientation, counselling, legal aid), co-ops, and internships.
- Practice contrast: Poland’s “Welcome to Poland”-style municipal platforms institutionalize services, whereas Türkiye’s city-level initiatives face budget and mandate constraints.
- Policy levers: performance-based municipal grants, university–industry–city compacts, integrated referral systems, and shared data standards.

4) Strategic Integration into the Entrepreneurship Ecosystem:

- Mechanism: migrant/student entrepreneurship channels “invisible” energy into productive capital – firm creation, job growth, and innovation.

- Practice contrast: Türkiye: traditional commerce and small-scale manufacturing with dense local multipliers but lower measured productivity. Poland: higher presence in ICT/digital services with faster scaling and clearer statistical footprints.
- Policy levers: startup visas, bilingual incubators, micro-credit with formalization coaching, public procurement access, IP support, and export readiness.

5) Social Acceptance and Inclusion:

- Mechanism: positive narratives and shared public spaces reduce discrimination costs, raise employability, and stabilize retention.
- Practice contrast: Türkiye faces salient “competition/burden” framings; Poland benefits from proximity-based solidarity yet must manage long-term integration concerns.
- Policy levers: evidence-based communication, intercultural dialogue initiatives, neighbourhood hubs, and media partnerships to normalize success stories.

6. Discussion

This section synthesizes the study’s findings within a systematic policy-design logic and proposes a feasible, evidence-based framework for structurally rendering “invisible capital” visible. The proposed approach treats problem definition, instrument selection, governance architecture, financing models, and monitoring–evaluation mechanisms as an integrated continuum rather than discrete, sequential steps. In doing so, it aligns diagnostic categories (e.g., informality traps, credential underutilization, low post-study retention) with targeted interventions (streamlined status pathways, accelerated recognition, entrepreneurship pipelines), embeds these interventions in an enabling governance ecology (city–university–employer–civil society compacts), and links them to sustainable funding arrangements (blended public–EU/IFI finance, outcome-based grants) and auditable indicators (formalization rates, credential utilization, firm survival, R&D participation, retention).

Crucially, the framework preserves the institutional specificities and relative advantages of Türkiye and Poland while elevating common mechanisms that enable reciprocal learning and responsible policy transfer. In practice, this means calibrating reforms to each country’s legal traditions and administrative capacities, yet standardizing core functions – permit processing, language and career services, credentialing, entrepreneurship support, and data collaboratives – so that contributions by migrants and international students shift from latent, under-measured spillovers to trackable, investable assets within local development strategies (Ulum, 2024).

The core challenge may be described as a “paradox of invisibility”. Although international students and migrants generate substantial economic and social value across local employment, entrepreneurship, consumption, and innovation ecosystems, the administrative traces of these

contributions remain fragmented, indirect, and distorted by information asymmetries. Consequently, these values are underrepresented in policy deliberations and underweighted in development planning. The solution requires an integrated, evidence-based policy design that simultaneously reduces informality, accelerates skills translation and matching, and embeds contributions within measurable, auditable systems of governance and finance (Baser, Feron, 2021).

For Türkiye, immediate priorities involve (I) structuring post-graduation transition permits to convert temporary educational inflows into durable human-capital stocks, and (II) broadening the tax base by formalizing significant portions of migrant labour, thus improving revenue buoyancy and social-insurance coverage. For Poland, priorities centre on (I) further accelerating the recognition of foreign diplomas and professional credentials, and (II) diffusing municipal integration capacity beyond leading metropolitan areas to ensure territorial equity in outcomes. In both contexts, the university–municipality–private-sector triad functions as a decisive interface: it orchestrates first-job matching, incubates entrepreneurship, and provides platforms for data integration and continuous improvement.

Implementation should proceed through sequenced, realistic phases that balance speed with institutional learning. In the short term (0–12 months), legal and administrative enablers – post-study work routes, startup/innovator visas, modular “Welcome & Work” programs, and interoperable data protocols – should be piloted in priority provinces and universities. In the medium term (12–36 months), growth instruments – seed and co-investment funds, bilingual accelerators, and credential-recognition “fast lanes” – should scale, while inter-municipal learning networks are formalized. In the long term (36+ months), successful pilots should be codified in statute, with internationally comparable indicators reported on a regular schedule to lock in accountability and policy durability.

Financing must be tailored to institutional capacity. In Türkiye, central-budget appropriations can be blended with KOSGEB/TÜBİTAK instruments and regional development-agency funds. In Poland, the European Social Fund+ (ESF+), the Asylum, Migration and Integration Fund (AMIF), regional agencies, and municipal consortia can serve as anchors. Across both settings, results-based instruments – including outcome-linked grants and social impact bonds – can be piloted to align incentives with measurable formalization, placement, and firm-survival outcomes. Table 5 details the policy package by domain, identifying country-specific levers alongside shared mechanisms that enable reciprocal learning and responsible policy transfer (KOSGEB, 2025; European Social Fund+, 2022; FI-Compass, 2024).

The proposed integrated policy package is expected to generate a series of positive socio-economic effects in a sequenced manner. In the short term, direct economic outputs and income effects will materialize through improved job matching and entrepreneurship. In the medium term, declining informality and a broadened tax base will ease pressures on public finances and strengthen fiscal sustainability. In the long term, the nourishment of human and social capital

stocks will enhance local innovation capacity, economic diversification, and global competitiveness.

Table 5.

Cross-country policy package: equivalences and common mechanisms

Policy domain	Türkiye - priority levers	Poland - priority levers	Common mechanisms (for policy transfer)
Legal pathways & status design	Post-study work permits tied to shortage occupations; status portability for employer changes; digital one-stop portals	Further streamlining of temporary→ stable status transitions; codified timelines for renewals; expanded grounds for graduate residence	Time-bound service-level agreements; API-based inter-agency workflows; transparency dashboards for permit pipelines
labour-market formalization	Targeted inspections paired with compliance incentives; portable social insurance; wage subsidies conditional on registration	Continued uptake of registered employment for protection holders; sectoral compacts in manufacturing/ICT/logistics	“Formalization for benefits” packages; contributory records portability; employer recognition schemes
Credential recognition & language	Occupation-linked language modules; recognition of prior learning (RPL); professional boards with fast-track tracks	Maintain accelerated recognition in shortage fields; expand bridging programs to mid-sized cities	Modular B1/B2 curricula; standardized rubrics for equivalence, hybrid/online bridging with supervised practice
International-student retention	Graduate transition routes; campus-based career services; co-op and internship mandates in shortage sectors	Extension of flexible post-study permits; stronger university–industry placement pipelines	12/36-month retention targets; alumni-network mobilization; employer-linked job-search visas
Entrepreneurship & firm creation	Bilingual incubators; micro-credit with formalization coaching; procurement access for migrant-owned SMEs	Innovation vouchers; export-readiness mentoring for digital services; IP and spin-off support	Startup/innovator visas; co-investment funds; survival-rate milestones (12/36 months)
Local governance capacity	Outcome-based municipal grants; university–city–NGO compacts in pilot provinces	Scaling “Welcome Hub” models; multi-city collaboratives for shared services	One-stop integration hubs; unified referral systems; quarterly learning reviews
Data, monitoring & evaluation	Unified migrant/student registries; linkages to tax/SI records; open indicator dashboards	Privacy-preserving data collaboratives across ministries and cities; standardized reporting	Core metrics stack: formalization rate, credential utilization, placements, retention, R&D participation, firm survival
Financing models	Central budget + KOSGEB/TÜBİTAK + development agencies; pilot social impact bonds	ESF+, AMIF, regional funds, municipal co-financing; outcome-linked grants	Blended finance with outcomes triggers; multi-year envelopes tied to indicator trajectories
Equity & safeguards	Gender-responsive programming; childcare supports; legal-aid access	Anti-discrimination enforcement; regional access parity	Disaggregated reporting (gender/age/status); grievance redress; periodic program audits
Risk management	Bureaucratic backlog; politicization; informality persistence	Administrative saturation; regional disparities; dependence on a single origin country	Buffer capacity (temporary staffing); surge protocols; diversified origin strategies; independent evaluation

Source: Authors' own compilation and policy proposal, informed by the research findings and sources cited in this work.

A robust monitoring-evaluation (M&E) architecture is indispensable for ensuring both the effectiveness and durability of the policy package. In line with best practice, indicators should be stratified into outputs, outcomes, and impacts, each aligned with explicit causal links and time horizons. Output indicators capture short-term implementation fidelity and service delivery – such as permit processing times, completion of language or credentialing modules, utilization of municipal “Welcome Hub” services, and the coverage of data linkages between registries and social insurance systems. Outcome indicators reflect medium-term behavioural and systemic change, including the formalization rate of migrant employment, wage-to-qualification congruence, 6-12-month job placement and retention, 12/36-month post-study stay rates, throughput of credential recognition, and startup survival with associated revenue growth. Impact indicators, by contrast, track long-run structural transformation and social returns: shifts toward higher-productivity sectors; increases in tax and social-insurance contributions; participation in R&D and patenting; export intensity among migrant- or graduate-founded firms; neighbourhood business dynamism; and attitudinal change and social-cohesion indices (UNESCO, 2019; OECD, 2022).

Credible attribution requires comparative, quasi-experimental designs that constitute the methodological backbone of evaluation. Difference-in-differences models should benchmark treated cities, sectors, or cohorts against comparable controls before and after policy rollout, incorporating unit and time fixed effects, cluster-robust standard errors, and pre-trend diagnostics. Interrupted time-series or trend-break designs can test whether policy introduction is associated with statistically significant level or slope changes in key indicators once seasonality and macroeconomic shocks are controlled. Complementary cost-effectiveness and cost-benefit analyses should relate incremental public outlays to quantifiable gains – such as additional formal jobs per unit of expenditure, tax or social-insurance yield per beneficiary, and the net present value of retained human capital – supported by sensitivity analyses on discount rates and program uptake. Where randomization is infeasible, propensity-score or machine-learning matching can improve balance, especially for graduate-retention and entrepreneurship interventions. Heterogeneity analysis, disaggregated by gender, age, legal status, region, and sector, is essential for detecting distributional trade-offs and informing mid-course corrections (Kusek, Rist, 2004; Funnel, Rogers, 2011).

High-integrity results depend on interoperable data and clear governance. Linked administrative datasets – covering permits, education records, tax and social-insurance contributions, and business registries – should be integrated via privacy-preserving record-linkage protocols and formal data-sharing agreements. Program management information systems need standardized inputs, outputs, timestamps, and geo-tags to support identification strategies in difference-in-differences and interrupted time-series models. Periodic survey modules for employers and beneficiaries can capture skills utilization, experiences of discrimination, and social-cohesion outcomes, ideally harmonized with national labour-force surveys. Public-facing dashboards that report headline indicators on a quarterly basis, combined

with controlled microdata access, enhance accountability and enable external replication (Culhane et al., 2017).

Accountability instruments should institutionalize methodological rigor and transparency. Independent methodological notes ought to pre-register identification strategies, model specifications, and primary and secondary endpoints, accompanied by codebooks and replication files. Annual spending–impact reports should reconcile budgets with realized outputs, outcomes, and monetized benefits, provide explanations for observed variances, and set out concrete remedial actions. Periodic third-party audits of data quality and methods, together with scholarly peer review of flagship evaluations, further strengthen credibility and policy salience (Zhang, Stevens, 2012).

Table 6.

Monitoring and evaluation indicator set

Indicator type	Example indicators	Analytical value and interpretation
Output indicators (0-12 months)	Number of post-graduation transition permits issued; employment transition rates of graduates at months 6 and 12; completion rates of language/orientation modules; number of newly registered firms	Provides early signals on implementation capacity, inclusiveness of access to services, and the operational effectiveness of policy instruments.
Outcome indicators (12-36 months)	Reduction in informal employment (percentage points); average tax contribution per migrant/international student; 12-month survival rate of newly established firms; average time-to-job placement (days)	Supplies quantitative evidence on economic incorporation, expansion of the tax base, and improvements in labour-market efficiency.
Impact indicators (36+ months)	Changes in human and social capital indices; price elasticities for housing and staple foods; social acceptance and social-cohesion index	Profiles medium- to long-term structural transformation in welfare, market equilibria, and the social fabric.

Source: Authors' own compilation and policy proposal, informed by the research findings and sources cited in this work.

The indicator set renders the causal chain of implementation traceable across short- (output), medium- (outcome), and long-term (impact) layers, thereby enabling a rigorous test of the operability of policy instruments and their capacity to convert value into productive capital. Output metrics provide early warnings on implementation capacity and inclusiveness; outcome metrics make shifts in formalization, tax-base broadening, and labour-market efficiency quantitatively visible; impact metrics profile structural transformation in human/social-capital accumulation and market equilibria, supplying evidence for policy continuity. This tripartite architecture supports comparative impact assessment (DiD/ITS) and feeds learning cycles, thereby rationalizing scale-up and course-correction decisions. Regional studies confirm that increased diversity and the influx of foreign workers promote the modernisation of economic structures, particularly in sectors with a growing share of knowledge (Kikoria, Sikora, Sanikidze, 2023).

It is also important to recognise potential risks and trade-offs associated with implementation. According to analyses contained in a nationwide report on migration (Polish Economic Institute, 2023), social tensions and concerns about competition in the labour market

most often arise in low-paid sectors and in areas with weaker public service infrastructure, which requires particularly precise compensatory measures. These include potential tensions in public perception, possible price pressures in housing markets, and concerns about “displacement” among native workers. However, when such risks are managed proactively through indicator-driven monitoring systems and balanced with active labour-market policies aimed at upskilling the native workforce, a transition from a “problem management” paradigm to an “opportunity management” paradigm becomes feasible.

7. Conclusions

This study has examined how international students and migrants contribute to local development in Türkiye and Poland through mechanisms that are often underrecognized in official statistics. Despite differing institutional and legal contexts, both countries face a common challenge: converting “invisible capital” – skills, entrepreneurship, and knowledge flows – into measurable, formal, and policy-relevant assets.

The findings underscore that this conversion depends not only on legal pathways and labour market access, but also on robust governance frameworks, inter-institutional coordination, and data systems that make such contributions visible. While Türkiye must prioritize formalization and post-study retention, Poland's challenge lies in scaling its successful models beyond major urban centres.

Strategic, data-informed migration and education policies can transform short-term inflows into long-term productivity gains. Making invisible contributions visible is not just a matter of inclusion—it is a condition for sustainable, competitive, and cohesive local economies.

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RESTRUCTURING IN A COMPANY THROUGH THE CONVERSION OF FIXED ASSETS INTO SALE AND LEASEBACK. A CASE STUDY SUPPORTING DECISION-MAKING PROCESSES

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Purpose: This article analyzes the impact of sale and leaseback transactions on the financial performance of a cigarette filter manufacturing company. The company used sale and leaseback to finance the purchase of a new production line, which consequently led to high costs and financial losses. The aim was to identify the optimal moment for converting fixed assets into leases during the restructuring process.

Design/Methodology/Approach: A case study was employed, analyzing key financial indicators from 2020 to 2024. These include liquidity ratios (current ratio, quick ratio, cash ratio), capital structure (current liabilities to equity ratio), and operational efficiency (operating cash flow to current liabilities ratio, cash conversion cycle). The study is based on a detailed financial analysis to assess the impact of leasing decisions.

Findings: The results indicate that the initial decision to implement sale and leaseback in 2020 temporarily improved financial liquidity. However, in subsequent years, the company encountered significant financial problems due to high leasing liabilities, which resulted in deteriorating liquidity and capital indicators. The optimal moment for converting fixed assets into leases was identified as 2020, before the negative effects of high leasing liabilities emerged.

Research Implications: The results provide valuable insights for both theorists and practitioners regarding the financial implications of sale and leaseback transactions. The study emphasizes the importance of thorough financial analysis before undertaking such transactions to avoid liquidity crises and maintain financial stability.

Originality/Value: The article attempts to contribute to the existing literature through a detailed case study of the impact of sale and leaseback transactions on financial performance in a production context. It highlights the critical importance of timing in asset conversion decisions and offers practical recommendations for effective lease liability management.

Keywords: sale and leaseback, financial performance, liquidity ratios, capital structure, cash conversion cycle, case study, manufacturing industry.

Category of the paper: research Article.

JEL Code: M41, G32, L21.

1. Introduction

In recent years, sale and leaseback has gained popularity as an alternative form of business financing (Longinidis, Georgiadis, 2014; Zang, Liu, 2020; Elsiefy, AbdElaal, 2019). Sale and leaseback, in which a company sells its assets and simultaneously leases them back, allows for the release of frozen capital and improved financial liquidity (McConnell, Schallheim, 1983; Wandelt et al., 2023). However, the decision to use this form of financing can have significant consequences for a company's financial performance (Chowdhury, 2023; Osei-Owusu, 2016). This article examines the impact of sale and leaseback on the financial performance of a cigarette filter manufacturing company that decided to use this form of financing to purchase a new production line. The company analyzed in this case study had been operating in the market for many years, achieving stable financial results in the cigarette filter manufacturing industry. In 2020, in response to increasing demand and the need to modernize its machinery, management decided to purchase a modern production line. To finance this investment, the company chose sale and leaseback, believing that releasing capital from assets would enable further development and improve financial liquidity. Unfortunately, this decision proved to be burdensome. High costs associated with the sale and leaseback significantly strained the company's budget, leading to deteriorating financial results and losses in subsequent years. The financial situation forced management to change the business profile from production to trading, aiming to reduce operating costs and improve profitability. The aim of this article is to support decision-making processes regarding the financing of operations using sale and leaseback. The study uses key liquidity, profitability, and equity indicators. The analysis will present financial data illustrating the impact of the sale and leaseback decision on the company's financial condition and the effects of the decision to change the business profile. The research method used in this article is the case study, which allows for a deep and detailed analysis of a specific case, providing valuable insights into the strategic financial decisions of manufacturing companies (Scapens, 1990; Yoon, Kim, 2023). This analysis will be significant for both theorists and practitioners, providing knowledge about potential risks and benefits associated with sale and leaseback and business profile changes (Zack, 2007). The structure of the article includes an introduction to the issue of sale and leaseback and a literature review on this form of financing. Following that, the research method section will describe the company, the financial indicators used, and the data sources. The analytical part will present a detailed analysis of financial data and liquidity, profitability, and equity indicators. The final section of the article will discuss the analysis results and provide conclusions and recommendations for companies considering sale and leaseback as a form of financing. The conducted study provides important insights into the impact of sale and leaseback on financial performance and the effectiveness of strategic management decisions in the context of a changing business profile. To achieve the research objective, the following research questions were formulated:

1. Does the conversion of fixed assets into leasing support the restructuring processes in the company?
2. How does sale and leaseback affect the financial liquidity of a cigarette filter manufacturing company?
3. What changes in liquidity ratios (current, quick, cash) were observed after the implementation of sale and leaseback?

2. Material and Methods

The case study method is increasingly used in the context of both financial and managerial accounting. The steps taken in the course of case study research are similar to those of other research methods (Stake, 2006; De Massis, Kotlar, 2014; Govindan et al., 2020). The first step is to identify a single case or a group of similar cases that fit within the context of the research questions posed. In this article, the study of the company is preceded by a literature review to determine the current state of research on the analyzed issue (Power, Sharda, 2007; Snyder, 2019; Kamalahmadi, Parast, 2016; Ramnath et al., 2008). Sale and leaseback is a form of financing that allows companies to release capital frozen in fixed assets (Liu et al., 2014; Rampini, Viswanathan, 2013). By selling assets and immediately leasing them back, companies can obtain financial resources for other operational or investment purposes (Zhang, 2023; Clausen, Flor, 2015; Baker et al., 2007). However, decisions to use sale and leaseback have significant consequences for companies' financial results (Koh, Jang, 2009; Bourke et al., 2020; Ronchini et al., 2021). This article discusses how these decisions affect various financial aspects of firms, with particular emphasis on financial liquidity, profitability, and capital structure (Benlemlih, 2017; Magni et al., 2022). Leasing decisions, including sale and leaseback, directly impact the financial liquidity of companies (Bourjade et al., 2017; Wang et al., 2020). Financial liquidity measures a company's ability to meet its obligations on time. Through sale and leaseback, a company can gain immediate access to cash, improving liquidity ratios such as the current ratio, quick ratio, and cash ratio. However, it should be noted that sale and leaseback involves regular leasing payments, which can burden the company's cash flows (Schallheim et al., 2013). When leasing costs are significantly higher than the depreciation costs of the sold assets, they can negatively impact the company's ability to cover other current liabilities. Long-term leasing can, therefore, improve liquidity in the short term, but its long-term impact depends on the company's ability to manage increased operating costs. Profitability is another key area affected by leasing decisions. Profitability measures a company's ability to generate profits relative to its revenues. In the context of sale and leaseback, it is essential to understand how additional leasing costs affect profit margins. Leasing costs can significantly reduce operating profitability (EBIT) and, consequently, net profitability. High leasing fees that exceed

previous depreciation costs can lead to a reduction in both gross and net profit margins. Additionally, sale and leaseback can impact the return on sales (ROS) ratio, which measures net profit in relation to sales revenue. High leasing costs can lower ROS, suggesting that the company generates less profit from each unit of sales. The capital structure of a company, which is the relationship between equity and debt, is also heavily influenced by leasing decisions. Sale and leaseback affects the company's liabilities, increasing its debt. In the company's balance sheet, operating leases are typically recorded as off-balance-sheet liabilities, which can impact debt ratios and the company's long-term financial stability. Companies must carefully analyze indicators such as the debt ratio and the debt-to-equity ratio. An increase in debt resulting from sale and leaseback can worsen these ratios, affecting the company's creditworthiness and attractiveness to investors. High levels of debt can also lead to increased financial risk, which is particularly important in the context of potential changes in market conditions. This article analyzes the impact of sale and leaseback on the financial results of a cigarette filter manufacturing company. In 2020, the company decided to use sale and leaseback to finance the purchase of a modern production line. Initially, this decision improved the company's financial liquidity, enabling investments in development and modernization. However, in subsequent years, high leasing costs significantly burdened the company's budget, leading to deteriorating financial results. The analysis of the company's financial data for the years 2020-2024 shows that leasing costs were higher than previous depreciation costs, which negatively impacted operating and net profitability. Liquidity ratios such as current ratio and quick ratio initially improved but declined in the long term due to regular leasing payments. Moreover, the increase in leasing liabilities affected the company's capital structure, increasing its debt and financial risk. Leasing decisions, including sale and leaseback, have a multifaceted impact on companies' financial results. Before deciding on sale and leaseback, companies should carefully analyze the potential benefits and costs associated with this form of financing. It is crucial to understand how leasing will impact liquidity, profitability, and capital structure in both the short and long term. Companies should also consider alternative forms of financing, such as bank loans or bond issuance, which may be more advantageous in terms of costs and capital structure. In the case of sale and leaseback decisions, it is crucial for the company to have effective mechanisms for managing operating costs to avoid excessive financial burdens. In summary, sale and leaseback can be an efficient financial tool if used prudently and under appropriate conditions. Companies should thoroughly assess all financial and strategic aspects to maximize benefits and minimize risks associated with this form of financing. This article will analyze the financial data of the company for the years 2020-2024. The aim is to examine whether the costs of sale and leaseback constituted a significant element of operating costs that exceeded the savings from the depreciation of sold assets. This, in turn, could lead to a systematic reduction in operating margin (EBIT) and consequently, net margin. The study will utilize the income statement, balance sheet, cash flow statement, and statement of changes in equity.

3. Literature Review

Research indicates that sale and leaseback can be particularly attractive for companies that need quick access to cash but do not want to give up the use of key assets (Beattie et al., 2006; Catarinella, 2024). Under this form of financing, a company sells its assets and then leases them back, allowing for the release of frozen capital (Raghavan, Mishra, 2011). Sale and leaseback is especially popular in industries that require significant capital investments, such as manufacturing, transportation, and real estate (Kica, 2023). Companies in these sectors often need to invest substantial funds in the purchase and maintenance of infrastructure and equipment. Through sale and leaseback, they can obtain the necessary financial resources without having to sell and lose control of their assets. The main advantage of sale and leaseback is the ability to improve the financial liquidity of a company without affecting the operational use of its assets. Companies can continue to use the leased assets while simultaneously increasing their financial resources. Additionally, sale and leaseback can offer tax benefits since lease payments are treated as operating expenses, reducing the taxable income (Schallheim et al., 2013). Empirical studies show that sale and leaseback can lead to an increase in company value by optimizing the capital structure and reducing the cost of capital. This allows companies to better manage their financial resources, which in turn translates into an increase in their market value (Gross et al., 2014).

However, it is important to note that sale and leaseback is not without its drawbacks. Although it can temporarily improve financial liquidity, long-term leasing liabilities may lead to a deterioration of liquidity ratios in the future (Elsiefy, AbdElaal, 2019). Therefore, optimal management of sale and leaseback requires a thorough analysis of costs and benefits as well as consideration of long-term financial consequences (Whitby, 2013). The literature review shows that interest in sale and leaseback has significantly increased over the past decades, as reflected in the number of scientific publications dedicated to this topic. Figure 1 presents the number of scientific publications on sale and leaseback in various countries from 1980 to 2024.

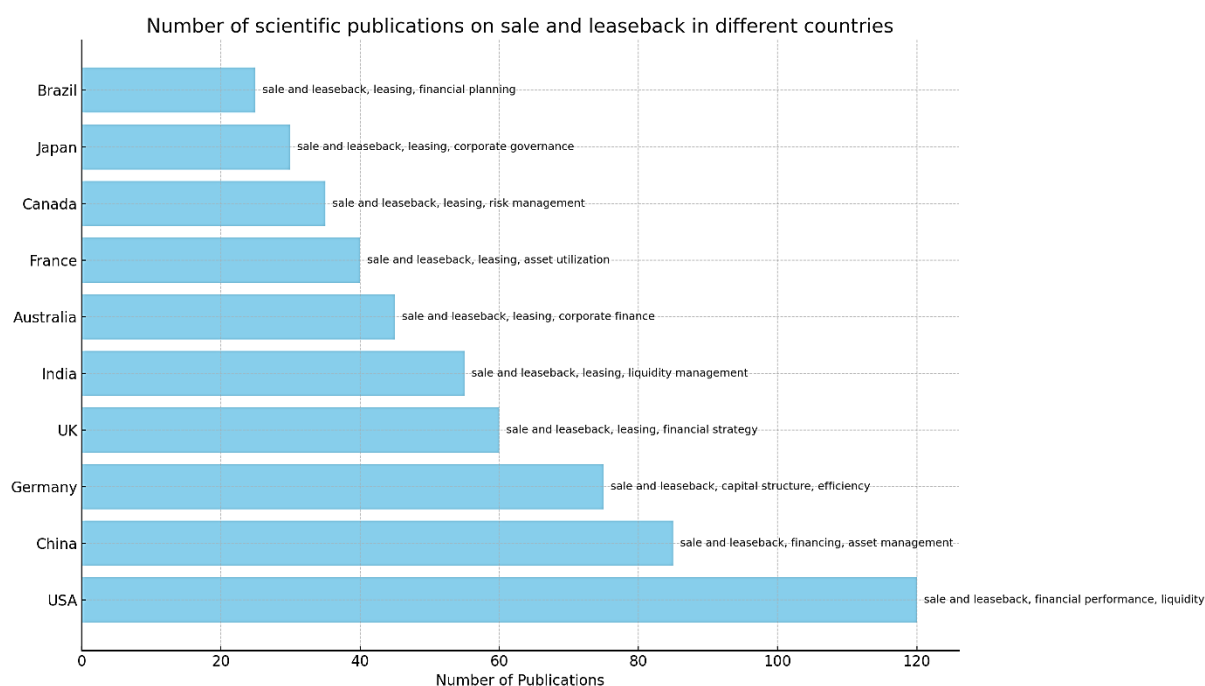


Figure 1. Number of Publications on Sale and Leaseback in Various Countries from 1980 to 2024.

Source: Own study based on Scopus, 24.07.2024.

The majority of research in this area comes from the USA (McConnell, Schallheim, 1983), China (Yao, Pretorius, 2016), and Germany (Miller, Töws, 2018), indicating a particular interest in this form of financing in these regions. The keywords most frequently appearing in publications are "sale and leaseback", "financial performance", "liquidity", "asset management", and "corporate finance". In this context, the case study is a particularly useful research method for analyzing the impact of strategic financial decisions, such as sale and leaseback, on the financial performance of companies. This research method allows for the consideration of industry-specific factors, organizational structure, and market context, enabling more precise and useful conclusions.

4. Results

The study examined the financial results of a cigarette filter manufacturing company in Poland, catering to both the domestic and export markets. The analyzed company employs an average of 120 employees annually, with 100 being production workers and the rest handling warehouse operations, administration, and management. Empirical data were obtained directly from the company, where one of the co-authors of the article is the chief accountant. This ensured unlimited access to complete and reliable data, allowing for an in-depth analysis. The deterioration in financial results forced management to take measures to reduce costs and improve profitability. One of the key steps was to carry out operational restructuring by

changing the business profile from production to trading (Zack, 2007). Management decided to sell part of the production assets and focus on trading activities to reduce operating costs and increase financial flexibility. This decision also aimed to reduce leasing costs, which were a significant financial burden (Zack, 2004). Operational restructuring brought some benefits in terms of reducing operating costs and improving financial liquidity. However, the process was time-consuming and involved additional costs associated with organizational changes and asset sales. In the long term, the change in business profile allowed the company to stabilize its financial situation, but financial results for the years 2021-2024 were significantly worse compared to previous years. To better understand the impact of sale and leaseback on the financial results of the cigarette filter manufacturing company, it is worth examining key financial indicators. In 2020, the company decided to release cash from fixed assets through sale and leaseback of the machine producing the main range of finished products. To evaluate the validity of this decision, its impact on the company's financial situation, and potential implications for other market participants, an analysis of key liquidity, profitability, and equity indicators was conducted. The current ratio trend is presented in Figure 2.

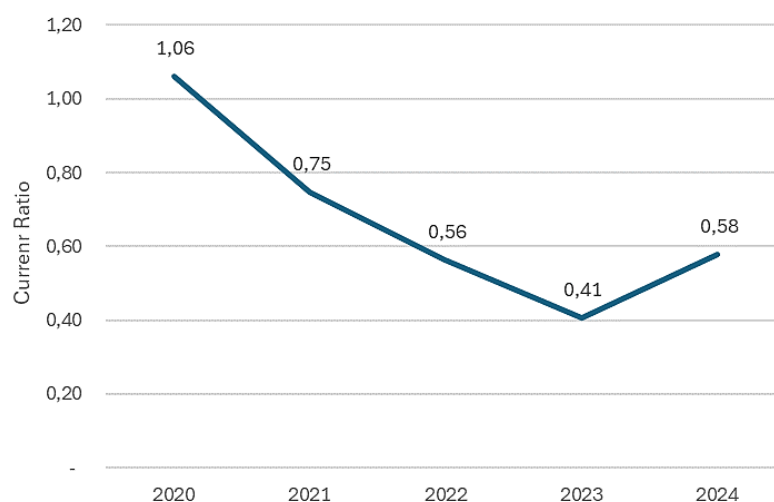


Figure 2. Current Ratio in the Restructured Company from 2020 to 2024.

Source: Own study.

Before the implementation of sale and leaseback, the Current Ratio was 1.06, indicating relatively good financial liquidity for the company. In this year, the company had sufficient current assets to cover its current liabilities. After implementing sale and leaseback, the Current Ratio significantly dropped, reaching values of 0.75 in 2021, 0.56 in 2022, 0.41 in 2023, and slightly increasing to 0.58 in 2024. This decline indicates the company's difficulties in maintaining sufficient liquidity to cover current liabilities, suggesting that the conversion of fixed assets into leases did not effectively support the restructuring processes. Instead, it burdened the company's budget, leading to a deterioration in its financial situation. Although sale and leaseback was initially intended to improve financial liquidity by releasing frozen capital, in the long term, it turned out to be a burden. The drastic drop in the Current Ratio after

implementing sale and leaseback means that the company increasingly struggled to meet its current liabilities. Complementing the analysis for the years 2020-2024 are the quick ratio (Figure 3) and the cash ratio (Figure 4).

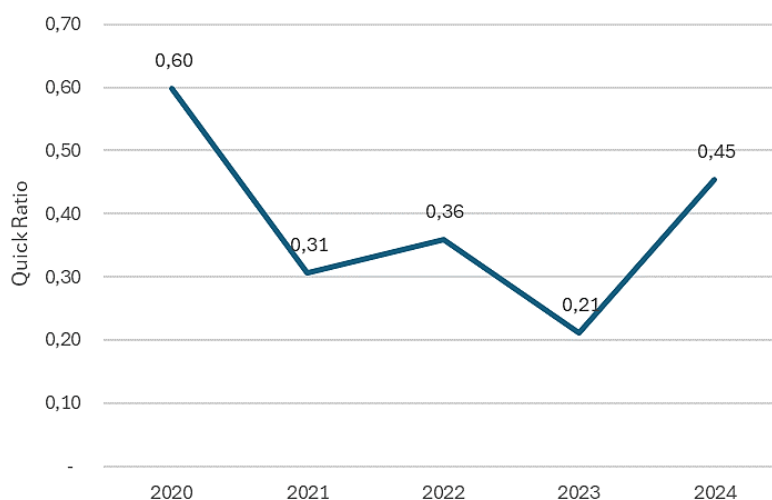


Figure 3. Quick Ratio in the Restructured Company from 2020 to 2024.

Source: Own study.

In year n_0 (2020), the quick ratio was 0.60, indicating that the company had relatively good ability to cover its current liabilities without needing to sell inventory. After implementing sale and leaseback, the quick ratio significantly dropped, reaching values of 0.31 in 2021, 0.36 in 2022, 0.21 in 2023, and increasing to 0.45 in 2024. Similar to the current ratio, the drop in the quick ratio indicates a deterioration in financial liquidity. This suggests that sale and leaseback did not support the restructuring processes; on the contrary, it additionally burdened the company, which struggled to maintain sufficient liquid assets.

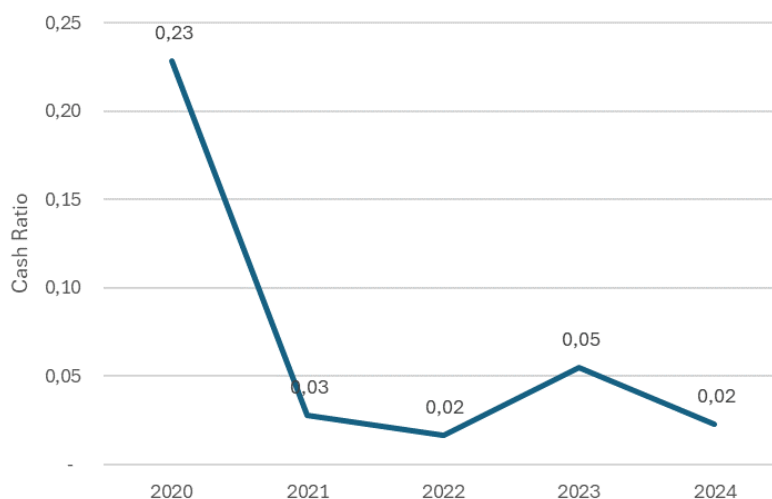


Figure 4. Cash Ratio in the Restructured Company from 2020 to 2024.

Source: Own study.

The significant drop from 0.23 in 2020 to 0.03 in 2021, and maintaining levels of 0.02-0.05 in subsequent years, indicates that the company had severe difficulties in maintaining enough cash to cover its current liabilities. In the next step, the cash conversion cycle in the company from 2020 to 2021 was examined (Figure 5).

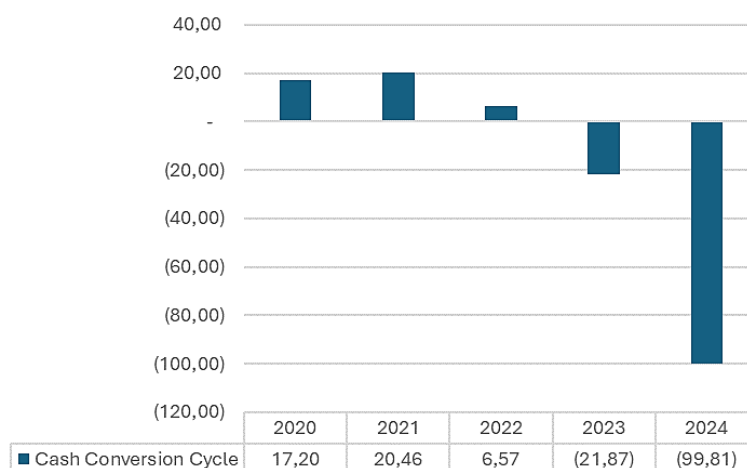


Figure 5. Cash Conversion Cycle in the Restructured Company from 2020 to 2024.

Source: Own study.

The values of the Cash Conversion Cycle (CCC) indicate the number of days needed for the company to convert its inventory investments into cash. After implementing the sale and leaseback, the CCC initially increased from 17.20 in 2020 to 20.46 in 2021, suggesting an extended time required to turn inventory into cash. However, in the following years, the CCC dramatically decreased, reaching negative values (-21.87 in 2023 and -99.81 in 2024). Negative CCC values indicate that the company receives cash from customers before it needs to pay its suppliers, which may be a result of restructuring and better management of the operating cycle. This suggests that the conversion of fixed assets into leases, despite initial difficulties, supported long-term restructuring processes by improving the cash conversion cycle. To verify this assumption, the current liabilities to equity ratio was calculated (Figure 6).

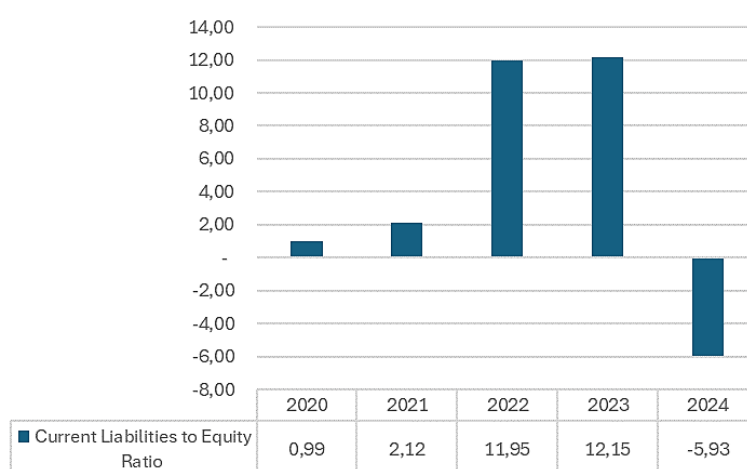


Figure 6. Current Liabilities to Equity Ratio in the Restructured Company from 2020 to 2024.

Source: Own study.

The Current Liabilities to Equity Ratio shows the relationship between current liabilities and equity. In 2020, the ratio was 0.99, indicating a balanced level of current liabilities relative to equity. However, by 2021, the ratio had risen to 2.12, and it then surged to 11.95 in 2022 and 12.15 in 2023, suggesting a significant burden of current liabilities on the company. The negative ratio in 2024 (-5.93) indicates a situation where equity became negative, possibly due to incurred losses. These changes suggest that the conversion of fixed assets into leases did not support the restructuring processes in the short term; on the contrary, it led to a significant increase in current liabilities relative to equity.

The final indicator analyzed was the operating cash flow to current liabilities ratio (Figure 7).

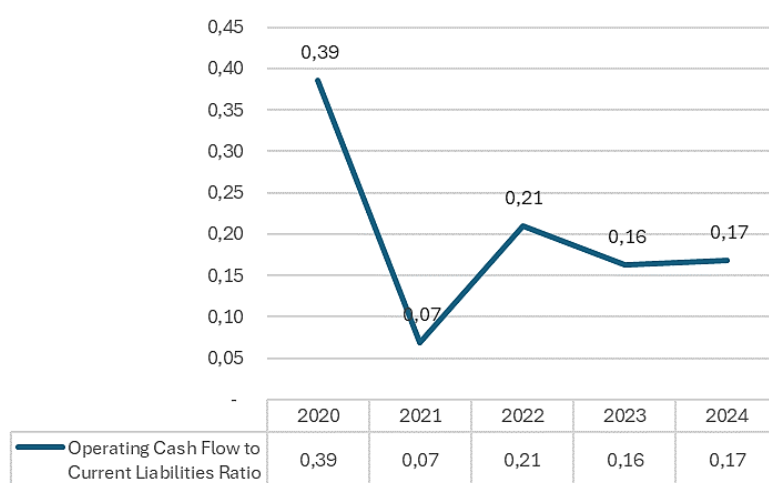


Figure 7. Operating Cash Flow to Current Liabilities Ratio in the Restructured Company from 2020 to 2024.

Source: Own study.

This ratio illustrates the extent to which operating cash flows cover current liabilities. The drastic decline in 2021 (from 0.39 in 2020 to 0.07) indicates that cash flows from operating activities were insufficient to cover current liabilities, significantly straining the company's financial liquidity. In subsequent years, the ratio shows a slight increase but remains at a low level (0.21 in 2022, 0.16 in 2023, and 0.17 in 2024), suggesting that financial liquidity remains tight. It is important to note that the release of cash from converting a fixed asset into a sale and leaseback is not reported in operating cash flows. These cash flows are presented under investing activities. Table 1 compares the analyzed ratio with the level of fixed assets and lease liabilities (Table 1).

Table 1.

Comparison of changes in the cash flow ratio with the level of fixed assets and lease liabilities in the restructured company from 2020 to 2024

Year	Operating Cash Flow to Current Liabilities Ratio	Lease liabilities	Fixed assets
2020	0,39	66 374,48 PLN	4 461 588,72 PLN
2022	0,21	5 324 389,28 PLN	2 409 565,66 PLN
2024	0,17	47 195,86 PLN	2 326 063,81 PLN

Source: Own study.

The significant increase in lease liabilities in 2021 (from PLN 66,374.48 in 2020 to PLN 6,510,498.84) indicates an intensification of sale and leaseback activities. Although this form of financing was intended to free up capital, it actually significantly increased the company's financial burden. In 2022 and 2023, lease liabilities began to decrease, which may indicate partial repayment of liabilities or renegotiation of lease terms. The decrease in the value of fixed assets from PLN 4,461,588.72 in 2020 to PLN 2,502,767.32 in 2021 may be a result of the sale and leaseback transactions. In the following years, the value of fixed assets stabilized at approximately PLN 2.3 million, suggesting that the company did not make further significant investments in fixed assets.

5. Conclusions

The sale and leaseback arrangement aimed to free up capital from fixed assets, which theoretically should support restructuring processes within the company. However, the data analysis shows that despite obtaining additional financial resources, the company faced significant difficulties in managing the newly incurred lease liabilities. The increase in lease liabilities in 2021 led to substantial financial burdens, limiting the company's ability to meet current obligations and make investments.

Companies considering sale and leaseback should carefully analyze their capacity to service the new liabilities. It is also advisable to introduce more flexible terms in lease agreements to better align payments with the company's financial situation. Additionally, advisory support in managing lease liabilities could help avoid serious liquidity issues.

Before deciding on sale and leaseback financing, companies should thoroughly analyze their cash flows and their ability to generate cash from operating activities. It is also worth considering alternative sources of financing that might be less burdensome on liquidity, such as bank loans with longer repayment periods or bond issuance.

Liquidity indicators analysis indicates a drastic deterioration in the company's financial situation following the implementation of sale and leaseback. The current ratio fell from 1.06 in 2020 to 0.41 in 2023, highlighting severe issues in covering current liabilities. The quick ratio and cash ratio also significantly worsened, further emphasizing the liquidity problems.

Companies should regularly monitor liquidity indicators and, if necessary, take corrective actions such as renegotiating lease terms or seeking additional financing sources. Figure 8 presents a scenario for companies considering converting fixed assets into a sale and leaseback arrangement. Based on the identified indicators, the optimal point for asset conversion into leasing has been estimated ($\rightarrow$ Optimal Conversion Point).

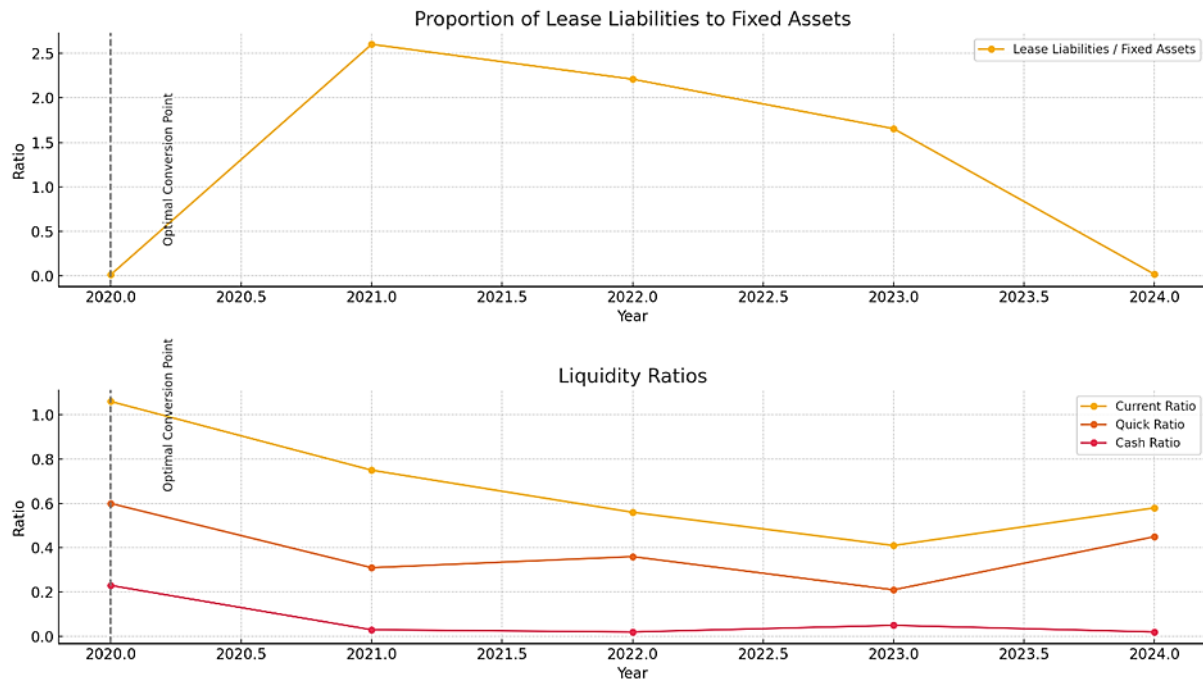


Figure 8. Scenario for companies considering the conversion of fixed assets into sale and leaseback.

Source: Own study based on analysis.

It is also advisable to implement more advanced liquidity management tools, such as cash flow forecasting and scenario analysis, to better prepare for potential financial challenges. Based on the conducted analysis and derived conclusions, several areas for further discussion can be proposed. Firstly, it is worth investigating whether sale and leaseback is an effective tool for supporting restructuring processes across various industries, as well as identifying best practices for its application. Additionally, comparing sale and leaseback with other forms of financing, such as investment loans, bonds, or equity issuance, would be beneficial to assess which instruments are most effective in specific situations.

Further research should delve into liquidity management methods that can help companies better cope with the burdens resulting from sale and leaseback arrangements. The analyzed case involved a medium-sized company producing cigarette tubes in Poland, in the Kuyavian-Pomeranian Voivodeship. In this context, it is also important to explore which liquidity management strategies are most effective for different types of activities and company sizes.

Studies should be conducted on the long-term effects of sale and leaseback on the financial stability of companies, taking into account various economic scenarios. It is essential to investigate the best strategies for exiting sale and leaseback arrangements and minimizing their negative impacts over the long term. While sale and leaseback can be attractive due to the

potential to free up frozen capital, it can also entail serious consequences for a company's financial liquidity and stability. Leasing decisions must be made with a full understanding of their impact on the company's finances and with an appropriate plan for managing liabilities. The case study analysis of the cigarette tube manufacturing company provides valuable insights and suggestions that may be useful for other companies considering sale and leaseback as a form of financing.

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PROCESS OF CONCEPT DEVELOPMENT FOR EDUCATIONAL PROJECTS CO-FINANCED FROM THE EUROPEAN UNION FUNDS WITH EXAMPLES OF SELECTED COMMUNES OF THE KUJAWSKO-POMORSKIE PROVINCE

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Purpose: The purpose of this article has been to present the education management stages in terms of concept development for educational projects from the European Union funds with examples of selected communes of the kujawsko-pomorskie province for the 2021-2027 financial prospective.

Design/methodology/approach: The article presents a case study for educational projects development by selected school-operating authorities: the Osielsko Commune and the Świecie Commune. The elaboration features the stages of educational projects concept development, from a development of the process of territory-specific strategies in the kujawsko-pomorskie province, a diagnosis of the schools supported and project works for co-funding applications development. The research methods applied included the case study as a methodology framework, semi-structured interviews with representatives of the school-operating authorities and school headmasters as well as the analysis of the contents of source documents; strategies, diagnoses, operational programmes, specify the programme and other EU guidelines.

Findings: The analysis of the projects concept development process in the Osielsko Commune and the Świecie Commune has demonstrated that the elaboration of educational projects involved a few stages, it was time-consuming and required a substantial institutional coordination; engagement of, e.g., representatives of the Marshal's Authority, Local Authorities, Primary Schools, Experts. The development of territory-specific strategies, diagnoses of schools and development of the final co-funding applications were of key importance, however the last stage turned out most complex. The participation of two external operators at the last stage facilitated coordinating the work of project teams, performing an in-depth analysis of schools, teachers and students as well as adjusting the scope of support in the project to the needs diagnosed in the light of the competition guidelines. The process was extremely long-lasting (over 4 years), which resulted in a decrease in the real value of the funds allocated (36.78% depreciation according to the GUS statistics for 2021-2025) and too intensive engagement of the representatives of many parties, namely the managing institution, school-operating authorities and representatives of schools; it is, therefore, indispensable to streamline the process in the successive prospective.

Research limitations/implications: Compliant with the EU co-funded projects management concept, it is indispensable to evaluate the project completed, which will facilitate an objective evaluation of adequacy, efficiency, usefulness, effectiveness and stability of support to schools,

teachers and students. The limitations to a further research process identified include high costs of evaluation research which account for 3-4% of the value of projects, resulting from a need to apply complex research methods, both quantitative (e.g., desk research, survey questionnaire, competence tests), and qualitative (e.g., in-depth interview, focus groups, participant observation, case study), ensuring representativeness and the right sample size number (namely, school headmasters, teachers, parents, students, civil servants engaged in project management) and field research in many educational facilities. With all that in mind, the subject of the Author's further research she plans to present in the successive article will be a comparative analysis of the projects for co-funding selected, which will facilitate identifying similarities and differences in the quality of intervention logic of preliminary project premises and finally accepted co-funding applications.

Practical implications: Presentation of the education management stages in the light of developing the concepts of educational projects from the European Union funds and conclusions from the analyses performed call for modifying the procedures applied in the competitions held by the Marshal's Authorities all across Poland. It mostly refers to: *Stage I. development of territory-specific strategies* in which representatives of schools, adequately trained before in terms of the possibilities of financing the facilities' specific educational needs, teachers and students must be included in terms of strategic records, namely types of projects, actions and performance indicators in the light of the EU guidelines. On top of that the programme documents should be most detailed to avoid substantive discrepancies while developing the strategy attachments (project premises). For *Stage II. A development of the diagnoses of the schools included in the support in the light of the project premises approved*, a diagnosis document template development is proposed considering a lack of clarity of the process for headmasters and primary schools-operating authorities. Due to exceptional labour-intensiveness of *Stage III. Development of applications for co-funding* and expecting the maximum effect-to-effort ratio, the local authorities are recommended to get engaged in the process of development of project concepts and applications for co-funding of external operators. Irrespective of those recommendations in the successive financial prospective it seems necessary to definitely shorten the procedures and to make them more efficient to ensure a faster funds flow and a greater effectiveness of educational interventions.

Social implications: The projects using the applications presented in this elaboration will have a social impact as offering an adequate support will facilitate providing equal educational opportunities to students by enhancing the quality and effectiveness of general education in primary schools all across Poland.

Originality/value: The article's original value is a practical approach to discussing the process of developing the concept of educational projects. The article is addressed to the local authorities as school-operating bodies which are the EU funds beneficiaries in the regional policy.

Keywords: education, primary schools, project, EU funds.

Category of the paper: research paper.

1. Introduction

The priority of the educational policy in Poland is to ensure an efficient system of education and lifelong teacher professional development which would respond to the real school needs and which will facilitate teachers' enhancement of professional competences and working tools

development. Schools should develop learning organizations which will keep improving their development (Hajdukiewicz, Wysocka, 2015, p. 7). at the same time it is important to promote self-education with teachers (Fila, Matuszczak, Rybińska, 2015, p. 43), and the key role in that process should be played by school headmasters (Fischer, Taylor, 2012, p. 235; Kordziński, 2010, p.10). The teacher reaches a high teaching effectiveness through providing experimental classes engaging students by using state-of-the-art equipment. Interestingly, Polish teachers, less frequently than their counterparts in other countries, apply the teaching techniques which gett the students most engaged, e.g., work in small groups, longer projects (Hernik, Malinowska, Piwowarski et al., 2014, p. 5; Kordziński, 2022, p. 71). In modern teaching a dynamic development of technologies calls for classes in a modern and engaging form, using innovative teaching aids which, through their multi-sensory impact enhance efficient acquisition of knowledge and storing it in long-term memory (Łukasik-Gębska, 2024, p. 4). Therefore, modern education faces permanent needs of additional equipment, improvement of managers and teachers in the light of the 21st century challenges (Ziółkowski, 2017, p. 8).

Unfortunately, the funds from the local authorities' budgets are insufficient to provide an effective support to educational facilities and so the school-operating authorities are interested in funds acquisition from the European Union (Adamowicz, Kmiecinski, 2017, p. 68). In the 2021-2027 financial prospective, the process of educational projects acquisition and execution for the local authorities is mostly carried out as part of the regional policy with support from the European Social Fund. The local authorities develop a strategy for the regional policy and develop the key projects they consider indispensable for the strategic development goals assumed. Having signed the applicable agreements with Marshal's Authorities, the strategies are included in the regional operational programmes implementation system. Then Marshal's Authorities launch a contracting procedure; the process of identifying the key projects in dedicated regional competitions. The local authorities as the schools-operating body or educational facilities providing general education, supported as part of the project, are obliged to develop the adequate co-funding applications to be evaluated and recommended for co-funding.

The process of co-funding for regional educational projects is extremely labour-intensive and distributed for the entire 2021-2027 financial prospective, namely from the strategy development stage, strategy approval, signing the co-funding applications, application evaluation and execution. The key stages of the process, understood as a strategy development, including the concept of educational projects and co-funding applications with the Osielsko Commune and the Świecie Commune as an example, have been presented in this elaboration.

2. Educational projects concept development process

From the analysis of the strategic documents specified below, the interviews with 2 representatives of the operating bodies in the Osielsko Commune and in the Świecie Commune and talks with 14 headmasters of educational facilities, it was identified that the process of educational projects concept development for primary schools covered by the support was extremely labour-intensive, with a long time-horizon, and it required an engagement of many interest-holders. In a nutshell, the following key stages can be specified:

Stage I: development of territory-specific strategies

The first step initiated in 2022 was to establish the local authorities' partnerships which included agreements between the local authorities and appointing the Steering Committee, which provided the institutional grounds for further strategic actions. The Świecie Commune was appointed the leader of the partnership for the Świecie Territory-Specific Policy Area (OPPT Świecie, 2023), while the city of Bydgoszcz – for the Strategy of Integrated Territory-Specific Investment Projects (ZIT Bydgoszcz, 2023). In 2022-2023 the ZIT Bydgoszcz Strategy project was developed, and in 2023-2024 – the OPPT Świecie Strategy. The strategies, next to the socioeconomic diagnosis, propose a list of the key projects (project premises), which were considered indispensable for the development goals execution. For each project premise, e.g., the topic, project execution location, tasks, the estimated total cost, time horizon and the key indicators were defined. In 2023, the ZIT project went through social consultation and the procedure of strategic evaluation of impact on the environment, whereas for OPPT Świecie the consultation was held a little later in 2024. The ZIT Bydgoszcz Strategy was approved with a resolution of the ZIT Steering Committee no 2/2023 of 2023, whereas the OPPT Świecie Territory-Specific Strategy – with resolution of the OPPT Steering Committee no 6/2024 of 31 October 2024. The last step involved signing the Territory-Specific Agreements between the partnerships of ZIT Bydgoszcz (on 7 September 2023) and OPPT Świecie (on 24 November 2023) and the Kujawsko-Pomorskie Province. The agreements signing was the key stage of institutionalising both strategies as it officially included them into the system of implementing the program of the 2021–2027 European Funds for Kujawy and Pomorze and initiated the contracting procedure, which is the process of identifying the key projects in dedicated competitions.

The difficulties and limitations of that stage were substantial, especially discrepancy among the decision-makers in terms of the hierarchy of the programme intervention directions and division of the funds for respective local authorities. At the same time there was observed an insufficient competence level of the staff who faced problems attributing precisely the projects to the adequate programme measures, estimating the real budgets and identifying the risk of double scopes of intervention, which resulted in numerous working documents discrepancies. The problems were even more serious due to the fact that in the strategy development period the competition regulations and guidelines were still unknown, and the programme documents were developed to be very general. Partners had only partial knowledge about access criteria, financial limits and procedure requirements specified in the operational programme and providing the programme with more details, which made the records more prognostic (2021-2027 European funds for Kujawy and Pomorze. Detailed Description of the Priorities of the 2021-2027 European Funds for Kujawy and Pomorze Programme). As a result, some project proposals needed to be many times revised due to some missing intervention logic, inadequate attribution of projects to measures and underestimated costs in terms of the indicator values assumed. As a result, the project premises were a few times updated since at the successive stages there appeared new substantive and formal discrepancies which required providing more precise scopes of support, indicators and budgets.

It is therefore indispensable to include the representatives of schools, properly trained before in terms of opportunities of funding the specific educational facilities, teachers in terms of strategic records, namely the project types, measures and indicator values to be achieved in the light of the applicable EU guidelines. The programme documents should be also developed in more detail to avoid substantive discrepancies while developing attachments to the strategy.

The support characteristics for the project types and the applicable guidelines in programme documents for the OPPT Świecie Strategy (Measure: FEKP.08.27 General education OPPT) and for the ZIT Bydgoszcz 2023 Strategy (Measure: FEKP 08.12 General education BYDOF-IP) are presented in Table 1.

Table 1.*Support characteristics for the project types and the applicable guidelines*

No	Support characteristics	Applicable guidelines
TYP 1	Support for students to provide equal educational opportunities by enhancing the quality and effectiveness of general education as well as by increasing the accessibility and social inclusion: a. enhancing the key, socio-emotional, basic, transversal competences or green or digital transformation-related competences; b. internships; c. inclusive education, with diagnosing the individual development or educational needs or providing psychological and pedagogical assistance, with counteracting premature education system abandonment; d. actions resulting from upbringing or supporting function of school, or problems prevention; e. education and vocational advisory service.	1. Accessibility must be understood as provided in the Guidelines for equality principles for the 2021-2027 EU funds. 2. Inclusive education must be understood as provided in the "Substantive report. Inclusive education in Poland – opening balance 2020", Centre for Education Development, Warsaw 2021. 3. The school's educational or supporting function must be understood compliant with Art. 1, clause 3 of the Education law Act. 4. Individual development or educational needs, psychological and pedagogical assistance must be understood as the needs and assistance provided for in Regulation of Minister of National Education of 9 August 2017 pertaining to the principles of organization and psychological and pedagogical assistance in public kindergartens, schools and facilities.
TYP 2	Support for representatives of the staff to increase the quality of general education: a. increasing competences or acquiring the professional qualifications; b. enhancing the key, socio-emotional, transversal competences or green or digital transformation-related competences; c. helping with solving teaching or educational problems; d. education and vocational advisory service tasks; e. preparation for inclusive education; f. developing networks of cooperation, learning from one another or mentoring programmes (e.g., teacher training school model).	5. Competences or qualifications must be understood as provided in Annex 2 to the 2021-2027 tangible programme execution progress monitoring guidelines. 6. Key competences must be understood as provided in the Council Recommendation of 22 May 2018 pertaining to the key competences for life-long learning. 7. Digital competences must be understood as provided in the Guidelines for projects with the European Social Fund Plus funds in the 2021-2027 regional programmes. 8. Basic and transversal competences must be understood as in the Integrated Skills Strategy (detailed part).
TYP 3	Support for schools and facilities helping to enhance the effectiveness and quality of general education: a. external support in terms of education and vocational advisory service; b. education conditions quality improvement; c. getting adapted to the green or digital transformation requirements, including digitalization enhancement; d. inclusive education, including accessibility improvement (e.g., accessible school model); e. innovative teaching methods implementation.	9. Socio-emotional competences must be understood as provided in the 2030 Integrated Skills Strategy (general part). 10. Accessible school model, https://model.dostepnaszkola.info/ 11. Teacher training school model, https://www.ore.edu.pl/category/projekty-powier/szkola-cwiczen/ 12. Marginalised area must be understood compliant with the list included in the Annex to the Territory policy of the kujawsko-pomorskie province. 13. As for digital competences support, the digital competences standard must be applied as of "DigComp" framework version valid on the admission announcement date.

Source: own elaboration based on: Detailed Description of the Priorities of the 2021-2027 European Funds for Kujawy and Pomorze Programme (2024) pp. 358, 432, and programme guidelines.

The scope of support types is multi-layered, expanded and the catalogue of measures has been general and technical, written in a project-specific language, which makes it hard for the school-operating authorities to interpret. Yet another difficulty is due to a dispersion of guidelines regulating, e.g., accessibility, inclusive education, key competences or digital standards which should be considered at every support planning stage. As a result, only a person with EU project experience can translate the above notes into cohesive, practical and feasible operational measures.

Stage II: diagnosis development for schools supported in the light of the project premises approved

As part of the ZIT Bydgoszcz Strategy for the Osielsko Commune one project premise was developed for the educational project including 4 primary schools referred to as ZIT-BY-55: "Educational projects for primary schools of the Osielsko Commune". In the OPPT Świecie Strategy for the Świecie Commune, there were developed three project premises the beneficiary of which are 10 primary schools: OPPT-SW-26: "A sound mind in a sound body"; OPPT-SW-27: "I learn to teach/ learn" and OPPT-SW-28: "English is easy". The key parameters for those project premises are provided in Table 2.

Table 2.

Key parameters of project premises for educational projects in the Osielsko Commune and in the Świecie Commune

Strategy no	Project topic	Project value	Time horizon	Support scope planned:
ZIT BY-55	Educational projects for primary schools of the Osielsko Commune	EUR 245 088	2023-2025	1. Organizing extracurricular activities for 500 students of 4 schools: a) English, b) ICT, c) maths and life sciences, d) English, e) entrepreneurship. 2. Held for 100 teachers: a) modern education conference, b) training workshops, c) emotional-social competences conference.
OPPT 26	A sound mind in a sound body	EUR 235 295	2025-2026	1. Holding swimming qualification training for 60 teachers. 2. Swimming classes for 150 students.
OPPT 27	I learn to teach/ learn	EUR 542 391	2023-2025	1. How-to-learn classes with 700 students. 2. English classes for 700 students. 3. Training workshops for 140 teachers. 4. Purchase of 21 computer displays for 10 schools.
OPPT 28	English jest easy	EUR 446 435	2025-2027	1. Enhancing the foreign language development competences of 43 teachers 2. English classes for 200 students.

Source: own elaboration based on project premises in the strategies approved: Territory-Specific Strategy of the Świecie Territory-Specific Policy Area; 2021-2027 Strategy of Integrated Territory-Specific Investment Projects for the Bydgoszcz Functional Area.

Working on the key projects, the schools the support has been addressed to as indicated in the project premises were obliged to develop the diagnoses which would justify the scope of support proposed. At that stage there were identified many doubts due to the fact that for the diagnosis document, formal requirements and elaboration standard were missing, while the applicable regulations did not oblige the schools to attach the diagnosis to the co-funding application. At the same time the project premises were many times updated, which was yet another substantial organizational burden for school headmasters. Some of them faced difficulties with updating the diagnoses and considered the process hardly justifiable in such dynamically changing conditions. As a result, most schools only provided a general declaration to make such diagnosis, without publishing the diagnosis document in the public space. It would have been reasonable to develop a diagnosis template as the process was unclear to the headmasters and primary-schools-operating authorities.

Stage III: co-funding applications development

The last stage was the greatest challenge for the local authorities as it required application development teams, to include school-operating authorities and schools supported, to be appointed. The teams intention was transferring the concepts from the project premises and the needs of target groups (schools, teachers and students) to the cofounding application fields compliant with the regulations of the competitions announced. Due to the extreme labour-intensiveness of the last stage and expecting the maximum effect-to-effort ratio, both local authorities decided to outsource professionals, who had to satisfy many requirements, especially the adequate level of knowledge and considerable co-funding application development and educational projects management experience. On top of that, high communication and managerial skills for project team management, especially planning, delegating tasks, motivating the project team members, were desired. The project team members representing schools included headmasters and teachers; potential coordinators of schools to be supported.

In developing the cofounding application, the key role was played by the operators who moderated the work of the project teams in terms of:

- defining the obligatory parameters as boundary conditions provided for in the project premises approved,
- practical discussion of 3 types and support opportunities according to the competition regulation,
- presenting the formal and substantive requirements for implementing 3 types of support,
- estimating the maximum expenses for each primary school considering the number of students and teachers,
- performing an in-depth analysis of the needs of schools, teachers and students,
- planning the key measures together with the schedule and budget,
- substantive discussion and proposal of changes leading to budget approval.

During the process there were some difficulties due to insufficient substantive knowledge and a varied level of engagement of the team members representing schools and so the external operator organized additional explanatory sessions, specified the competition requirements further and defined deadlines in the work schedule.

3. Conclusions

A dynamic development of technology determines the necessity of open teaching process following the formula based on state-of-the-art tools, multi-sensory methods and regular improvement of teachers' and managers' competences. At the same time, the local authorities' limited financial potential result the public education development draw more and more on the EU funds acquired from regional programmes as the key instrument for primary school support in the 2021-2027 prospective.

The entire process, including strategic planning and educational project concept development involved many stages and required more than 2 thousand interest holders participating. ZIT and OPPT territory-specific strategies development, social consultation and formal approval by the steering committees taking resolutions have facilitated including them to the 2021-2027 European Funds for Kujawy and Pomorze programme implementation system. It was most complex and demanding to appoint the interdisciplinary project teams with representatives of the school-operating authorities, headmasters, teachers, the student council and precise transfer of strategic concepts to co-funding applications compliant with the requirements of the competition regulations.

In that process the key role was played by outsourced operators through competition and selection as the development of operationally-feasible application required specialist competences beyond the standard resources of schools and local authorities. At the same time for every local authority, the operator engaged coordinated the work of the project teams, specified more precise parameters pre-defined in the project premises, interpreted the types of support while referring to the regulation. Regional competitions announced in the kujawsko-pomorskie province defined the principles of providing support precisely only at the recruitment stage, specifying the final framework of intervention. Yet another barrier was due to dispersed regulations which included, e.g., inclusive education, accessibility, key competences and digital standards, which required a high level of expert knowledge and EU project experience.

The process of regional educational projects co-funding, from strategy development to final application development, turned out extremely labour-intensive and burdensome organization-wise. Many-years procedure also led to a significant devaluation of the purchasing power value of the funds allocated to education due to the time lapse and inflation. In the successive financial prospective it seems, therefore, necessary to shorten the procedures a lot and to make them

more efficient to ensure a faster flow of funds and a greater effectiveness of educational interventions.

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WHEN REPUTATION BURNS. THE EFFECTIVENESS OF IMAGE CRISIS MANAGEMENT MODELS IN SOCIAL MEDIA

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Purpose: The purpose of this article is to assess the effectiveness of reputational crisis management models in the social media environment based on the analysis of real-world cases involving brands and online content creators. The study identifies key factors determining the effectiveness of crisis responses and the process of organizational reputation recovery. Particular emphasis is placed on the role of authenticity, response speed, and communication consistency.

Design/methodology/approach: A mixed qualitative–quantitative approach was employed, drawing on empirical research conducted in 2025 among social media users (N = 210). The analysis focused on four high-profile reputational crises: Shein, Budda, Alkotubki, and Pandoragate. Data were collected using an online survey and content analysis of crisis-related communications published on social media platforms.

Findings: The findings indicate that the effectiveness of reputational crisis management primarily depends on three factors: response speed, message authenticity, and consistency with the brand's prior image. Respondents perceived apology-based responses combined with tangible corrective actions as significantly more effective than silence, denial, or the deletion of user comments.

Research limitations/implications: The study is descriptive and diagnostic in nature and is based on a relatively limited sample of respondents. Moreover, the analyzed cases originate from a Polish-language social media environment, which may constrain the generalizability of the findings.

Practical implications: The results provide a foundation for a practical digital crisis management framework. The study recommends responding within the first 24 hours following the emergence of a crisis, avoiding the deletion of comments, combining verbal statements with concrete remedial actions, and adopting an empathetic communication tone. A three-stage crisis response framework is proposed: identification, response, and reputation reconstruction.

Social implications: Effective online crisis communication enhances social trust and supports the development of responsible digital practices.

Originality/value: This article offers an empirical verification of classical crisis management models within the context of social media.

Keywords: crisis communication; reputational crisis management; social media; organizational reputation.

Category of the paper: Research-based case study.

1. Introduction

The contemporary digital communication environment is characterized by exceptional dynamism, interactivity, and the immediacy of information flows. The Internet—and social media in particular—has become not only a tool for exchanging opinions and promoting brands, but above all a space in which public opinion is shaped and trust is built or eroded (Dharta, Aziz, 2024; Granstedt, 2024; Quinn, 2025). For modern organizations, a presence on social media is no longer optional; at the same time, it constitutes a significant source of risk. In an environment where any user can instantly publish an opinion, recording, or comment, even a single incident may rapidly evolve into a large-scale media crisis (Reuter et al., 2018; Zhang, Vos, 2015).

Corporate image, as one of the key organizational assets, is the result of a long-term communicative process between an organization and its stakeholders (Heugens, 2004; Malara, Sobol-Wojciechowska, 2011). Today, social media serve not only as a space for image creation but also for its continuous verification, as audiences respond immediately to brand actions, compare communicated messages with reality, and interpret any inconsistency between words and actions as a sign of inauthenticity, potentially leading to reputational loss (Menon, 2024; Sohail et al., 2020; Yang et al., 2021). As noted by Schwarz et al., a crisis is not merely the consequence of a material event, but a process of social meaning construction in which organizations, media, and audiences negotiate the interpretation of a situation (Schwarz et al., 2016).

Under conditions of instantaneous information circulation, brand reputation has become particularly vulnerable to disruption, and reputational crisis management has ceased to be the exclusive domain of public relations departments—it has become a strategic task for the entire organization (Do, Nham, 2021; Etter et al., 2019). Organizational image constitutes one of the most important elements of intangible capital (Peshev, 2020; Veh et al., 2019). It reflects how a company, brand, or public figure is perceived by its environment, including customers, business partners, employees, and the general public. Image is formed through a long-term communication process and represents the organization's identity, values, and style of operation. As emphasised by (Iwacewicz-Orłowska, 2016) image results not only from marketing communication, but also from how an organisation fulfils its social obligations. Therefore, consistency between declared values and actual practices is crucial for reputational stability. A lack of a clearly defined brand identity leads to communication inconsistencies, which may become a direct source of reputational crises. When organizations fail to control their messaging or provide contradictory information, trust erodes, and even minor incidents may escalate into serious reputational crises (Do, Nham, 2021; Greyser, 2009). Whereas reputational crises in the past tended to develop gradually and could be managed through traditional media, today they are often immediate and unpredictable (Akcan, Merdin,

2025; Hosseinali-Mirza et al., 2015). Their origins may lie in an imprudent statement by a company representative or in false information disseminated by Internet users. A reputational crisis can therefore be defined as a disruption in the balance between an organization's desired image and its actual public perception (Coombs, T., 2013; Heugens, 2004; Kaczmarek-Śliwińska, 2015). Importantly, as Spector notes, a crisis begins only when a public reaction emerges indicating that an organization has violated shared values or norms. The dynamics of online communities, the emotional intensity of user comments, and the tendency toward mass content sharing mean that the timing of a brand's response is critical to limiting reputational damage. Consequently, contemporary reputational crisis management requires not only strategic competencies but also a thorough understanding of communication mechanisms in the digital environment.(Spector, 2019).

Crises often result from communication errors, inadequate information management, or failure to respond to early warning signals (Cheng, 2016; Fischer et al., 2016; Špoljarić, 2021; Wang, Lu, 2020). In social media environments, these factors gain particular importance, as the speed of information diffusion and the emotional nature of user reactions cause even minor shortcomings to quickly escalate. The literature (Coombs, T., 2007; Kaczmarek-Śliwińska, 2015) indicates that a fundamental condition for effective reputational crisis management is the existence of a well-developed communication strategy and a designated crisis management team. As Tworzydło observes, rapid threat identification and the immediate activation of communication procedures significantly reduce the negative consequences of a crisis. Conversely, the absence of an action plan or ambiguous managerial decisions leads to escalation and loss of control over the narrative (Tworzydło, 2022).

Reputational crises may be classified according to several criteria, including duration, point of origin, the type of stakeholders involved, and the level of organizational control over the situation.

Table 1.
Types of crises

Criterion	Type of crisis	Characteristics
Time Frame	Rapid-onset	Emerge unexpectedly and require immediate decisions with limited analysis; typical of social media environments, where responses are expected within hours.
	Short-term	Last from several days up to one month; affect selected areas of organizational activity and may be partially controllable.
	Long-term	Persist for months, leading to sustained reputational damage, for example as a result of recurring scandals or prolonged conflicts.
Origin	Internal	Result from organizational failures, lack of competencies, or improper managerial decisions.
	External	Caused by factors beyond the organization's direct control, such as competitor actions, changes in the social environment, media criticism, or consumer behavior.

Cont. table 1.

Nature of involved stakeholders	Personal	Concern specific individuals, most often opinion leaders, politicians or influencers.
	Media-related	Originate in the online media space, often triggered by the publication of controversial content.
	Customer- related	Linked to product quality or customer service issues.
	Social	Involve ethical or moral issues, frequently related to values promoted by the brand.
Level of control	Controlled	The organization is able to manage the situation and limit its consequences.
	Moderately controlled	Partially manageable, though accompanied by difficult-to-predict outcomes.
	Uncontrolled	Escalate beyond the organization's influence and lead to significant reputational losses.

Source: Author's own elaboration based on: (Al Balawi et al., 2023; Antonetti et al., 2024; Badu et al., 2023; Björck, 2016; Coombs, T., 2007; Lerbinger, 2012; Lim et al., 2025; Mansoor, 2024; Ndone, Kyriakopoulos, 2024; Quamina, Singh, 2023; Yang, Fu, 2025).

Such a classification makes it possible to understand that each crisis is an individual phenomenon, requiring specific actions tailored to its scale, sources, and development dynamics. Reputational crisis management in social media involves planned, systematic, and integrated organizational action (Coombs, T., 2007), encompassing both the prevention of potential threats and rapid responses to crises that have already emerged (Austin et al., 2012; Zheng et al., 2020). It is a multi-stage process (Fearn-Banks, 2016), that requires not only procedural preparedness but also organizational maturity, communicative empathy, and the ability to make decisions under time pressure (Austin et al., 2012). Its primary objective is to mitigate the negative consequences of crises, restore informational stability, and rebuild trust and a positive organizational image in the eyes of stakeholders (Ulmer, Sellnow, Seeger, 2017). The literature on crisis management increasingly emphasizes the role of organizational readiness (*crisis readiness*), understood as an organization's ability to respond flexibly and rapidly to dynamically changing crisis conditions. According to the framework proposed by Jin et al. (2024), readiness constitutes a multidimensional construct that encompasses organizational attitudes, cognitive–emotional adaptive capacity, and a process-oriented approach to crisis management, extending beyond the traditional understanding of organizational preparedness and resilience.

In the context of social media, this process acquires particular significance because communication takes place in real time and user opinions can rapidly shape brand perceptions (Mishra, Maheshwari, 2025). W tak dynamicznym środowisku każde opóźnienie w reakcji, nieprecyzyjna informacja lub brak spójności przekazu może doprowadzić do eskalacji kryzysu i utraty reputacji (Nuortimo et al., 2024). Dlatego skuteczne zarządzanie kryzysem wymaga stałego monitorowania przestrzeni internetowej, analizy nastrojów społecznych oraz umiejętnego wykorzystania narzędzi analitycznych do identyfikowania potencjalnych zagrożeń zanim przerodzą się one w otwarty konflikt (Krysiński, Kowalska-Chrzanowska, 2023).

A crucial role in this process is played by the communication competencies of organizational representatives, including the ability to formulate clear, credible, and empathetic message (Kowalski, Padlowska, 2023). Contemporary audiences expect not only informational responses but, above all, authentic dialogue that entails acknowledging mistakes, explaining the situation, and undertaking corrective actions. Consequently, the effectiveness of crisis response strategies depends on an organization's capacity to engage in communication that is not merely defensive but proactive and oriented toward relationship building (Krawczyk, 2018).

Crisis management, however, is not limited to ad hoc interventions. As indicated in the literature and supported by the empirical findings presented in this study, effective crisis management constitutes a continuous process in which both the pre-crisis and post-crisis phases are of critical importance (Zakrzewska-Bielawska, 2008). In the pre-crisis phase, organizations assess risks, develop response procedures, and train crisis teams; following the resolution of a crisis, they analyze the course of events, draw conclusions, and implement improvements (Starosta, 2016; Vašíčková, 2020). In this way, a crisis may become a turning point in organizational development, contributing to enhanced reputational resilience, higher communication standards, and improved relationships with stakeholders.

Indeed, as scholars of crisis management emphasize (Pahl-Wostl et al., 2023; Pedersen et al., 2020), every crisis carries transformative potential—it may lead to a loss of trust and market position, but it may also catalyze internal change, restructuring of communication processes, or a redefinition of brand values. Organizations that are able to properly interpret crisis experiences often emerge stronger, more self-aware, and more closely aligned with their audiences (Evenseth et al., 2022).

For this reason, reputational crisis management in social media should be understood not merely as a defensive reaction to a threat, but as a strategic element of organizational culture that integrates communication, leadership, and social responsibility (Cheng, 2016). From this perspective, a crisis does not mark the end of reputation, but rather a moment of reflection and renewal, in which transparency, consistency, and credibility become the foundations of long-term brand success.

The effectiveness of reputational crisis management models has been the subject of numerous analyses in the literature on organizational management, communication, and public relations (Dwiedienawati et al., 2021; Tworzydło, Gawroński, 2022). Contemporary scholars emphasize that no single universal model can guarantee effective resolution of every crisis situation (Oscarsson, 2022; Upadhyay, Upadhyay, 2023; Zamiar, Ścibiorek, 2022). The effectiveness of a given strategy depends on the nature of the crisis, the dynamics of its development, the level of organizational preparedness, and the quality of communication with the external environment (Jong, 2025; Zakiri, 2020).

Reputational crisis management may thus be viewed as a multidimensional process that integrates communicative, organizational, and psychological aspects. The effectiveness of crisis response depends not only on the existence of an appropriate response plan, but primarily

on the organization's ability to rapidly interpret the situation, make appropriate decisions, and maintain credibility in the eyes of public opinion. As Kaczmarek-Śliwińska (Kaczmarek-Śliwińska, 2015), notes, effective crisis communication requires balancing the need to inform with responsibility for the message, so as not to exacerbate negative emotions among audiences. In crisis management theory, the effectiveness of models is typically assessed on the basis of three groups of criteria, as presented in Table 2.

Table 2.
Criteria for Effectiveness in Crisis Management

Criterion	Characteristics
Temporal	Speed of response, pace of decision-making, and organizational readiness for immediate action
Communication-related	Consistency, clarity, and credibility of messages communicated to stakeholders
Reputational	The organization's ability to maintain or rebuild trust after the crisis has subsided

Source: Author's own elaboration based on: (Gasana, 2024; Iveson et al., 2023; Nuortimo et al., 2024).

These criteria are mutually complementary: a delayed response weakens communication effectiveness, while an inconsistent narrative leads to the deepening of reputational losses. Therefore, the effectiveness of reputational crisis management should be understood not only in terms of short-term conflict containment, but also in a long-term perspective—as an organization's capacity for learning and for building reputational resilience. Classical literature identifies several models that have laid the foundations for contemporary crisis management practices, as presented in Table 3.

Table 3.
Effectiveness of Crisis Management Models in the Classical Perspective

Model	Założenia modelu
S. Fink's Model	Assumes that management effectiveness depends on the accurate identification of crisis phases: pre-crisis, crisis, and post-crisis. A key success factor is the ability to detect early warning signals and to respond before the crisis reaches its peak.
I. Mitroff's Model	Crisis management effectiveness is measured not only by the speed of response, but also by the organization's ability to implement changes and modify procedures based on prior experience.
Four-Phase Crisis Management Mode	Consists of four phases: prevention, preparedness, response, and recovery. The model emphasizes the continuity of actions and consistency of decision-making. Effectiveness is understood as the integration of all phases into a single, recurring process.
Organizational Maturity Model	Management effectiveness is a function of organizational culture and staff competencies. A mature organization can anticipate potential threats, manage stakeholder emotions, and conduct value-based communication.

Source: Author's own elaboration based on: (Brito, 2025b, 2025a; Coombs, T., 2007; Howell, Miller, 2006).

All models presented in Table 3 assume that the effectiveness of crisis response does not stem from the mere existence of a plan, but rather from its practical implementation and flexibility in the face of changing circumstances. The effectiveness of reputational crisis management models is closely linked to human factors—managerial competencies, leadership quality, and the organization's communication culture. High levels of internal trust, openness

to dialogue, and willingness to accept criticism facilitate efficient responses and help reduce the scale of reputational losses.

As emphasized by Tworzydło (Tworzydło, 2022), Marcinkiewicz and Nogalski (Nogalski, Marcinkiewicz, 2004) and Jin et al. (Jin et al., 2024) effective crisis management models should not function solely as sets of procedures, but rather as integral components of organizational strategy grounded in risk awareness and communication ethics. This implies that organizational preparedness for crises must begin well in advance through employee education, trust-building initiatives, and the development of empathetic communication capabilities toward stakeholders.

Social media constitute a distinctive communication environment (Abiodun, Nwabueze, 2025; Tworzydło, Gawroński, 2022), in which the boundaries between sender and receiver become blurred. Unlike traditional media channels, this relationship is inherently interactive, as users actively participate in content creation, commenting, sharing, and shaping the opinions of others. Consequently, during a crisis, organizations no longer retain full control over information flows, and their messages are subject to immediate evaluation and reinterpretation (Cheng, 2018). Effective crisis response in social media therefore requires a combination of professionalism, empathy, and authenticity. Contemporary social media platforms further diminish the boundary between private and public communication (Zakiri, 2020; Greś et al., 2022). Users simultaneously assume the roles of information producers and consumers, and their activity directly affects brand reputation. Each comment, video, or post may either escalate or mitigate a conflict.

The so-called “snowball effect” is particularly dangerous in this context, as a single ill-considered publication can reach audiences within hours that exceed an organization’s response capacity (Vosoughi et al., 2018). Accordingly, modern organizations must not only monitor online discourse but also continuously build relationships with audiences based on trust and transparency (Strauss, Nentwich, 2013). This dynamic of emotional escalation in social media is further amplified by algorithmic mechanisms that prioritize content eliciting strong affective responses, which may intensify reputational crises and influence the speed of their diffusion (Vosoughi et al., 2018).

Social media can function both as a trigger of crises and as a tool for their resolution. However, their effective use in crisis management requires consistency, rapid action, and an empathetic approach toward audiences. The manner in which a brand communicates during the first hours following a crisis outbreak often determines its subsequent trajectory (Abiodun, Nwabueze, 2025; Kopera, 2022).

Communication plays a pivotal role at every stage of crisis management—from prevention, through response, to reputational recovery (Krynicka-Duszyńska, 2010). Effective communication requires message consistency, informational clarity, and adaptation of language to target audiences. In practice, this necessitates the preparation of a crisis communication plan, designation of spokespersons, and identification of channels through which messages will be disseminated (Elfattah, 2024; Larisu, Zulham, 2024; Mwandembo, 2024).

In social media environments, not only the content of a message matters, but also its tone and timing. Organizations that respond quickly tend to seize the initiative in shaping the narrative, whereas silence or excessive defensiveness undermines credibility. Effective crisis communication therefore rests on four core principles: speed, consistency, empathy, and transparency.

Despite the growing body of literature on crisis communication in digital environments, a noticeable gap remains concerning the perceptual (audience-centered) dimension of communication effectiveness in a strongly platform-specific context. While many studies focus on crisis phases and recommended response strategies, fewer examine how users of different platforms interpret “authenticity” and “credibility” as outcomes not only of message content, but also of form (e.g., video/live versus written statements) and response speed. There is also a lack of integrative approaches that link temporal, communicative, and reputational criteria with expectations of so-called “evidence-based actions,” understood as visible costs and the materialization of apologies through concrete changes or compensatory measures.

This article addresses this gap by presenting the results of a diagnostic–exploratory study (N = 210) based on four widely publicized media crisis cases, and by subsequently proposing a synthesized, three-stage framework for crisis response in social media: identification – response – reconstruction. The contribution of this study lies in:

1. Demonstrating how users assess the effectiveness of communication actions depending on response speed, tone, and message format.
2. Capturing differences in audience expectations across social media platforms.
3. Proposing a response model that integrates the communicative component with an “evidence-based” component that is crucial for reputational recovery in algorithm-driven environments.

2. Research Methodology

The aim of the study was to examine how social media users perceive the effectiveness of communication actions undertaken by brands and online creators during reputational crises. The research adopted a diagnostic–descriptive design, with its primary objective being to identify which factors—such as response speed, communication tone, message format, and attitude toward audiences—contribute to reputational recovery in the digital environment. The main research question was formulated as follows: Which communication actions in social media are perceived by audiences as the most effective during reputational crises? Based on this overarching question, the following specific research questions were posed:

1. How do audiences assess the credibility of brand responses in crisis situations?
2. Which forms of communication (post, video, livestream, official statement) generate a positive reputational effect?
3. To what extent do response speed and message tone influence public perception?
4. Does long-term relationship-building with audiences facilitate reputational recovery after a crisis?

The substantive scope of the study included an analysis of four real-life media crisis cases: the brand Shein, the influencer Budda, the creators of the Alkotubki channel, and the Pandoragate scandal. These cases were selected due to their extensive reach, strong presence in the online environment, and high levels of user engagement in the form of comments and interactions. The study was exploratory in nature and employed a qualitative approach complemented by elements of descriptive quantitative analysis. Data were collected using an online survey (N = 210), which enabled the gathering of opinions and evaluations from social media users regarding the effectiveness of communication actions undertaken by brands and creators during crisis situations. This method provided not only numerical data (percentage shares and response frequencies), but also insights into respondents' motivations, emotions, and interpretations, thereby giving the study a qualitative dimension.

The questionnaire consisted of closed-ended and semi-open questions designed to assess brand responses, audience emotions, and levels of trust following a crisis. Respondents were asked, among other things, about the perceived authenticity of messages, the effectiveness of apologies, and the reception of corrective actions. In addition, a content analysis of crisis-related communications published on social media platforms (X, Facebook, Instagram, TikTok, and YouTube) was conducted. The analysis focused on official statements issued by brands and creators in relation to the examined crises.

The study employed a non-probability sampling method (convenience sampling) with defined inclusion criteria:

- 1) age between 18 and 45 years,
- 2) regular use of at least two social media platforms, and
- 3) declared exposure to content related to reputational crises.

The survey was distributed online, participation was voluntary, and responses were anonymous. While this sampling approach is appropriate for diagnostic–exploratory research, it limits the generalizability of the findings to the broader population of internet users.

The sample consisted of 62% women and 38% men. The largest group comprised respondents aged 18–30, representing the cohort most actively engaged in online interactions. The questionnaire was developed based on prior studies on user behavior during reputational crises and a review of the literature on social media communication. It included 20 questions organized into four thematic blocks:

1. Respondent demographic characteristics.
2. Frequency and patterns of social media use.
3. Evaluation of brand actions during crisis situations.
4. Perceived credibility and effectiveness of crisis communication.

For analytical purposes, the study adopted operational definitions of key concepts:

- “Effectiveness” was defined as the extent to which brand or creator actions limited crisis escalation and supported trust recovery.
- “Authenticity” referred to perceived sincerity, naturalness, and the absence of an overly “corporate” tone.
- “Empathy” denoted the expression of understanding toward audience emotions and a willingness to engage in dialogue.
- “Consistency with brand image” was understood as the alignment of crisis responses with prior communication style and declared values.

Quantitative assessments reported in the results (M) refer to mean values on a five-point Likert scale (1-5), where higher scores indicate a more favorable evaluation of a given aspect of crisis response. Quantitative data analysis was limited to descriptive statistics (percentages, frequencies, means, and standard deviations), which is consistent with the exploratory nature of the study. Open-ended responses were subjected to content analysis using thematic coding. Analytical categories were initially derived deductively from the literature (response speed, authenticity, corrective actions, emotions) and subsequently refined inductively based on empirical material by grouping similar meanings and motifs into subcategories.

The study was conducted in accordance with fundamental ethical principles. Participation was voluntary, data were collected anonymously, and respondents were informed about the purpose of the research, the use of results, and their right to withdraw at any stage. The questionnaire did not include any sensitive data that could enable respondent identification.

Data processing was carried out in four stages, presented in Table 4. This approach made it possible to identify dominant statistical trends while also capturing individual respondent attitudes toward crisis communication in social media environments.

Table 4.
Stages of Data Processing and Applied Analytical Techniques

Stage	Scope of Activities	Analytical Objective	Applied Tools and Techniques
I		Identification of dominant trends in perceptions of the effectiveness of brand and creator responses on social media.	Excel; basic descriptive statistics – means, percentages, frequencies.
II	Thematic coding of responses to open-ended questions; identification of recurring motifs and emotions.	Understanding audience attitudes, emotions, and interpretations toward brands’ crisis responses.	Content analysis; thematic coding method.

Cont. table 4.

III	Integration of quantitative results with qualitative observations; comparison of opinions with descriptions of emotions and user narratives.	Obtaining a more comprehensive picture of crisis communication effectiveness and verifying result consistency.	Comparative analysis; cross-tabulations; contextual interpretation.
IV	Development of conclusions and linkage of findings with reputational crisis management theory.	identification of factors determining the effectiveness of corrective actions in social media.	Deductive analysis; interpretation within crisis communication models.

Source: Author's own elaboration.

The empirical material used in this article derives from research conducted in 2025 by D. Szmytkowska under my academic supervision. The research instrument underwent preliminary validation through a pilot study conducted with a group of 15 respondents, which allowed for the refinement of rating scales and question wording. It should be emphasized that the study was not representative in nature, and the results should therefore be treated as diagnostic–exploratory. The objective was not to reflect the opinions of the entire population of internet users, but rather to identify tendencies, attitudes, and emotions accompanying audiences in situations of reputational crisis. Despite these limitations, the collected data enable the formulation of meaningful qualitative conclusions.

3. Results

The conducted research enabled the identification of key factors influencing the effectiveness of reputational crisis management in social media. Analysis of the survey data confirmed that respondents rated most highly those actions undertaken by brands and online creators that were rapid, authentic, and consistent with their prior brand image.

The study included 210 respondents, of whom 62% were women and 38% were men. The largest age group consisted of individuals aged 18–30 (71%), who most frequently used platforms such as TikTok (82%), Instagram (74%), and Facebook (61%). The average daily time spent on social media was 3.6 hours (SD = 1.2), indicating a high level of engagement with these platforms.

Respondents were asked to identify the most important factors influencing the effectiveness of actions undertaken by brands and creators during a crisis. The results are presented in Table 5.

Table 5.*Factors Perceived as Key to the Effectiveness of Crisis Communication*

Factor	Number of Indications [n]	Percentage Share [%]	Mean Rating 1-5 [M]
Response speed	143	68	4.6
Authenticity and tone of communication	118	56	4.4
Corrective actions (compensation, apologies)	99	47	4.1
Consistency with prior brand image	83	39	3.9
Transparency and sincerity	71	34	4.0
Message format (video, post, livestream)	68	28	3.7
Support from brand spokespersons or ambassadors	44	21	3.5

Source: Author's own elaboration.

The data presented in **Table 5** indicate that response speed ($M = 4.6$) and message authenticity ($M = 4.4$) were identified as the two most important elements of effective crisis communication. This suggests that social media users attach greater importance to rapid and credible brand–audience interaction than to formal image-related elements, such as message aesthetics or the use of brand representatives.

Qualitative analysis of open-ended responses made it possible to identify the emotions most frequently experienced by users while observing reputational crises on social media. These findings are presented in Table 6.

Table 6.*Emotions Associated with Reputational Crises*

Type of Emotion	Percentage Share (%)	Emotional Valence	Illustrative Respondent Comments
Anger	41	negative	"I can't stand it when brands pretend that nothing has happened."
Disappointment	37	negative	"I used to like this brand, but after what they did, I lost trust."
Curiosity	28	neutral	"I wanted to see how they would explain themselves, whether they would say anything."
Supprise	19	Neutral-negative	"I didn't expect this from them."
Embarrassment / Shame	14	negative	"It was embarrassing how they tried to explain themselves."
Indifference	12	neutral	"It doesn't affect me anymore—these kinds of scandals happen every day."
Compassion	11	positive	"I feel sorry for the people going through this; everyone makes mistakes."

Source: Author's own elaboration.

Respondents most frequently indicated anger (41%), disappointment (37%), and curiosity (28%). Only 11% of participants declared compassion toward the brand or creator at the center of the crisis.

Content analysis of open-ended responses and user comments enabled the identification of recurring motifs and emotions accompanying audiences during reputational crises. A thematic coding approach was applied, involving the assignment of analytical categories reflecting similar meanings to individual statements. Based on the literature, four main thematic categories were identified (presented in Table 7): response speed, message authenticity,

corrective actions, and audience emotions. Within each category, specific subcategories were defined, and their frequency of occurrence in respondents' statements was recorded.

Table 7.

Thematic Categories, Subcategories, and Frequency of Respondent Indications

Thematic Category	Specific Motifs	Percentage of Respondent Indications (%)	Description
Brand response speed	Immediate response	44	Audiences positively evaluate rapid engagement with the situation—preferably within 24 hours.
	Delayed response (2-3 days)	31	Perceived as a lack of preparedness and associated with a decline in trust.
	No response / silence	25	The most negatively evaluated strategy, interpreted as disregard for audiences.
Authenticity and emotional tone of communication	Sincerity and naturalness of expression	52	Respondents prefer direct, spontaneous, and “human” communication.
	Empathy toward audiences	46	Highly valued; fosters a sense of understanding and relational closeness.
	Personal contact (video, livestreams, comments)	38	Perceived as the most credible form of communication.
Type of corrective actions undertaken	Public apologies	57	A key reparative gesture and a prerequisite for reputational recovery.
	Compensation or concrete actions (CSR initiatives, procedural changes)	43	Increase brand credibility and serve as evidence of genuine intent.
	Cooperation with audiences / post-crisis dialogue	28	Less frequently indicated but positively evaluated as a form of relationship repair.
Audience reactions and emotions	Anger	41	Dominant negative emotion, particularly in the absence of a brand response.
	Disappointment	37	
	Curiosity	28	Stemming from the dynamics and sensational nature of social media.
	Compassion	11	Emerges toward brands that respond calmly and transparently.

Source: Author's own elaboration.

The content analysis results, based on Table 7, indicate that the most frequently occurring motifs in respondents' statements were response speed (44%) and communication sincerity (52%). Audiences clearly preferred actions that were immediate, emotionally authentic, and consistent with the brand's established image. Among negatively perceived factors, delayed responses (31%) and silence (25%) were predominant, both being associated with disregard for criticism and a lack of communicative responsibility. The frequency of indications confirms that social media users respond strongly and emotionally to reputational crises, and that message authenticity and concrete corrective actions are considered more important than formal language or message aesthetics. The most positive reactions (compassion, understanding) emerged in cases where the brand or influencer responded personally, using simple, sincere language and video-based formats. This points to the growing importance of message humanization in the context of reputational crisis management in digital environments.

The data presented in Table 8 show the percentage of respondents from specific demographic groups (women, men, age cohorts) who identified a given category or subcategory as important for crisis communication effectiveness. Percentages do not sum to 100% across rows, as they refer to shares within each group rather than to the total number of indications for a given category. This approach allows for the identification of differences in perceptions of crisis responses between women and men, as well as between younger and older respondents. It should be emphasized that the comparison presented in Table 8 is descriptive in nature and is intended to identify tendencies within groups, as statistical significance testing of differences between segments was not conducted in this study. The purpose of this comparison was not only to show the frequency of particular motifs, but also to determine which communication elements (response speed, empathy, sincerity, message format) were most appreciated by specific user groups. This made it possible to capture differences in the reception of crisis communication and to better understand the dominant expectations of social media audiences across demographic segments.

Tabela 8.

Structure of Subcategory Indications by Respondent Groups

Category / Subcategory	Women (%)	Men (%)	18-30 years (%)	31-45 years (%)	Dominant Platforms
Response speed – immediate response	49	36	52	29	TikTok, Instagram
Response latency – non-response /communication silence	19	33	22	30	Facebook
Authenticity and emotional tone – sincerity and naturalness	58	42	61	35	TikTok, Instagram
Authenticity – empathy	54	38	57	28	Instagram
Personal contact (video, livestream)	44	33	49	25	TikTok, YouTube
Corrective actions – public apologies	63	48	60	42	Instagram, Facebook
Corrective actions – concrete actions / compensation	47	40	45	36	Facebook
Audience reactions and emotions – anger / disappointment	39	44	42	40	All platforms
Audience reactions and emotions – curiosity / willingness to observe	29	27	31	22	TikTok, YouTube
Audience reactions and emotions – compassion / understanding	14	7	12	9	Instagram

Source: Author's own elaboration.

The analysis of the structure of indications presented in Table 8 reveals clear differentiation in perceptions of crisis communication effectiveness across gender, age, and dominant social media platforms. Women more frequently than men emphasized the importance of an immediate brand response (49% vs. 36%), authenticity and naturalness of the message (58% vs. 42%), and empathy (54% vs. 38%), and they more often identified public apologies as a key element of reputational recovery (63% vs. 48%). Men, in contrast, more frequently indicated the absence of a response or silence as a salient—typically negatively evaluated—

factor (33% vs. 19%) and slightly more often reported emotions of anger and disappointment (44% vs. 39%). These differences suggest that women respond more strongly to the relational and emotional dimensions of crisis communication, whereas men appear more sensitive to strategies perceived as avoiding responsibility.

A similar pattern of differentiation is visible in Table 8 across age groups. Respondents aged 18–30 were considerably more likely to expect an immediate response (52% vs. 29%), sincerity and naturalness of communication (61% vs. 35%), empathy (57% vs. 28%), and personal contact in the form of video or livestreams (49% vs. 25%) compared with the 31–45 age group. At the same time, older respondents more frequently identified silence or lack of response as a significant problem (30% vs. 22%) and placed relatively greater emphasis on the necessity of concrete corrective actions and compensation. These findings indicate that younger social media users operate within a logic of rapid, emotionally driven, and highly personalized communication, whereas older users are more inclined to evaluate crises in terms of accountability and tangible remedial actions.

The juxtaposition of the results presented in Table 8 with dominant platforms confirms that the communication channel context plays a significant role in shaping audience expectations. TikTok and Instagram are primarily associated with expectations of rapid responses, authenticity, empathy, and video-based formats, reflecting the dynamics of these platforms and the preferences of younger users. Facebook is more frequently linked to critical evaluations of silence and to expectations of concrete corrective actions and public apologies, while YouTube tends to facilitate curiosity and longer-term observation of crisis development through narrative video formats. Regardless of the platform, anger and disappointment remain the dominant emotions accompanying reputational crises, underscoring the affective nature of crisis communication in social media environments.

4. Discussion and Conclusions

The aim of the study was to identify how social media users perceive the effectiveness of communication activities undertaken by brands and online creators during reputational crises, based on four high-profile cases (Shein, Budda, Alkotubki, Pandoragate) and user opinions (N = 210). The results indicate three dominant determinants of effectiveness: response speed, message authenticity, and consistency with the brand's prior image.

The most highly rated factor was response speed (M = 4.6; 68% of indications). In the social media environment, speed becomes not only an operational parameter but, above all, a tool for managing meaning and interpretation of the event. The mechanism of *narrative primacy* (Entman, 1993) suggests that the actor who responds quickly has the opportunity to define the frame of the discussion (causes, consequences, and remedial plan) before this is done by online

communities, the media, or competitors. For this reason, the strategy of silence (Coombs, W.T., 2007; Kaczmarek-Śliwińska, 2015), historically applied in some crises, is interpreted in the digital environment as disregard for audiences (25% of indications for “no response/silence”; among men, 33% indicated this subcategory). Data from Table 8 further suggest that Facebook users are relatively more likely to identify lack of response as problematic (which may result from greater exposure to comment-based discourse and accountability pressure), whereas TikTok and Instagram users place stronger emphasis on immediacy (49% of women and 52% of respondents aged 18-30 indicated “immediate response”).

his finding is consistent with the logic of crisis phase models (four-phase models) (Brito, 2025), while simultaneously pointing to the need for reinterpretation. In social media, the crisis phase may begin and reach its peak within hours rather than days (Austin et al., 2012; Coombs, T., 2007; Coombs, W.T., 2007; Eriksson, 2018). This implies that organizations must have ready-made “response modules” and decision-making competencies that allow communication to be initiated even before a full diagnosis is available. In practice, messages such as: (1) we are aware of the situation; (2) we are investigating; (3) we will return with verified information at time X—may be particularly effective, as they meet expectations of speed while reducing the risk of inaccuracies.

The second key finding concerned authenticity and communication tone (56% of indications; $M = 4.4$; “sincerity and naturalness” 52%, “empathy” 46%). In respondents’ interpretations, authenticity is not a stylistic feature but a signal of intent (Erickson, 2021; Kaczmarek-Śliwińska, 2015; Lee, 2025). Evidence that the sender understands the problem and accepts responsibility. Notably, authenticity was emphasised more strongly by younger users (61% in the 18-30 age group) and by women (58%), and it correlated with a preference for “contact-based” formats (video/live—38% overall; 49% among those aged 18-30). This indicates that in digital environments, form becomes part of content. Video or livestream formats are often perceived as more difficult to “stage,” and therefore as more credible, even when the substantive content is comparable to a written statement.

These results extend classical approaches to crisis communication, suggesting that merely “issuing a statement (Coombs, T., 2007) is no longer sufficient if audiences interpret it as a corporate formula or a damage-minimisation strategy (Badu et al., 2023; Kim, Cameron, 2011; Upadhyay, Upadhyay, 2023). In this sense, the growing importance of humanization and empathetic tone as elements of reputational recovery should be emphasized. At the same time, authenticity remains a perceptual category dependent on prior expectations toward the brand. For some audiences, “overly polished” apologies or excessively formal language may reduce credibility and generate emotions such as embarrassment (14%) or anger (41%).

The third pillar of effectiveness proved to be consistency with the prior brand image (39% of indications; $M = 3.9$). This result demonstrates that audiences do not evaluate crisis responses in isolation; rather, messages are filtered through the lens of prior reputation, behavioral history, and declared values. In practical terms, this means that identical

communication strategies—such as public apologies—may be interpreted as credible or purely image-driven depending on the brand's reputational context and audience expectations (Eberl et al., 2015). In social media environments, authenticity is dynamic and negotiated; audiences interpret messages not only through their content, but also through prior experiences with the brand and the cultural and platform-specific context in which communication occurs. Research shows that authenticity in social media communication is not an absolute attribute, but depends on user perceptions and expectations, which may determine whether a message is received as sincere and responsible or as a calculated damage-control strategy (Chmiel, Korneta, 2025; Gasana, 2024; Wilk et al., 2025).

Respondents identified public apologies as a key reparative gesture (57% of indications; 63% among women), but concrete corrective actions were considered equally important (43%; “compensation/procedural changes/CSR”). The results indicate that social media audiences expect evidence-based crisis communication, not merely declarative statements. Apologies alone do not close the reputational recovery process if they are not accompanied by a visible cost on the part of the responsible actor—such as time investment, real resources, procedural changes, or compensation. The literature emphasizes that costly actions function as credible signals of intent and responsibility, whereas purely symbolic responses are evaluated as insufficient (Eberl et al., 2015). In this context, strategies of denial, comment deletion, or blame shifting are interpreted negatively, as they violate perceptions of procedural justice and intensify anger and disappointment, leading to crisis escalation rather than resolution (Coombs, T., 2013; Kim, Cameron, 2011).

From a practical perspective, corrective actions were relatively more frequently indicated among Facebook users, which may be linked to the platform's distinct culture—favoring longer discussion threads, content archiving, and accountability-oriented discourse (Navon, Noy, 2023; Wilk et al., 2025; Zhang, Nekmat, 2024). On platforms such as TikTok and YouTube, performative responses in the form of video or livestreams play a greater role and are evaluated as more emotional and authentic (Borden et al., 2020; Eriksson, 2018). However, without parallel corrective actions, such performances may easily be interpreted as communicative “spectacle” rather than evidence of responsibility (Bay-Cheng, 2023; Austin et al., 2012). This highlights differentiated audience expectations depending on platform characteristics, which has significant implications for crisis communication practitioners.

The identified emotions (anger 41%, disappointment 37%, curiosity 28%) confirm that crises on social media are strongly affective phenomena rather than purely informational ones. Anger and disappointment facilitate escalation through comments, shares, and the creation of secondary content (memes, duets, reactions), while curiosity functions as an attention-sustaining mechanism. At the same time, the low level of compassion (11%) indicates that the “empathy credit” is limited and emerges primarily when a brand or creator communicates calmly, personally, and transparently. In this sense, crisis effectiveness is not limited to reducing negative evaluations, but involves shifting emotions—from anger and disappointment

toward compassion or at least neutrality. This shift is particularly important in algorithmic environments, where high-intensity emotions increase the reach and lifespan of crisis-related content.

In light of the above, it can be argued that the results support the assumptions of phase-based and organizational learning models, while simultaneously pointing to the need to further specify the platform component of crisis management models:

- The pre-crisis phase in social media should encompass not only procedures and monitoring, but also relationship-building and a coherent brand identity, as consistency functions as a reputational buffer.
- The response phase is more strongly dependent on speed (the 24-hour window) and the choice of format (video/livestream vs. text), making it more operational and technology-driven than in traditional approaches.
- The recovery phase requires evidence of action (compensation, procedural changes), as audiences expect the “materialization” of apologies.
- The learning phase should involve not only adjustments in communication, but also changes in moderation policies and dialog architecture (e.g., how comments are addressed and how update threads are maintained).

In this context, a three-stage crisis response model is ultimately proposed, as presented in Figure 1.



Figure 1. Three-stage crisis response model.

Source: Author’s own elaboration.

Identification should be immediate (monitoring and early warning signals), the response should be authentic and empathetic, and reconstruction should be grounded in concrete actions and dialogue. It is worth emphasizing that reputational reconstruction in the digital environment may require a longer “evidence period” than in traditional media, as audiences can easily return to archived content and algorithms may re-amplify the issue. The study results reinforce recommendations to respond within the first 24 hours and to avoid deleting comments, while simultaneously suggesting that an effective strategy should integrate three components:

1. Initial communication (speed and narrative control), involving acknowledgment of the issue and an announcement of a subsequent update.
2. Humanized communication (authenticity and empathy), in which personal formats (video/livestream), simple language, and responsibility without evasiveness are crucial.
3. Evidence-based action (reputational reconstruction), in the form of compensation, procedural changes, transparent reporting of progress, and sustained post-crisis dialogue.

From a reputational management perspective, this means that a crisis should not be treated as a one-off “news item” to be covered up, but rather as a process in which audiences expect continuity—from explanation, through repair, to reflection and change—integrating theoretical insights with practical application.

From the perspective of crisis communication practitioners, the findings support three key recommendations. First, organisations should have ready-made procedures that allow for the publication of an initial statement within the first 24 hours, while reducing the risk of errors by announcing a follow-up update at a specified time. Second, message format should be aligned with platform logic and audience expectations: on TikTok and Instagram, “contact-based” formats (video/livestream) may be particularly effective, whereas on Facebook, corrective actions and consistent engagement in comment threads play a greater role. Third, apologies should be supported by evidence-based actions—such as compensation, procedural changes, or transparent progress reporting—because it is the materialisation of actions that ultimately completes the trust-rebuilding process. From a theoretical standpoint, the results reinforce the relevance of phase-based models and organisational learning approaches, while simultaneously pointing to the need to incorporate a platform component as a moderating factor of strategic effectiveness. This implies that classical recommendations regarding speed, tone, and apologies should be interpreted in relation to the interaction architecture of a given platform (content circulation speed, dominant formats, persistence of comment threads, and mechanisms of algorithmic amplification of emotions).

The study was diagnostic–exploratory in nature and relied on non-probability sampling, which limits the generalizability of the findings. In addition, the analyzed cases operated within a Polish-language social media environment, where cultural norms may intensify specific expectations toward brands (e.g., understandings of authenticity and pressure for public apologies). Nevertheless, the findings also demonstrate practical applicability in an international context. The dynamics of emotions, the importance of response speed, and the role of message authenticity are consistent with observations of crises in English-language digital environments, suggesting the universal nature of the mechanisms under investigation. One limitation of the study is the descriptive character of platform-based segmentation, as statistical significance tests of differences between groups were not conducted; therefore, interpretations related to specific platforms should be treated as indicative tendencies rather than definitive conclusions. Future research would benefit from a more in-depth cross-platform analysis through the application of statistical testing to identify differences in the perception of crisis communication among users of individual platforms (e.g., TikTok vs. Instagram vs. Facebook). Such an approach would enable a more precise assessment of the impact of platform-specific characteristics on emotional dynamics and the perceived effectiveness of crisis response strategies.

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ARTIFICIAL INTELLIGENCE AS A CATALYST FOR INNOVATION IN POLISH TECHNOLOGY STARTUPS

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Purpose: The article aims to show how artificial intelligence influences the development of innovative solutions in Polish technology startups and to determine Poland's significance in the global startup ecosystem in the face of dynamic changes in AI-based industries.

Design/methodology/approach: The article is based on a review of the literature and an analysis of secondary data from industry reports, including the *Global Startup Ecosystem Index 2025* and research by the Startup Poland Foundation (2024). The analysis was supplemented by case studies of 11 Polish technology startups using AI in their business models. The selection of startups was deliberate and included companies distinguished in prestigious competitions and acceleration programs, such as Aulery and Warsaw Booster.

Findings: The analysis indicates that artificial intelligence is widely used in Polish technology startups, both in process optimization and in the creation of innovative products and business models. The fastest growing global startup sectors are Foodtech, Hardware & IoT, and Energy & Environment. Poland occupies a stable position in the top 40 of the global ranking of 100 startup countries, with Warsaw as the leader of the national ecosystem. Examples of distinguished Polish startups show the growing importance of AI in the MedTech, DeepTech, and IoT sectors, offering solutions such as health applications, educational robots, autonomous ecological systems, and IT infrastructure management platforms.

Research limitations/implications: The list of startups is not exhaustive, which limits the possibility of an in-depth analysis of the entire Polish startup ecosystem. Future research could include in-depth interviews with startup founders and an analysis of the impact of legal regulations and the availability of financing on the development of AI-based solutions.

Practical implications: The results can support entrepreneurs, investors, and young technology companies in identifying key areas of development and directions for implementing AI-based innovations in Polish startups, increasing awareness of its applications.

Originality/value: The article combines current global and national data with an analysis of the role of artificial intelligence in the Polish startup ecosystem based on 11 case studies, showing specific examples of AI applications in innovative business models.

Keywords: artificial intelligence, AI, startups, digital transformation, innovation, technological entrepreneurship.

Category of the paper: Case study.

1. Introduction

Over the past two decades, there has been a significant increase in research in the field of technological entrepreneurship, which is increasingly focusing on artificial intelligence (Czemiel-Grzybowska, 2023, p. 126). The impact of AI on the activities of startups, and more broadly on the functioning of modern enterprises, including the processes, practices, and results of new business initiatives, is widely discussed in foreign literature (Alateeg, Al-Ayed, 2024; Rezazadeh et al., 2025; Sedláček, Sterk, 2017; Anane-Simon, Atiku, 2024; Baek et al., 2023; Schulte-Althoff et al., 2021; Bakouche et al., 2025; Pešík et al., 2023; Basri et al., 2024; Bessen, Impink, Seamans, 2022; Bessen, Impink, Reichensperger et al., 2022; Winecoff, Watkins, 2022; Cot et al., 2025; Jorzik et al., 2024; Amarasekara Rajapaksha, 2024; Lee et al., 2023; Maulina et al., 2020; Paepflow et al., 2025; Rios-Campos et al., 2024; Cautela et al., 2019; Nam et al., 2024; Tang et al., 2025), but is also increasingly reflected in Polish scientific works, where there is a growing number of publications in this area (Bielińska-Dusza, 2022; Piwowar et al., 2023; Chaciński, 2025; Czemiel-Grzybowska, 2023; Kmita, 2025; Puślecki, 2021; Ratajczak, 2025).

2. The concept of artificial intelligence: a theoretical approach

According to the European Commission, artificial intelligence is defined as (...) "systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals. AI-based systems can be purely software-based, acting in the virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications)" (European Commission, 2018, p. 1).

The European Union has adopted Regulation (EU) 2024/1689 of the European Parliament and of the Council, The Artificial Intelligence Act (AI Act), which is the world's first comprehensive legal regulation on artificial intelligence. This act establishes normative definitions of concepts that are essential for determining its scope. Article 3 of the AI Act defines the concept of an artificial intelligence system, specifying what an AI system is within the meaning of EU law, stating that "'AI system' means a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments" (European Union, 2024, p. 46).

According to the OECD, an artificial intelligence system is defined as follows: (...) "An AI system is a machine-based system that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments. Different AI systems vary in their levels of autonomy and adaptiveness after deployment" (OECD, 2024, p. 4).

AI as a scientific discipline integrates a wide range of techniques and approaches (Ratajczak, 2025). Currently, the key research and technological approaches in the field of artificial intelligence include: machine learning, natural language processing, computer vision, deep learning, and neural networks (Piowar et al., 2023, pp. 6-7; Chaciński, 2025, p. 116; Kowalkiewicz, 2024, p. 6; Kuszneruk, Zemke-Górecka, 2022, p. 65; Marszałek, 2024, p. 23).

3. The role of artificial intelligence in shaping innovative solutions in enterprises

The continuous development of AI technology has a significant impact on the functioning of enterprises, affecting competitiveness, productivity, innovation, business processes, and the growth of company value, resulting in the creation of new, innovative business models (Bielińska-Dusza, 2022; Chaciński, 2025; Piowar et al., 2023). The use of artificial intelligence in business and the economy brings many benefits in the form of automation of routine processes, increased productivity, and savings in time and resources (Kmita, 2025; Mosbah, 2020; Ratajczak, 2025).

AI enables personalization of offers and improvement of customer service, as well as supporting the forecasting of market trends, demand, and prices, which allows for more effective planning of production, inventory, and marketing activities (Piowar et al., 2023; Hauke, 2025). In addition, AI technologies contribute to improving efficiency through automation and better resource management within the company (Piowar et al., 2023; Ratajczak, 2025).

Its application allows (...) 'to increase the accuracy of forecasts, minimize operational risk, and influence the quality of strategic decisions' (Chaciński, 2025, p. 116). AI can also help with (...) 'sustainable development, cybersecurity, and data analysis' (Kmita, 2025, p. 4).

Artificial intelligence-based solutions can help startups identify market opportunities, collect and process large amounts of user data to make more informed decisions, better understand user preferences, and obtain more accurate information about demand for specific products or services (Nowak-Mizgalska, 2024, p. 85).

In the Polish economy, AI is most often used by large enterprises, alongside which startups developing AI technologies are actively operating, while in SMEs its implementation remains limited (Chaciński, 2025; Bielińska-Dusza, 2022; Kmita, 2025). The process of digital transformation in small and medium-sized companies is at an early stage (Ratajczak, 2025).

The technological transformation of enterprises largely depends on the development and implementation of AI technologies (Bielińska-Dusza, 2022). As Bielińska-Dusza points out, the pillars of technological transformation include a digital strategy supported by management, building an organizational culture conducive to digitization and attracting qualified employees, as well as cooperation within partnerships, collaboration in communities, and a focus on development rather than solely on costs (Bielińska-Dusza, 2022, p. 193). Digital transformation not only promotes rapid business growth, but also strengthens their resilience to various types of risk. This phenomenon was particularly evident in the second half of 2020, when the COVID-19 pandemic forced companies to quickly adapt to new technologies (Puślecki, 2021, p. 132).

A key factor increasing the competitiveness of companies is their ability to innovate, especially in areas that are new to the entire industry (Puślecki, 2021). As Kruk and Wierzbicki note, the ability of startups to implement product, process, and business model innovations determines their market success (Kruk, Wierzbicki, 2025). Product innovations increase customer satisfaction and market share, while process innovations are linked to operational efficiency and reduce costs. Business model innovations, on the other hand, provide a competitive advantage by allowing companies to create new value propositions and reach untapped market segments. This type of innovation has a particularly strong impact because (...) ‘it can redefine market dynamics and set new standards within industries’ (Kruk, Wierzbicki, 2025, p. 61).

4. The dominant sectors in the development of innovative startups

StartupBlink is a global research center that analyzes startup ecosystems and monitors trends affecting their development. Every year, it publishes the Global Startup Ecosystem Index—the world's most comprehensive report evaluating startup ecosystems in 1000 cities and 100 countries (‘About Us - StartupBlink’, n.d.).

According to the latest Global Startup Ecosystem Index 2025 report, among the 11 key startup industries worldwide, the fastest growing sector is Foodtech, which recorded growth of 46.1%. This sector includes Agtech, Food and Beverage, Food Manufacturing, Online Food Ordering, and Foodtech-Other. The Hardware & IoT sector ranked second, with a growth rate of 45.4%. It includes areas such as 3D Printing, Consumer Electronics, Hardware, Manufacturing, Nanotechnology, Robotics, Internet of Everything, Smart Cities, Smart Home,

and Hardware & IoT-Other. The third fastest growing sector is Energy & Environment, which achieved growth of 40.2%. This sector includes Clean Energy, Cleantech, Energy, Sustainability, Waste Management, and Energy & Environment-Other (Global Startup Ecosystem Index 2025, 2025, pp. 15, 360). These are the three main industries that are growing the fastest, each of which has seen an increase in the number of startups exceeding 40.0%. The next places in the ranking are occupied by industries related to health, data analysis, and technology: Healthtech (31.9%), Software & Data (28.7%), and Fintech (26.6%). The Social & Leisure (22.5%) and Ecommerce & Retail (20.6%) sectors are growing at a moderate pace, while Marketing & Sales has seen a slight increase (8.8%) and Transportation remains virtually unchanged (0.9%) (Global Startup Ecosystem Index 2025, 2025, p. 15) (Figure 1).

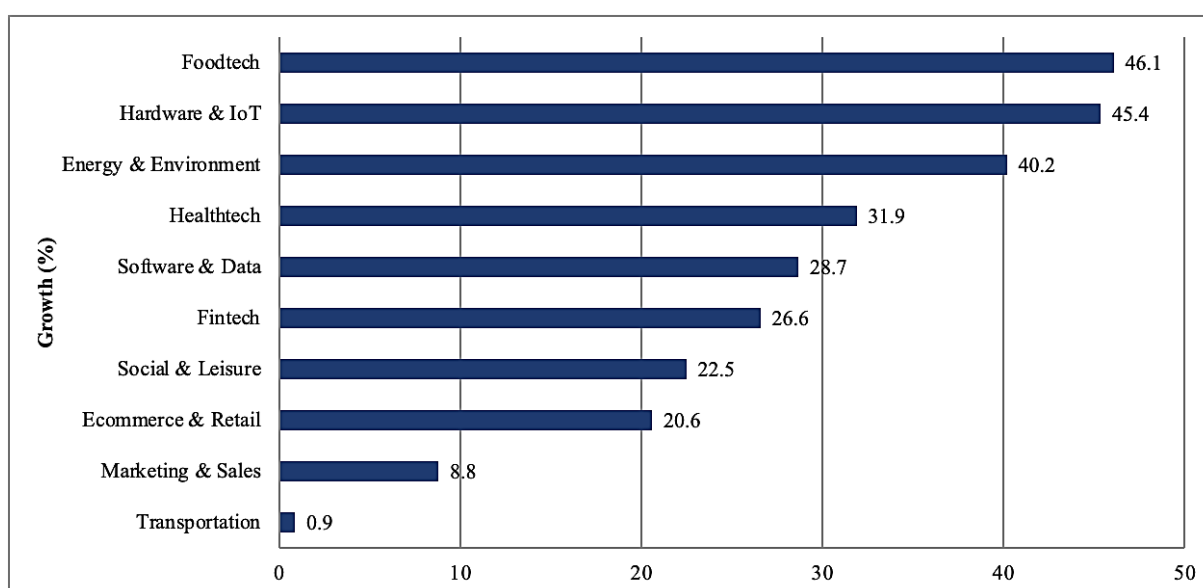


Figure 1. Trends in startup ecosystems: 10 key industries in 2025 [%].

Source: own work based on (Global Startup Ecosystem Index 2025, 2025, p. 15).

5. Poland's position in the global startup ecosystem

The importance of AI and innovative business models of Polish startups is best seen in the context of the global startup ecosystem. An analysis of Poland's position and that of its cities in global rankings allows us to assess the development of the domestic technological entrepreneurship environment and identify prospects for further growth and integration with global trends.

In a report published by StartupBlink, Poland ranks 33rd out of 100 countries in the overall ranking of the best countries (Global Startup Ecosystem Index 2025, 2025, p. 25). Compared to 2024, Poland moved up one place, recording an annual ecosystem growth of 10.6% and achieving a total score of 8233. Considering the global ranking of the best countries in 2021-

2025, Poland ranks among the leading startup ecosystems in the world. During the analyzed period, Poland remained in the top 40 of the ranking, occupying the following positions: 30th place in 2021, 33rd place in 2022 and 2023, 34th place in 2024, and again 33rd place in 2025 (Global Startup Ecosystem Index 2025, 2025, p. 155) (Figure 2). The slight fluctuations in position confirm the resilience of the Polish ecosystem to changing economic and technological conditions around the world.

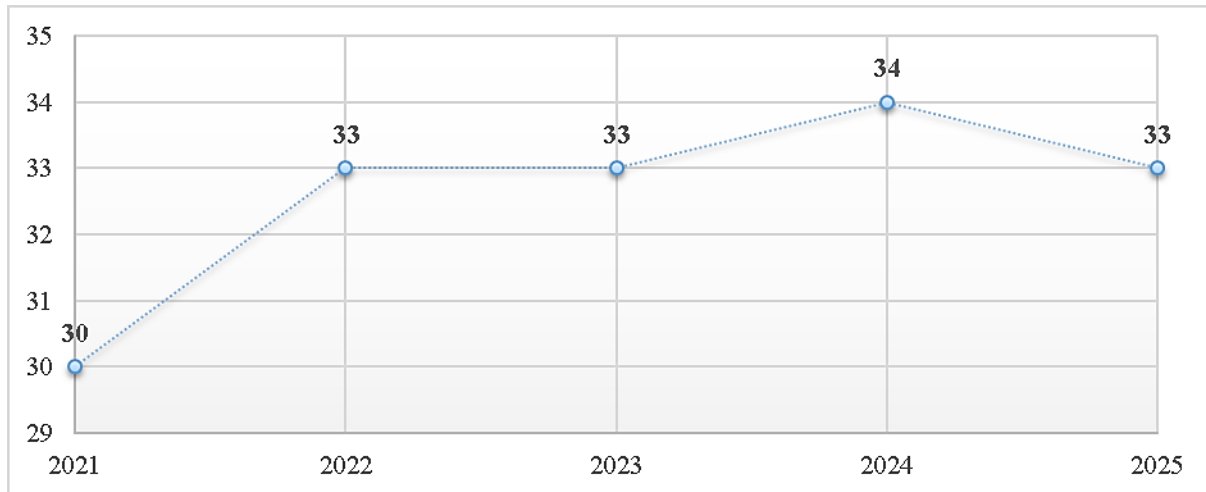


Figure 2. Poland in the Global Startup Ecosystem Index – country ranking (2021-2025) [N].

Source: own work based on (Global Startup Ecosystem Index 2025, 2025, p. 155).

In the latest ranking, Poland can boast the presence of thirteen cities among the 1000 classified worldwide (Global Startup Ecosystem Index 2025, 2025, p. 156). The highest-ranked Polish city in the ranking remains Warsaw, which took 91st place in the world, moving up four places compared to 2024 (Global Startup Ecosystem Index 2025, 2025, p. 27). The capital remains the clear leader of the Polish ecosystem, being the only city from Poland in the top 100 of the ranking (91). The second highest position in Poland is held by Wrocław, which ranked 176th, followed closely by Kraków in 184th place. Both cities are strong academic and technological centers that offer a dynamically developing environment for startups and growing institutional support. The next places in the StartupBlink Index 2025 ranking were taken by: Gdańsk (326th place), Poznań (330th), Katowice (479th), Lublin (548th), Łódź (571st), and Rzeszów (575th). Szczecin, ranked 810th, closes the top ten Polish cities in the ranking (Global Startup Ecosystem Index 2025, 2025, p. 156). Three other Polish cities are ranked further down the list: Toruń (839th place), Białystok (893rd) and Olsztyn (935th) (Global Startup Ecosystem Index 2025, 2025, pp. 369-377). Although they rank lower, their presence in the ranking of the 1,000 best startup ecosystems in the world testifies to the growing involvement of smaller cities in the development of local startup ecosystems and innovative initiatives (Table 1).

Table 1.*Ranking of Polish cities in the Global Startup Ecosystem Index 2025*

National Rank	City	Global Rank & Change (from 2024)	Total Score
1	Warsaw	91 ⁺⁴	9,675
2	Wrocław	176 ⁺⁹	3,89
3	Krakow	184 ⁻	3,518
4	Gdańsk	326 ⁺⁹¹	1,313
5	Poznan	330 ⁻⁷	1,289
6	Katowice	479 ⁻⁵⁴	0,611
7	Lublin	548 ⁺¹⁰¹	0,476
8	Lodz	571 ⁻²⁵	0,436
9	Rzeszow	575 ⁻¹⁰⁸	0,429
10	Szczecin	810 ⁺⁴⁹	0,214
11	Torun	839 ⁺⁷³	0,197
12	Białystok	893 ⁺⁵⁴	0,174
13	Olsztyn	935 ⁺²³	0,154

Source: own work based on (Global Startup Ecosystem Index 2025, 2025, pp. 156, 369-377).

6. AI-driven innovation in Polish technology startups

Artificial intelligence plays a significant role in the activities and development of Polish technology startups. According to a survey conducted by the Startup Poland Foundation between July 1 and September 9, 2024, on a sample of 3297 startups, more than half of young technology companies in Poland (56%) use AI to increase work efficiency, and for 13% of founders, artificial intelligence is a key element of their business model (Dziewit, 2024, pp. 6, 18).

The Startup Poland Foundation also asked startups about the keywords that best describe the nature of their main product or service. The largest percentage of respondents (28%) indicated the category covering AI, Deep Tech, and the Internet of Things (IoT) (Dziewit, 2024, pp. 15-16). Following AI/DeepTech/IoT are sectors with high growth potential: Medtech (14%), Hardware (13%), and Analytical Tools and Business Intelligence (12%). The categories “Education” and “Industry 4.0” received the same percentage of responses (Figure 3).

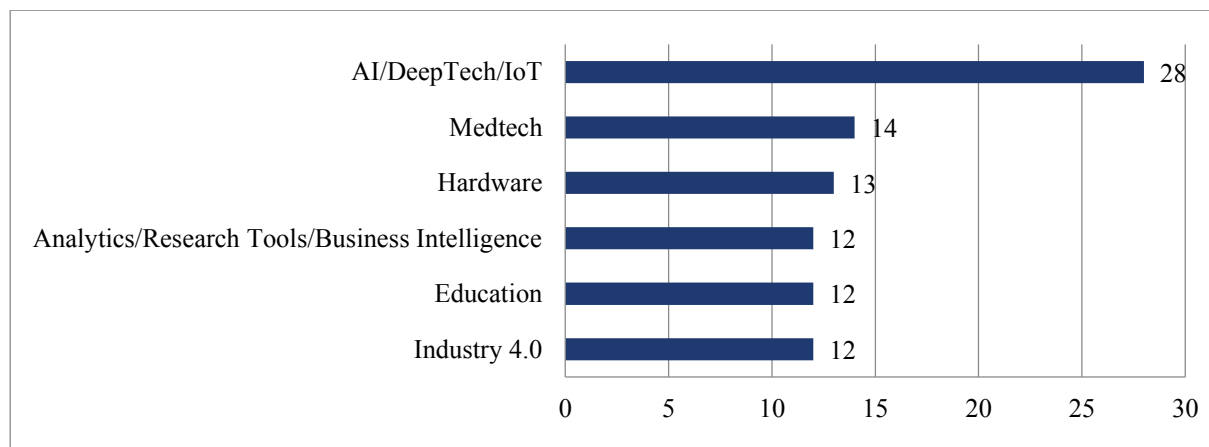


Figure 3. Keywords that best describe the nature of the main product/service offered by startups in Poland [%]

Source: own work based on (Dziewit, 2024, p. 16).

In the Startup Poland Foundation report, entrepreneurs most often declared that their startup offers solutions in the SaaS (Software as a Service) model, i.e., software made available to users as a service—39% of participants gave this answer. Web applications (29%) and mobile applications (28%) ranked lower (Dziewit, 2024, p. 14). SaaS is one of the innovative e-business models distinguished by the way it uses the Internet (Rojek, 2023, p. 154). In turn, 18% of startups offer their customers physical products in the form of hardware, while 17% develop their activities in the area of consulting (Dziewit, 2024, p. 14) (Figure 4).

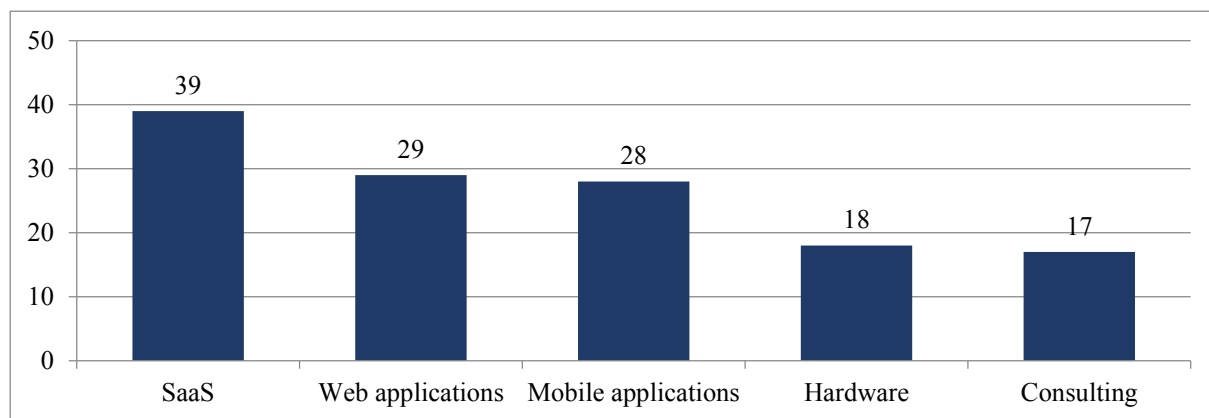


Figure 4. Key areas of startup offerings [%].

Source: own work based on (Dziewit, 2024, p. 14).

Every second startup surveyed operates in the B2B model, offering its products or services to both large enterprises (B2B enterprise) (35%) and smaller business customers (B2B small business) (21%). The direct-to-consumer sales model is chosen by 17% of young companies, and one in ten indicates that it operates in the marketplace model (Dziewit, 2024, p. 12) (Figure 5).

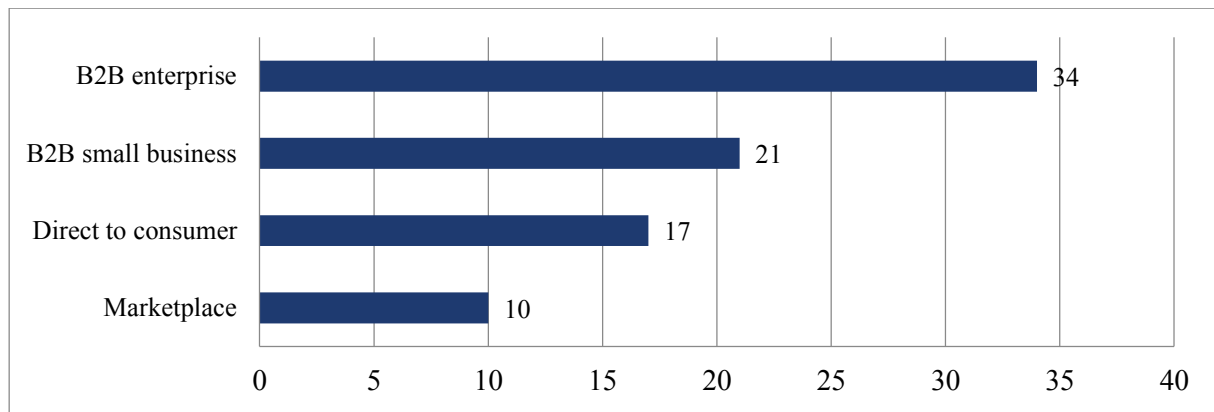


Figure 5. Business models of Polish startups – most popular solutions [%].

Source: own work based on (Dziewit, 2024, p. 12).

Polish technology startups are increasingly implementing solutions based on advanced technologies, including artificial intelligence, which allows them to create innovative products and services. Below are selected examples of Polish startups that effectively use modern technologies and AI in their business models. Table 2 lists a total of 11 startups. Three of them are winners of the 2024 Aulery competition, Poland's oldest startup competition, which selects the best companies with global potential every year (*Aulery*, n.d.). The winners of the 14th edition of the Auler Gala 2024 were: PhotoAiD, Respo Centre, and Mizzox (Zieliński, 2024; Korneluk, 2025a; Duszczyk, 2023; Janczewska-Bażak, 2025; Gryn, 2024; Kieszek, 2024a; Dobroszek, 2024). The next three startups listed are winners of Warsaw Booster'24: Inventmed, Semi Robotics, and Water Sense (*Warsaw Booster 2024. Podsumowanie Edycji*, 2024; Kuta, 2024; Kieszek, 2024; *Water Sense czyli polskie rzeki pod czujnym okiem IoT*, 2024; WaterSense..., 2025; Zieliński, 2024a). Warsaw Booster, implemented since 2015 on behalf of the City of Warsaw by a consortium of the Startup Hub Poland Foundation (SHP), the Coalition for Polish Innovation Foundation (KPI), and the Mobile Open Society Through Technology Foundation (MOST), is a unique urban acceleration program in Poland and the Central and Eastern European region, supporting young technology companies and the development of their founders' business skills (*Warsaw Booster - O Programie*, n.d.). Other startups that received recognition include: Spacelift, Spaceform, Photon Entertainment, iYoni (Lifebite), and StethoMe (Twój Biznes..., 2025; Krogulec, 2025a, 2025b; Korneluk, 2025; Wittenberg, 2025; Cyrny, 2025; Lemańska, 2022; Drązkiewicz, 2023; Domaradzki, 2021; Polska Agencja Rozwoju Przedsiębiorczości, 2023) (Table 2).

Table 2.*Examples of Polish startups using advanced technologies and AI*

No.	Startup	Sector	Description of the innovative solution	The role of AI / advanced technologies	The role of AI in the business model	Scale of implementation / impact of innovation on the market
1	Lifebite (iYoni)	MedTech	An application supporting fertility and efforts to conceive. It provides prevention, health education, psychological support, and assistance in treatment planning	Automatic fertility assessment based on medical algorithms and AI	Enables accurate fertility prediction, detection of fertility-affecting diseases, and menstrual cycle monitoring through the use of AI	Over 250,000 downloads of the app; support for approximately 30,000 women
2	StethoMe	MedTech	Wireless stethoscope integrated with a thermometer and sound analysis system compatible with smartphones	Automatic interpretation of auscultation sounds. The StethoMe AI algorithm recognizes and classifies abnormal auscultation sounds	Shorten the diagnostic process and enable remote medical consultations	It allows parents to listen to their child's lungs themselves and send the recording to their doctor. Speeding up consultations and reducing the number of in-person visits to clinics
3	PhotoAiD	GovTech	An application for automatically generating biometric photographs that comply with official standards using a smartphone, without the need to visit a photo studio	Automation of the photo creation process in the SaaS model	It allows anyone to take a photo for documents on their own, without specialist knowledge or equipment, from any location	Global reach – customers from over 150 countries on five continents, approximately 11 million photos for documents taken annually
4	Respo Center	HealthTech	An online diet application that supports users in changing their eating habits and losing weight, connecting them with a team of dietitians and physiotherapists	Individualized nutrition plans and ongoing monitoring of treatment results	Scalable online dietary services using AI personalization	Over 16,000 active users and nearly 71,000 app downloads. The platform is developed by a team of 188 specialists. The startup was named the best Polish startup of the last 15 years in the 'Aulery All-Stars' poll

Cont. table 2.

5	Mizzox	SaaS	An integrated platform that automates and streamlines daily business, financial, and communication operations within a company	Automation of payment processes, interest calculation, and accounting document circulation, integration with banking systems, and secure data storage in the cloud. The platform also offers extensive modules for managing projects, tasks, calendars, finances, HR, and internal communication	Comprehensive, automated business management, enabling cost reduction by replacing multiple scattered tools with a single universal system accessible from any device	Over 15,000 active licenses, corresponding to 26,000 platform users in Poland. Revenue in the first quarter of 2024 at PLN 2.7 million
6	Inventmed	MedTech	Innovative medical device "LaseroBaria 2.0_S" accelerating the treatment of difficult-to-heal chronic and post-traumatic wounds of the limbs	The use of advanced physical technologies through the simultaneous application of five therapeutic factors in a single applicator	Launch of a certified medical device that integrates the effects of oxygen, ozone, magnetic fields, red light, and UV light to improve treatment effectiveness	The product has won numerous awards and distinctions, including in the Startup Challenge 2023, Mother & Child Start-up Challenge, and Silesian Innovator competitions. International expansion. Clinical implementations; prevention of limb amputations in patients with diabetes and atherosclerosis, among other conditions
7	Semi Robotics	Robotics	FIDI feeding robot supporting people with disabilities	The robot is fully autonomous, using a 3D camera and software to recognize the face and gestures of the person being fed, enabling precise meal delivery without the involvement of a caregiver	Personalization of robot operation and automation of the feeding process, which increases the efficiency of care and reduces the need for direct staff involvement	Commercialization of a social innovation solution. Increased independence for people with disabilities. The startup was a semifinalist in the Infoshare Startup Contest. Focus on the B2B market with private care and medical facilities, with planned cooperation with the public sector, including hospitals

Cont. table 2.

10	Spaceform	DeepTech	3D printing technology designed to work on Earth and in space	The technology is based on innovative solutions in the field of materials engineering, automation, and process control systems. The innovation lies in the method of feeding and applying the metal powder. It allows layers to be applied in microgravity conditions, which is a barrier to the use of other powder technologies in space	Spaceform aims to provide a scalable solution for manufacturing in space — particularly for spare parts and tools needed to maintain orbital infrastructure	The technology is aimed at operators of future orbital stations. The startup plans to test the prototype in parabolic flights in Europe or the United States. Funding is provided by, among others, the ESA BIC Poland incubator
11	Photon Entertainment	EdTech	Photon educational robot for children to learn programming	The robot responds to programmed instructions, enabling practical learning about how intelligent systems work. The robot allows students to be gradually introduced to the world of coding. Photon can be programmed using four proprietary graphical languages and the most popular programming languages, including Scratch (MIT), JavaScript, Python, and Apple Swift	Building digital skills. By learning to code, children learn how to think logically, plan, analyze, predict, and spot mistakes. Photon teaches the basics of coding, creative problem solving, and, above all, improves logical thinking	The Photon robot is widely used in educational systems in many countries. The product has gained popularity in Poland, Slovakia, France, and Italy, among others, and in 2024, it significantly expanded its operations in Spain and the United States. Over 70% of the company's revenue comes from foreign markets. Photon solutions are used by over 1.5 million pupils on six continents

Source: own work based on (Twój Biznes. Fundusze Europejskie w Polskiej Agencji Rozwoju Przedsiębiorczości, 2025; Drążkiewicz, 2023; Polska Agencja Rozwoju Przedsiębiorczości, 2023; Goch, n.d.; Domaradzki, 2021; Zieliński, 2024a, 2024b; Korneluk, 2025a, 2025b; Duszczyk, 2023; Krogulec, 2025a, 2025b, 2025c, 2025d; Janczewska-Bażak, 2025; Gryn, 2024; Kieszek, 2024; Dobroszek, 2024; Kuta, 2024; ‘Polskie WaterSense triumfuje w globalnym konkursie Dysona. Jak projekt może dbać o jakość wód?’, 2025; Wittenberg, 2025; Cyrny, 2025; Lemańska, 2022; *Zdjęcia do dokumentów online*, n.d.; *Water Sense czyli polskie rzeki pod czujnym okiem IoT*, 2024).

The companies presented include startups from the medical sector (MedTech, HealthTech), Information Technology (SaaS, IT, DeepTech), Robotics, IoT, and Education (EdTech).

In the MedTech sector, health and diagnostic applications stand out, including iYoni, which supports fertility and pregnancy efforts, and StethoMe, a wireless stethoscope that uses algorithms to automatically interpret auscultation sounds. The Respo Center uses artificial intelligence to personalize diet plans and track user progress. On the other hand, Inventmed is a startup that uses advanced physical technologies to treat hard-to-heal wounds, while Semi Robotics offers autonomous feeding robots that support people with disabilities.

SaaS startups such as Mizzox use business process automation, integrating financial, HR, and communication functions into a single platform, which significantly reduces costs by replacing multiple disparate tools with a single, universal system accessible from any device.

In the IoT sector, startup Water Sense has developed autonomous water quality monitoring stations that use AI to predict environmental hazards, while Spacelift offers a platform for managing cloud infrastructure with full IT process automation. Spaceform develops 3D printing technologies for both terrestrial and space applications.

PhotoAiD is an example of a Polish startup operating in the GovTech area, providing modern IT solutions for public administration. The company has created an application that automatically generates biometric photos that comply with official requirements. In the field of EdTech, Photon Entertainment is introducing educational robots that teach programming and develop children's digital skills.

7. Summary

The Polish startup ecosystem maintains a stable position in the Global Startup Ecosystem Index published by StartupBlink, ranking 33rd among 100 countries assessed in 2025. The presence of thirteen Polish cities in the list of 1,000 classified worldwide confirms the gradual development and growing importance of the domestic technological entrepreneurship environment in the global dimension.

According to the results of a study conducted by the Startup Poland Foundation, more than half of Polish startups (56%) use AI to increase efficiency, and 13% treat it as a key element of their business model. The dominant models for offering products are SaaS (39%), web applications (29%), and mobile applications (28%). At the same time, nearly 60% of startups operate in the B2B model, targeting both large enterprises and smaller business customers.

The success of Polish startups awarded in competitions such as 'Aulery' 2024 and Warsaw Booster 2024 confirms the growing potential of Polish technology startups. These startups stand out both for their modern solutions and their ability to expand internationally. Their innovations

have a significant impact on the market: from medical and dietary applications reaching thousands of users, to educational platforms and SaaS services that serve millions of users around the world. Many of these startups are achieving global reach, securing funding, and winning prestigious international awards, further confirming their potential to create scalable and innovative solutions. In all 11 case studies analyzed, artificial intelligence and advanced technologies play a key role, enabling process automation, service personalization, and increased operational efficiency.

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PROFITABILITY IN CIRCULAR BUSINESS MODELS: AN ANALYSIS OF THE FURNITURE INDUSTRY

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Purpose: This study investigates the financial implications and profitability potential of Circular Business Models (CBMs) within the furniture industry, addressing the research gap in understanding timeline to profitability and economic viability of circular transitions.

Design/methodology/approach: The research employs a qualitative approach combining systematic literature review with exploratory case study analysis. Three CBMs—BuyBack, Rental, and Product-as-a-Service (PaaS)—were selected based on relevance to the furniture industry, availability of financial data, and scalability potential. Data were collected from peer-reviewed literature, company sustainability reports, and industry publications.

Findings: While CBMs require significant initial investments and extended payback periods, they demonstrate substantial long-term benefits including enhanced resource efficiency, improved customer loyalty, and stable revenue streams. Financial evaluation frameworks reveal furniture can achieve over 200% total value extraction through multiple lifecycle iterations.

Research limitations/implications: Limited access to proprietary financial data, evolving CE regulations, and focus on three CBM types constrain generalizability. Future research should incorporate quantitative financial modeling and expanded geographic scope.

Practical implications: The research provides actionable insights for furniture manufacturers exploring CBMs, including profitability pathways, operational strategies, and recommendations for design-for-circularity implementation.

Social implications: CBMs support environmental goals including waste reduction, product lifecycle extension, and resource conservation, aligning with EU Circular Economy Action Plan objectives.

Originality/value: This study is examining CBM profitability specifically within furniture industry context, integrating lifecycle perspectives from eco-design through end-of-life scenarios, and providing financial evaluation frameworks beyond traditional payback period analysis.

Keywords: circular economy, furniture industry, profitability analysis, buyback models, product-as-a-service.

Category of the paper: Conceptual paper, Research paper.

1. Introduction

In neoclassical economics, businesses traditionally prioritized profit maximization (Smith, 1776), often emphasizing efficiency over environmental and social considerations. However, as environmental concerns intensify and global resource limits are approached, businesses increasingly face pressure to balance profitability with sustainability (Geissdoerfer et al., 2017). The circular economy (CE) offers a strategic framework by minimizing waste, extending resource lifecycles, and fostering sustainable practices (Ellen MacArthur Foundation, 2013).

The traditional linear economic model's "take, make, waste" approach has resulted in significant environmental degradation, resource depletion, and unsustainable waste generation (Kirchherr, Reike, Hekkert, 2017). Current estimates suggest only 8.6% of the global economy operates on circular principles (United Nations Environment Programme, 2021), underscoring the imperative for transitioning to CE principles given climate change and resource scarcity challenges (McKinsey & Company, 2015).

This study addresses a research gap by focusing on financial viability and profitability of circular business models (CBMs) within the furniture industry. The furniture sector represents a great case study due to heavy reliance on natural resources, inherent product durability, and substantial potential for multiple lifecycles through reuse and refurbishment (Stahel, 2016). Recent research emphasizes that furniture design decisions fundamentally determine circular economy feasibility, with eco-design strategies enabling enhanced material recovery and extended lifespans (Azevedo, Godina, Matias, 2024). Despite strategic fit with CE principles, limited research examines the timeline to profitability and comprehensive economic implications of adopting CBMs in this sector (Hultberg, Pal, 2024).

By exploring three CBMs: BuyBack, Rental, and Product-as-a-Service (PaaS), this study evaluates their financial and operational challenges and potential. These models offer opportunities for reducing resource use and waste while presenting economic dynamics including revenue stability, investment requirements, and customer retention benefits (Lieder, Rashid, 2016; Lüdeke-Freund, Freudenreich, Saviuc, Stock, Schaltegger, 2018).

This research addresses the following questions: What are the financial challenges and opportunities associated with implementing CBMs in the furniture industry? How do these models impact the timeline to profitability for businesses transitioning from linear to circular approaches? What role does customer retention and resource efficiency play in CBM financial success?

The study's novelty lies in its integrated focus on financial implications of CBMs, lifecycle perspectives from eco-design to end-of-life scenarios, and specific contextualization within the furniture industry. The paper is structured as follows: Section 2 outlines methodology, Section 3 examines circular economy principles in furniture lifecycles, Section 4 analyzes three

CBMs, Section 5 discusses profitability challenges and financial frameworks, Section 6 presents discussion of barriers and opportunities, and Section 7 provides conclusions.

2. Research Methodology

2.1. Research Design

This study employs a qualitative approach combining systematic literature review with exploratory case study analysis. The research is designed as a conceptual-analytical paper examining the financial viability of three distinct CBMs within the furniture industry context, addressing the identified research gap regarding CBM profitability timelines and economic implications.

2.2. Literature Review Methodology

The literature review followed a semi-systematic approach (Snyder, 2019), balancing comprehensiveness with focused exploration of CBM profitability dimensions. Academic databases (Scopus, Web of Science, Google Scholar) were searched using keywords: "circular economy", "circular business models", "furniture industry", "profitability", "product-as-a-service", "rental models", "buyback programs", "life cycle costing", and "eco-design". Inclusion criteria encompassed peer-reviewed articles and authoritative industry reports published 2013-2024 (with seminal works included regardless of date), focusing on circular economy, business model innovation, or profitability analysis in English. Exclusion criteria eliminated non-peer-reviewed sources (except established industry authorities), studies focused exclusively on environmental impact without economic analysis, and conference abstracts without full papers. This approach yielded approximately 80 relevant sources, from which 25 were selected for in-depth analysis based on direct relevance to research questions.

2.3. Selection Criteria

CBMs were selected based on documented implementation in the furniture or related durable goods sectors based on available exploratory case studies with financial data or economic analysis, the capacity for widespread adoption across market segments, and the representation of different operational complexity. This resulted in a selection of BuyBack, Rental, and PaaS models, representing primary circular approaches currently implemented in the furniture industry (Lüdeke-Freund et al., 2018; Centobelli, Cerchione, Chiaroni, Del Vecchio, Urbinati, 2020). Five case studies employed purposive sampling (Patton, 2002) targeting established companies with documented CBM implementation spanning 2-3 years, public information availability, geographic and market segment diversity

(B2C and B2B), and representation of all three CBM types. Cases include IKEA's Buyback & Resell program, CORT Furniture Rental, Steelcase Flex Rental, Leaseby, and Fernish.

2.4. Data Collection and Limitations

Data collection encompasses company websites, sustainability reports, peer-reviewed literature, industry reports, and media coverage. Analysis involved comparative assessment of revenue mechanisms, cost structures, operational complexity, customer retention strategies, and resource efficiency metrics. Limitations include restricted access to proprietary financial data, reliance on publicly available information, evolving regulatory landscape, focus on three CBM types, and predominantly European/North American geographic scope.

3. Circular Economy Principles in Furniture Lifecycle

Understanding how circular economy principles apply across furniture lifecycles provides an essential context for evaluating profitability implications. The furniture industry's transition from linear to circular models requires fundamental transformation in design, production, use, and end-of-life phases (Sumter, de Koning, Bakker, Balkenende, 2021).

Circular furniture production begins with strategic material selection determining downstream circularity potential (Azevedo et al., 2024). Material choices significantly impact both environmental performance and economic viability: FSC-certified wood ensures sustainable practices while maintaining quality for multiple lifecycles, bamboo offers faster regeneration, recycled content integration reduces virgin material costs, and bio-based alternatives replace petroleum-derived components. Material passports—detailed composition records—enable efficient end-of-life processing, with upcoming EU Digital Product Passport regulation (mandatory 2030) standardizing documentation to facilitate secondary material markets (European Commission, 2024).

Design for Circularity principles incorporate modularity (separable components enabling selective replacement), standardization (common fasteners facilitating disassembly), durability (20+ year technical lifespans), timeless aesthetics (minimizing fashion-driven obsolescence), reparability (accessible components and spare parts), and recyclability (material compatibility and separation ease) (Sumter et al., 2021; Pieroni, Blomsma, McAloone, Pigosso, 2020).

Multiple end-of-life pathways preserve value hierarchically (Reike, Vermeulen, Witjes, 2018): reuse captures 40-70% of original value through direct second-hand sale; refurbishment captures 30-50% value after cosmetic and functional restoration; remanufacturing achieves 60-80% value through complete reconstruction; component harvesting captures 10-20% value; material recycling recovers 5-15% value; and energy recovery represents final option when other pathways are exhausted.

Different furniture types present varying circular economy potentials directly impacting CBM profitability. Solid wood furniture offers exceptional durability (50+ year lifespan), straightforward repair, and high-value recycling, though high weight increases logistics costs. Upholstered furniture enables aesthetic updates through fabric replacement but faces material separation complexity and hygiene concerns. Composite furniture provides lightweight construction, reducing logistics costs but suffers from adhesive bonding preventing disassembly and limited repair possibilities. Metal furniture demonstrates extreme durability, minimal maintenance requirements, and high recycling rates (>90%) (Hultberg, Pal, 2024). This material-dependent variation suggests that CBM profitability heavily depends on product portfolio composition.

4. Circular Business Models in the Furniture Industry

4.1. The BuyBack Model

The BuyBack model involves companies offering to repurchase products from consumers after specified periods, subsequently refurbishing or recycling these products before reselling or utilizing recovered materials for new production (Lüdeke-Freund et al., 2019). By recovering materials from returned products, companies substantially reduce virgin material procurement costs by 20-40%, though varying by material type and condition (Centobelli et al., 2020). Buyback programs eliminate disposal fees and environmental taxes while meeting Extended Producer Responsibility obligations (European Commission, 2024).

Enhanced lifecycle management allows companies to derive additional value from each product. Financial modeling suggests products completing three lifecycle iterations achieve 150-200% total revenue compared to single-lifecycle linear models (Mendoza, Sharmina, Gallego-Schmid, Heyes, Azapagic, 2017). Buyback program participants exhibit 35-50% higher customer lifetime values through repeat purchases and brand loyalty (Konietzko, Bocken, Hultink, 2019). The refurbished furniture market continues expanding, driven by costconscious and environmentally aware consumers, with 73% of millennials and Gen Z expressing willingness to purchase refurbished furniture given quality assurance (World Economic Forum, 2024). Selling refurbished items at 40-70% of original prices maintains attractive margins after refurbishment costs.

However, establishing refurbishment infrastructure requires substantial initial investment. Dedicated facilities demand workshop space, equipment, and skilled labour, with capital expenditure estimates ranging €200,000-€500,000 for medium-scale operations and ongoing operational costs adding 15-25% to total product costs (Hultberg, Pal, 2024). Reverse logistics costs approx. 8-15% of product sale prices (Govindan, Soleimani, Kannan, 2015). Quality control mechanisms and inventory management add complexity and costs.

Comprehensive cost-benefit analysis indicates refurbishment becomes profitable when products resell at a minimum of 35-40% of original price after costs (Bressanelli, Perona, Saccani, 2023). Payback periods range from 3-5 years depending on product categories, refurbishment efficiency, and market acceptance. Successful programs price refurbished items at 40-70% of original prices, achieving gross margins of 25-40% (Centobelli et al., 2020).

IKEA's Buyback & Resell program, launched globally in 2020, allows IKEA Family program members to return used furniture for store credit, with items refurbished and sold in As-Is sections at reduced prices. Program expansion to multiple markets suggests positive economics (IKEA, 2024). MillerKnoll's RePurpose Program, launched 2009, coordinates donation, resale, and recycling of used office furniture, diverting up to 98% from landfills while creating secondary market revenue (MillerKnoll, 2023).

4.2. Rental Model

The rental model offers furniture as a service where customers rent items for specified durations, with furniture returning to companies for refurbishment and re-rental (Kirchherr et al., 2017). Steady revenue streams from rental fees offer predictable income compared to purchase transactions, though revenue irregularities arise from varying contract durations. Successfully rented furniture can generate 150-200% of original sale price over 5-7 years through multiple rental cycles (Lieder, Rashid, 2016).

Rental models necessitate maintaining larger inventory pools, with capital tied up in inventory typically 2-3× higher than sales-based operations (Ghisellini, Cialani, Ulgiati, 2016). Logistics costs can reach 12-20% of rental revenue (Govindan et al., 2015). Each returned item requires cleaning, inspection, and refurbishment, with ongoing costs varying by product type. Profitability modeling reveals rental models achieve positive returns when furniture completes minimum 3-4 rental cycles, with break-even around 2-3 cycles depending on product category and operational efficiency (Bressanelli et al., 2023). Successful operations price monthly rentals at 3-5% of product sale price, achieving payback in 20-33 months before additional cycles generate profit (Lüdeke-Freund et al., 2018).

CORT Furniture Rental exemplifies successful implementation offering flexible solutions for temporary needs. Scale enables economies of scope with large inventory pools supporting diverse customer needs (Lieder, Rashid, 2016). Steelcase Flex Rental adapts to evolving office workspace needs with modular furniture, addressing hybrid work trends and enabling companies to adjust configurations without capital expenditure (Ellen MacArthur Foundation, 2013).

4.3. Product-as-a-Service Model

The PaaS model shifts from traditional ownership to access-based consumption where customers subscribe to furniture services rather than purchasing outright (Tukker, 2015). This emphasizes providing functionality and comprehensive services including maintenance, customization, and upgrades throughout subscription periods. Consistent recurring revenue streams ensure highly predictable cash flows compared to sporadic sales, supporting better financial planning (Tukker, 2015). PaaS customers demonstrate 40-60% higher retention compared to traditional purchasers (Stahel, 2016; Konietzko et al., 2019). Companies retain ownership enabling strategic control over end-of-life decisions, with products refurbished and redeployed 5-7 times over technical lifespans (Lieder, Rashid, 2016).

However, PaaS requires substantial initial investments in sophisticated systems for managing subscriptions, coordinating logistics, tracking inventory, and scheduling maintenance. Digital platforms are essential but costly to develop and maintain (Ghisellini et al., 2016). Ongoing maintenance and service delivery costs can reach 20-30% of subscription revenue (Stahel, 2016; Reim, Parida, Sjödin, 2015). Complex operational logistics for coordinating delivery, upgrades, repairs, and retrieval challenge implementation (Govindan et al., 2015).

Financial modeling indicates PaaS models require 5-7 years to achieve profitability given high initial investments, but subsequently generate strong returns through ongoing subscription revenue with declining marginal costs as systems mature (Lüdeke-Freund et al., 2018). Subscription-based furniture services appeal to urban professionals with high mobility, companies seeking flexible workspace solutions, and environmentally conscious consumers, with pricing typically targeting 3-4% of product value monthly (Kirchherr et al., 2017).

Leaseby offers office furniture on flexible subscription terms, reducing upfront costs while providing high-quality furnishings. B2B focus enables larger contract values and longer subscription periods (average 3-5 years), improving economics (Lüdeke-Freund, Gold, Bocken, 2019). Fernish targets urban consumers with furniture rental accommodating varying durations and style preferences, emphasizing convenience and flexibility (Reim et al., 2015).

4.4. Comparative Analysis

Table 1. synthesizes key profitability dimensions across the three CBMs, enabling systematic comparison of trade-offs and strategic fit considerations.

Table 1.*Comparative profitability indicators across circular business models*

Aspect	Rental	BuyBack	PaaS
Revenue Model	Irregular, rental-based	Irregular, resale-based	Regular, subscription
Initial Investment	Low	Moderate	High
Operational Complexity	Moderate	High	Very High
Customer Retention	Low-Moderate	High	Very High
Maintenance Costs	High	Moderate-High	Low-Moderate
Resource Efficiency	Moderate	High	Very High
Payback Period	2-4 years	3-5 years	5-7 years
CLV Multiplier	1.5-2×	2-3×	3-4×
Gross Margin	40-60%	25-40%	60-80%
Scalability	High	Moderate	Low-Moderate

Note. CLV = Customer Lifetime Value multiplier. Gross margin percentages represent profitability after operational costs including refurbishment, logistics, and maintenance.

Source: Author's analysis based on Lüdeke-Freund et al. (2018); Centobelli et al. (2020); Konietzko et al. (2019); Bressanelli et al. (2023).

This analysis reveals distinct profitability profiles. Rental offers lowest barriers to entry and fastest payback but faces revenue stability challenges and high maintenance costs. BuyBack balances moderate investment with strong customer retention, though operational complexity in managing reverse logistics demands sophisticated management. PaaS requires highest initial investments and longest payback periods but delivers superior long-term profitability through recurring revenue and exceptional customer lifetime values once operational maturity is achieved (Centobelli et al., 2020).

5. Profitability Challenges and Financial Evaluation

5.1. Profitability Challenges

CBM profitability is significantly influenced by interconnected regulatory but also technical, and market-related challenges (Caldera, Desha, Dawes, 2019). Government policies including certifications, financial incentives, waste penalties create favourable environments, with the EU's Circular Economy Action Plan establishing regulatory frameworks increasingly aligned with circular approaches (European Commission, 2024). However, inconsistent regulations across jurisdictions, VAT treatment differences between sales and rental/service models, create barriers. Extended Producer Responsibility regulations, while generally supportive, vary in implementation details and cost implications (Cainelli, D'Amato, Mazzanti, 2020).

Companies face limitations in recycling and refurbishment technologies for complex materials like composites or items with integrated non-recyclable components. Advanced recycling infrastructure remains underdeveloped in many regions, constraining material recovery economics (Stahel, 2016). Designing products for disassembly and reuse requires

significant R&D investment and fundamental shifts in design approaches, increasing product development complexity and costs by 15-30% (Sumter et al., 2021; Centobelli et al., 2020).

Despite growing sustainability awareness, many consumers remain hesitant regarding refurbished or second-hand goods. Surveys indicate 40-50% express concerns about hygiene, durability, or aesthetic condition despite warranty coverage (Mendoza et al., 2017; Hultberg, Pal, 2023). Cultural associations between newness and quality persist, requiring substantial marketing investment. Pricing strategies must balance affordability with profitability, typically positioning refurbished items at 40-70% of original prices.

High initial investments, particularly for PaaS, present barriers. Managing logistics of product returns, refurbishments, and customer service adds operational complexity, with circular operations requiring 30-50% more logistical capacity than forward-only distribution (Govindan et al., 2015). CBMs typically exhibit extended payback periods (2-7 years) compared to linear models due to substantial infrastructure investments, requiring long-term perspectives. Quality and durability requirements necessitate focus on higher-quality, more durable products costing 15-30% more to produce (Centobelli et al., 2020).

5.2. Financial Evaluation Frameworks

Comprehensive CBM evaluation requires multiple complementary frameworks addressing both short-term viability and long-term value creation (Bressanelli et al., 2023). Cost-Benefit Analysis must systematically compare costs (initial capital expenditure for infrastructure, refurbishment facilities, IT systems; operating costs for transportation, labour, facilities, materials, marketing) against benefits (revenue streams from sales, resale, subscriptions; cost avoidances from reduced material procurement, disposal fees; intangible benefits like brand equity enhancement). Net Present Value calculation provides standard framework:

$$NPV = \sum_{t=1}^n \left[\frac{Revenue_t - Operating_{cost}_t}{(1+r)^t} \right] - Initial_{investment}$$

where t represents time period (typically 10-15 years) and r represents discount rate (8-12% for furniture industry). Positive NPV indicates that CBM generates value exceeding traditional linear approaches (Mendoza et al., 2017).

Life Cycle Costing evaluates the total cost of ownership across complete product lifecycles. Example calculation for office chair demonstrates circular advantage: initial production cost €200, first refurbishment €50 after 10 years, second refurbishment €60 after 8 years, third use period 6 years, end-of-life recycling recovery €20, total €290 over 24 years (€12.08 annual cost) versus linear model requiring three separate €150 purchases total €450 over 24 years (€18.75 annual cost), revealing 35% cost advantage (Bressanelli et al., 2023).

Cascade use valuation tracks cumulative value retention through successive lifecycles. Example office chair calculation: initial sale €500, first refurbishment resale €300 (60% retention), second refurbishment €150 (30%), component recovery €50 (10%), material

recycling €25 (5%), total €1,025 (205% of original sale price). While time value of money reduces total returns, typically still exceeding 150% of initial sale price over 15-20 years (Reike et al., 2018). Customer Lifetime Value in CBMs incorporates multiple dimensions:

$$\text{CLV}_{\text{cbm}} = (\text{SubscriptionRevenue} \times \text{RetentionRate} \times \text{Duration}) \\ + \text{Product Return Value} + \text{Referral Value} + \text{Cross-sell Opportunity}$$

CBM customers demonstrate 40-60% higher retention rates, 25-35% increased lifetime value, 2-3× referral rates, and 30-50% improved cross-selling success (Konietzko et al., 2024). A customer purchasing €3,000 lifetime furniture in traditional model may represent €5,000-€7,000 in CBM context (Lüdeke-Freund et al., 2019).

6. Discussion: Barriers and Opportunities

6.1. Barriers to Implementation

Ownership ambiguity in PaaS and rental creates legal uncertainties regarding liability for accidents, responsibility for damage, and applicable consumer protection regulations, with current frameworks primarily addressing either clear ownership transfer or short-term rentals (Reike et al., 2018). VAT treatment varies between sales, rental, and service models across EU jurisdictions, creating complexity and potentially disadvantaging circular approaches in certain markets (European Commission, 2024). Warranty and liability considerations become complex in multi-lifecycle scenarios, with Extended Producer Responsibility regulations mandating manufacturer responsibility throughout lifecycles but implementation varying significantly across regions (Pieron et al., 2020). Cross-border challenges complicate reverse logistics and product take-back through varying national regulations regarding waste management and environmental requirements (Cainelli et al., 2020).

Reverse logistics complexity requires 30-50% more capacity than forward distribution, with furniture's bulky nature, fragility, and weight-dependent costs challenges (Centobelli et al., 2020). Geographic dispersion affects collection economics, with cost-effective collection requiring sufficient return volumes within geographic clusters. Condition variability complicates standardized operations, requiring flexible refurbishment processes. Infrastructure gaps constrain implementation, with many regions lacking specialized refurbishment facilities, trained technicians, and quality control equipment (Hultberg, Pal, 2023).

Design legacy poses challenges, with existing furniture not designed for disassembly, repair, or multiple lifecycles. Product redesign requires 3-5 year development cycles, delaying transition benefits (Sumter et al., 2021). Material complexity impedes recovery, with composite materials, adhesives, and finishes complicating separation, limiting recovery rates to 60-70% for complex furniture versus 85-95% for simple pieces (Azevedo et al., 2024). Technology

requirements create digital infrastructure demands that smaller manufacturers may lack capabilities for developing (Ranta, Aarikka-Stenroos, Väisänen, 2021). Skill gaps constrain refurbishment operations, with traditional craft skills facing declining availability (Caldera et al., 2019).

Consumer perceptions persist despite quality equivalence, with stigma associated with refurbished furniture requiring sustained marketing investment. Ownership preferences represent cultural barriers, particularly in residential markets where furniture carries symbolic meaning. Trust deficits regarding quality assurance, cleanliness, warranty coverage, and company longevity require substantial relationship building (Kirchherr et al., 2017). Price sensitivity paradoxes create positioning challenges, with consumers expecting substantial discounts while remaining quality-conscious (Centobelli et al., 2020).

6.2. Opportunities for Enhanced Profitability

Extended Producer Responsibility regulations create regulatory alignment with CBMs, with upcoming EU directives mandating furniture take-back transforming voluntary circular initiatives into compliance necessities (European Commission, 2024). Tax incentives improve refurbishment economics, with several EU countries reducing VAT rates for repair services to 5-10%. Green procurement creates stable B2B demand, with public sector organizations prioritizing circular solutions in procurement decisions. Subsidy programs support infrastructure development, with national and EU-level circular economy funds financing reverse logistics and refurbishment facilities (Caldera et al., 2019).

Sustainability consciousness drives market demand, with 73% of millennials willing to pay 10-20% premiums for sustainable products (World Economic Forum, 2024). Flexible lifestyles increase demand adaptability, with urban mobility, remote work, and smaller living spaces creating furniture flexibility demand (Ranta et al., 2021). Cost pressures drive refurbished market growth, with economic uncertainty increasing price sensitivity. Subscription normalization reduces adoption barriers, with increasing acceptance of subscription models familiarizing consumers with access-over-ownership paradigms (Konietzko et al., 2019).

Digital Product Passports mandatory from 2026 creates standardized systems for documenting product composition, maintenance history, and refurbishment cycles (European Commission, 2024). AI-powered condition assessment demonstrates 40% reduction in assessment labour costs while improving consistency (Cainelli et al., 2020). Predictive maintenance extends product lifespans 30-50% through proactive approaches (Konietzko et al., 2019). Platform economics reduce transaction costs through digital marketplaces (Ranta et al., 2021).

Strategic partnerships enable shared infrastructure distribution of costs while achieving economies of scale. Third-party reverse logistics specialists offer established networks reducing operational complexity (Govindan et al., 2015). Cross-industry synergies enable knowledge transfer from mature circular industries. Social enterprise partnerships access cost-effective

refurbishment labour while enhancing social impact (Villalba-Eguiluz, Sahakian, Etxezarreta, 2023).

6.3. Strategic Recommendations

Furniture manufacturers should implement design for circularity principles from inception, with modular designs, standardized fasteners, durable materials, and disassembly-friendly construction as default parameters. While increasing initial development costs 15-25%, these investments enable all circular models and future-proof products (Sumter et al., 2021; Azevedo et al., 2024). Hybrid approaches combining traditional sales with circular offerings manage risk while building capabilities. Positioning refurbished products as "certified pre-owned" reduces stigma while appealing to value-conscious consumers (Mendoza et al., 2017). Integrating comprehensive service bundles with PaaS offerings differentiates from simple rental while justifying premium pricing (Tukker, 2015). Investing in digital infrastructure determines operational efficiency and scalability potential (Ranta et al., 2021).

Policymakers should harmonize circular economy regulations across jurisdictions to reduce compliance complexity and enable economies of scale f.e.g. supporting regional refurbishment hubs through public-private partnerships reduces SME barriers while creating green employment (Caldera et al., 2019), implementing consumer education campaigns addresses refurbished product perceptions (Hultberg, Pal, 2023). Funding R&D programs advances recycling and refurbishment technologies (Cainelli et al., 2020), incorporating circular economy criteria in public procurement creates stable demand signals (European Commission, 2024).

7. Conclusion

This comprehensive analysis of three CBMs: BuyBack, Rental, and Product-as-a-Service, reveals distinct profitability profiles within the furniture sector. While CBMs require significant initial investments (low to high) and extended payback periods (2-7 years) compared to traditional linear approaches, they deliver substantial long-term benefits including enhanced resource efficiency (achieving 150-205% total value extraction), improved customer loyalty (1.5-4× CLV multipliers), and stable recurring revenue streams particularly in subscription-based models.

Financial evaluation frameworks extending beyond simple payback analysis—including Life Cycle Costing, cascade use valuation, and Customer Lifetime Value assessment—demonstrate circular approaches achieve superior long-term financial performance despite higher upfront requirements. The integration of lifecycle perspectives spanning eco-design

through end-of-life scenarios reveals material and design decisions fundamentally determine CBM viability and profitability potential.

The BuyBack model emphasizes resource efficiency and customer loyalty, achieving moderate profitability (25-40% gross margins) with 3-5 year payback periods but faces reverse logistics management challenges. The Rental model offers operational flexibility and lower barriers with 2-4 year payback periods but struggles with revenue irregularity, succeeding particularly in B2B office furniture applications. The PaaS model guarantees steady revenue and exceptional retention (3-4× CLV multipliers) achieving highest margins (60-80%) once mature, but faces substantial initial investments and 5-7 year payback periods creating significant entry barriers.

Barriers spanning legal ambiguities, logistical complexities, technical constraints, and behavioural resistance require systematic attention. However, corresponding opportunities (including supportive policy incentives, growing sustainability-conscious consumer segments, technological enablers reducing operational costs, and partnership ecosystems distributing risks) provide pathways to overcome challenges.

The furniture industry's inherent characteristics — durable products suitable for multiple lifecycles, substantial material value, and design flexibility—position the sector advantageously for circular transitions. Companies embracing circular models proactively position themselves for regulatory compliance, market differentiation, and long-term profitability in increasingly resource-constrained and environmentally conscious markets. Future research should pursue quantitative financial modelling using detailed company data, longitudinal studies tracking profitability evolution over 10-15 years, comparative analyses across geographic regions, investigation of hybrid business models, and examination of digital technologies' impacts on circular operation efficiency.

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DESIGN THINKING IN DEVELOPING THE INTERCULTURAL COMPETENCE OF STUDENTS AS AN ELEMENT OF THE UNIVERSITY'S SOCIAL IMPACT

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Purpose: This article aims to examine the potential of the Design Thinking (DT) methodology in educating students about intercultural competence, which is considered an essential element of the university's social role.

Design/methodology/approach: To achieve this goal, the author based her considerations on analysing the relevant literature (including international research on DT and intercultural competence) and a case study of DT implementation within the Intercultural Business Communication module at the Wrocław University of Economics. As part of the case study, the author analysed students' experiences, reflections, and conclusions from working in intercultural teams and addressing the challenge of intercultural collaboration.

Findings: The research findings indicate that the use of DT supports the development of key elements of intercultural competence, including empathy, openness, cultural self-awareness, cognitive flexibility, effective communication, and teamwork. Students recognised the real challenges of working in an international environment (language differences, communication styles, decision-making, and building trust). They indicated that the DT process helped them better understand perspectives and develop practical collaboration skills.

Social implications: The article highlights the role of universities as institutions supporting intercultural dialogue and inclusiveness. Using DT in teaching can better prepare students for the workplace, promote diversity, and support the development of social and cultural competencies essential for future leaders.

Originality/value: The article provides original value by combining two areas: Design Thinking and the development of intercultural competencies, which have rarely been analysed together in the literature. The case study demonstrates the practical application of DT in teaching and suggests directions for further research and the potential for adapting this methodology in higher education.

Keywords: intercultural competence, Design Thinking, universities.

Category of the paper: Research paper.

1. Introduction

In today's rapidly changing world, young people leaving university should be equipped with a range of skills and competencies to enable them to function effectively in the labour market and facilitate collaboration with partners. One of the most critical competencies currently essential for effective functioning is intercultural competence.

Intercultural competence can be described as a range of competencies that enable efficient operation in a multicultural or intercultural environment. They facilitate understanding people from other cultures, building lasting and satisfying relationships, and effectively managing operations. Intercultural competence seems particularly important in managing an international team or negotiating, but it is also crucial in other areas, such as teamwork, leadership, and delegating employees abroad.

The role of intercultural competence in higher education is also significant. Internationalisation is a priority for most universities, and students experience international environments and participate in international exchange programs. Universities accept foreigners for study. Visiting professors are now the norm, rather than the exception, in teaching. The need to build intercultural competence in higher education seems downright essential. Moreover, universities are now perceived not only as teaching and research centres but also as key actors in shaping social impact, meaning that their role is focused on education and science and active engagement in solving social, economic, and cultural problems. Universities play a crucial role in shaping the social awareness of students and future leaders, fostering intercultural dialogue, promoting diversity and inclusivity, and equipping students with the tools to influence social and economic processes.

There are many tools and methods for building intercultural competence. Design Thinking (DT) can be very helpful in this regard. DT is an iterative process based on five phases (empathise, define, ideate, prototype, test) that can be used to build intercultural competence. The literature emphasises that DT develops empathy, collaboration, and creative problem-solving (Brown, 2009; Razzouk, Shute, 2012), which constitute essential elements of intercultural competence.

This article aims to discuss the potential of Design Thinking in building intercultural competence in students as a component of the social impact of higher education institutions. The literature contains numerous studies on building intercultural competence, including in the context of higher education institutions, as well as on DT and its use in education. However, few studies combine these two areas, demonstrating the potential of DT in building intercultural competence.

To achieve her goals, the author based her discussion on analysing the relevant literature, drawing primarily on foreign sources, including scientific articles, conference proceedings, and information on websites dedicated to DT and intercultural competence. The author utilised

Google Scholar and Science Direct to gather the literature. These sources allowed the author to define concepts related to culture and intercultural competence, and to identify the most critical models. She also characterised the DT process and identified connections between its individual stages and the development of intercultural competence. Additionally, in the final section, the author utilised a case study of the use of DT methodology on the Intercultural Business Communication module. All these elements allowed to identify the main conclusions, limitations, and opportunities for future research in this area and for using this methodology to build intercultural competence.

2. Theoretical framework of the development of intercultural competence

Finding a single definition of culture that captures its essence is difficult in the literature. According to Kłoskowska (1980), culture is shaped by generations and the external world of things and thoughts that influences people. It is not the creation of a single human being, but rather a product of coexistence and cooperation, developing and enriching through generations. Hofstede et al. (2010) view culture as the collective programming of the mind that distinguishes members of one group from another.

Culture shapes human values, attitudes, behaviours, and perceptions; therefore, collaborating with people from different cultural backgrounds can lead to misperceptions, problems with cooperation, and a lack of mutual understanding at various levels. Therefore, developing cultural competence is crucial for effective functioning in an international environment.

As with culture, there is no consensus on what constitutes intercultural competence. According to Taylor (1994), intercultural competence is a learning process in which a person from another culture develops the ability to adapt, change their perspective, understand, and meet the expectations and requirements of the host culture. Johnson, Lenartowicz, and Apud (2006) define intercultural competence as an individual's ability to use knowledge, skills, and personal characteristics to effectively collaborate with people from different cultural backgrounds, both domestically and internationally. According to Fantini and Tirmizi (2006), intercultural competence is a set of skills necessary for effective and appropriate use in contacts with others who differ linguistically and culturally. The set of skills comprises several components, including communication, knowledge, cooperation, relationships, attitudes, awareness, and knowledge of the language and the country.

Kim (2002), analysing intercultural communication competence, placed adaptability at its centre and emphasised the individual's ability to suspend or modify some old cultural customs and learn and adapt some new ones, as well as creatively find ways to cope with ignorance of cultural differences, intergroup attitudes, and the accompanying stress. Deardorff (2009),

in a study conducted in the United States with the participation of other leading researchers, developed a widely accepted definition stating that intercultural competence is adequate, appropriate behaviour and communication in intercultural situations. Schwarzenenthal et al. (2019) point out that intercultural competence is not limited to intergroup attitudes but also encompasses awareness and knowledge of diverse worldviews and the ability to demonstrate behavioural flexibility in the face of diverse cultural contexts. Based on an extensive literature review and their own research, Guillén-Yparrea & Ramírez-Montoya (2020, 2023) concluded that intercultural competence enables an individual to possess adequate knowledge and understanding of different cultures, as well as to interact and relate effectively in diverse cultural environments.

Along with defining the concept of intercultural competence, many researchers have developed their models (Bolten, 2006; Bennet, 1993; Brinkmann, van Weerdenburg, 2014; Byram, 1997; Deardorff, 2009; AAC&U, 2009), which also exhibit specific differences. Three selected models will be discussed below.

Byram's Model of Intercultural Communicative Competence (Byram et al., 2002) presents a comprehensive framework for language education, which, in addition to language knowledge, also requires teaching intercultural competence, as language proficiency alone does not automatically translate into intercultural competence (Alred et al., 2003, 2006; Byram, 1997; Deardorff, 2006). Byram conceptualises intercultural competence as a complex whole, encompassing knowledge, skills, attitudes, and critical awareness (Xiaoyan et al., 2024). In his approach, the so-called *savoirs*—five interrelated components – are crucial (Deardorff, Jones, 2012):

- Knowledge (*Savoir*) – knowledge of aspects of culture, beliefs, and points of reference that are familiar to the local community.
- Attitudes (*Savoir être*) – understanding and coping with cultural differences with curiosity and openness, without ethnocentrism.
- The ability to discover and interact (*Savoir apprendre*) – interpreting how others live, think, feel, and communicate.
- The ability to interpret and relate (*Savoir comprendre*) – the ability to gain insight into cultural meanings, beliefs, and practices in comparison to one's own culture.
- The ability to engage (*Savoir s'engager*) – making informed, critical assessments of aspects of one's own and other cultures.

One of the most recognised models in the scientific literature is the model developed by Deardorf (2009), resulting from a multi-stage research process. It is a processual model, meaning that intercultural competence is not a final state but a dynamic, continuous learning and development process. The author begins the acquiring competencies process at the individual level (attitudes, knowledge, and skills) and reaches the interactive level (internal and external outcomes). Attitudes include respect, openness, curiosity, and discovery; knowledge and skills encompass cultural self-awareness, deep cultural understanding, and sociolinguistic

awareness; skills, in turn, include listening, observing, evaluating, analysing, interpreting, and relating. These elements lead to internal outcomes, such as adaptability, flexibility, an ethnorelative perspective, and empathy. The external outcomes, in turn, include effective and appropriate communication and behaviour in intercultural situations. The degree of intercultural competence depends on acquired attitudes, knowledge/understanding, and skills (Głazewska, 2020).

The Association of American Colleges and Universities (AAC&U, 2009; Hantsiuk et al., 2021), which represents over one hundred colleges and universities in the United States, has proposed an Intercultural Knowledge and Competence VALUE Rubric, which identifies the following six key components of cross-cultural competence:

- an attitude of openness, demonstrated by a non-judgmental approach when interacting with people from other cultures,
- an attitude of curiosity, leading to asking sophisticated questions about other cultures and formulating answers to those questions that represent diverse cultural perspectives,
- cultural self-awareness, meaning understanding one's own cultural rules and biases,
- knowledge of the framework of a cultural worldview, demonstrating an awareness of the complexities of elements essential to members of another culture,
- nonverbal and verbal communication skills help one understand cultural differences in verbal and nonverbal communication and effectively negotiate these differences,
- empathy skills are related to the ability to analyse intercultural experiences both from one's own perspective and from the perspective of several other worldviews, and to act respectfully, taking into account the feelings of another cultural group.

Most definitions and models emphasise the cognitive, affective, and behavioural perspectives necessary for interacting with people from other cultures. Cognitive skills refer to understanding the situation and environment of intercultural interactions and applying intercultural awareness, which is also influenced by understanding one's own culture. Knowledge focuses on general aspects of culture, knowledge of the country, its culture, language, standards, and behaviours. Affective skills are linked to the emotions accompanying intercultural interactions, such as respect, tolerance, openness to new behaviours, openness to differences and diversity, the ability to change views and perspectives, and self-reflection. The behavioural perspective focuses on how to act effectively in intercultural situations, behave appropriately in given circumstances, resolve conflict situations, cope with culture shock, and so on.

3. Design Thinking in the educational process

To identify the importance of DT in building intercultural competence, it is necessary to define the concept. Design Thinking is a creative problem-solving method described as a human-centred methodology that supports and drives practical innovation (Bauer et al., 2008). Design Thinking emphasises observation, collaboration, rapid learning, idea visualisation, rapid concept prototyping, and simultaneous business analysis, ultimately influencing innovation (Lokwood, 2009). The DT process's primary goal is to create commercially viable, technically feasible solutions and respond to real user needs. The essence of this process is creating and implementing innovative solutions, which encompass new products, technologies, services, strategies, methods, business models, and educational programs. Due to its universal nature, Design Thinking has a broad application, wherever we deal with so-called "wicked problems", or problems that don't have a single, obvious solution (Derlukiewicz, Koziółek, 2008).

An interdisciplinary team is one of the key elements of this process. Its members are selected from diverse backgrounds. These should include individuals with diverse experiences, skills, and knowledge. Diversity and diverse perspectives on the problem create a vast space for developing solutions that are ultimately innovative and more practical. Design Thinking practitioners should focus on human needs, demonstrate empathy, gather user feedback and incorporate it into their projects, make experimentation an integral part of the design process, and collaborate with people from diverse backgrounds and respect their perspectives. Tackling challenging problems, curiosity, and optimism are essential. The main attributes of design thinking are (Baeck, Gremett, 2011):

- Ambiguity – accepting unclear situations and accepting that answers may be unknown or not obvious.
- Collaborative – collaboration with partners from different fields and disciplines.
- Constructive – involves building on the ideas of others, already existing ones, not negating old ideas, but rather building on them and improving them.
- Curiosity – naturally asking questions, being interested in things that are not understood, or perceiving things differently.
- Empathy – seeing and understanding things from the point of view of users/others.
- Holistic – a broad view of the problem, looking at it from multiple perspectives.
- Iterative – a cyclical process in which improvements are introduced to the solution or idea regardless of the phase.
- Non-judgmental – the ability to create ideas without judging the creator of the concept or the idea itself.
- Open mindset – appreciating wild ideas, not jumping to conclusions, and adopting an experimental approach.

There are many Design Thinking models, each consisting of several stages, but the number of stages varies, typically ranging from 4 to 7. The Hasso Plattner Institute of Design at Stanford (the "d.school") developed the most well-known model. According to this model, the design thinking process consists of five stages (Hasso Plattner, n.d.):

- Empathise – empathy is a central element of the human-centred design process. The goal of empathy is to understand people in the context of the design challenge, to put ourselves "in the shoes" of the user by learning about their needs and problems, to understand potential frustrations and dissatisfaction, to understand how and why they act, how they think about the world, and what is important to them.
- Define – this stage aims to define the actual problem from the user's perspective. This stage serves to understand the collected information. Properly defining the problem significantly facilitates determining the direction of the solutions sought.
- Ideate – a mode of the design process that focuses on generating ideas. Ideation provides fuel and source material for building prototypes and delivering innovative solutions to users.
- Prototype – at this stage, a physical prototype is created. A physical representation of the created idea is made from simple, readily available materials. The goal of prototyping is to move to action as quickly as possible, providing the opportunity to visually present the idea to users and quickly gather feedback on the solution.
- Test – at this stage, the selected solution is tested in the user environment. Prototypes are tested with potential customers or end users to learn how the developed solution works. Testing is another opportunity to understand the user, where, after receiving feedback, it is essential to demonstrate empathy and objectively address user feedback.

Over the years, the approach to the DT process has evolved; the current approach emphasises greater fluctuation between stages, adaptation, reversion, iteration, and even skipping specific steps if the situation requires it. The DT process is no longer treated as "the process", a set of manuals. Instead, it is emphasised that institutions and educators should choose tools, methods, and ways of working for a specific context and goals (Carter, 2016).

Design Thinking has been successfully integrated into curricula across various disciplines, including creative modules and areas such as tourism, management, engineering, law, communication, and cultural studies. Implementing DT helps universities align with their social impact goals, including addressing real social problems reported by various institutions, NGOs, local governments, and local communities. Implemented solutions can help address the challenges faced by local users. The university becomes a partner in social development, serving as an institution that benefits the local community. Trust between the university and its social environment can increase, and knowledge is transferred to practice. Engagement in real-world problems enables students to acquire practical skills, enhance their social awareness, and demonstrate their ability to influence various aspects of life.

Research (Kijima et al., 2021; Clark et al., 2020; Lebid et al., 2020; Sandorova, 2019) indicates that Design Thinking facilitates the development of key competencies in students. Five groups of competencies backed by Design Thinking can be distinguished (Hantsiuk et al., 2021):

- creativity – the human-centred approach represented by Design Thinking allows students to present ideas and take creative risks boldly;
- problem-solving – prototyping develops students' ability to combine innovation with practical problem-solving;
- design competencies – implementing Design Thinking-based projects develops the ability to plan, collaborate, and implement innovations;
- communicative competence – supporting the development of oral and written communication, including foreign language learning;
- intercultural competence – supporting the development of empathy, collaboration skills, and a creative approach to problem-solving.

Considering the stages of DT and the components of intercultural competence, connections can be drawn between them (Hantsiuk et al., 2021; Deardorff, 2006; Schadewitz, 2009):

- Empathising – developing cultural empathy.
By collecting information through interviews and observations, students learn active listening, openness to other perspectives, and curiosity about different cultures, "getting into the shoes" of culturally diverse people. This stage corresponds to components of intercultural competence such as openness, curiosity, and a willingness to relativise one's own norms. It promotes the reduction of cognitive biases and develops the ability to recognise diverse perspectives.
- Defining – building cultural self-awareness and knowledge about other cultures.
Defining user needs requires understanding cultural assumptions and diverse cognitive frameworks. Framing a problem in a culturally sensitive way requires considering diverse perspectives, which exercises cognitive flexibility. Collaborative problem definition fosters diverse perspectives, facilitating the development of interpretive and relational competencies.
- Ideation – drawing on diverse perspectives, developing communication skills.
Collaborative ideation, drawing on diverse cultural experiences and perspectives, develops intercultural interaction skills, promotes inclusivity, and fosters diversity of perspectives as a source of innovation. This process requires communication and agreeing on ideas, which develops intercultural dialogue skills.
- Prototyping – developing empathy.
Building a prototype helps develop empathy by "getting in the shoes" of users, empathising with their needs, and responding to them. Developing a prototype requires collaborative action, collaboration, and compromise. It provides tangible evidence of

a shared solution, requiring participants to communicate and understand the perspectives of people with different cultural experiences.

- Testing – communication and reflexivity.

Testing solutions requires good communication, develops the ability to listen, accept criticism, adapt, and revise one's own ideas while considering users' perspectives, often in real-world intercultural settings. It allows for the development of reflexivity and the validation of one's own perspectives.

The juxtaposition of DT with the components of intercultural competence demonstrates the interconnectedness and complementarity of these two areas. Design Thinking can be considered and utilised as a tool for designing innovative solutions. Still, it also serves equally well in the teaching process, developing a range of competencies, including intercultural ones, essential for students to function effectively in the labour market.

4. Implementing DT in Intercultural Business Communication classes

The author of this article uses the Design Thinking methodology as one of the teaching tools in the subject of *Intercultural Business Communication*. The course is offered during the first year of the Master's program in International Business (in English) at the Wrocław University of Economics. The module comprises an interactive lecture and workshops, during which students work on intercultural challenges using the Design Thinking methodology. The workshop component (15H) aims to develop students' competencies in creative and innovative thinking – solving intercultural problems unconventionally, collaborating in culturally diverse groups, and aims to develop intercultural competence, including empathy, openness, cultural self-awareness, the appreciation of different perspectives and communication skills. Furthermore, the purpose of using Design Thinking was to enable students to verify the theoretical knowledge acquired in the lecture and confront it with the intercultural problems faced by people working in an international environment.

The students worked on a challenge related to improving collaboration in intercultural teams. They were divided into groups of four, each consisting of Polish and international students from Germany, Turkey, Spain, the Czech Republic, and Italy (for a total of 20 people in the administrative group). Some of the students had their own experience with intercultural collaboration, including working in international teams. The DT process in which the students worked was divided into 5 stages, in accordance with the model developed at Stanford University: empathization (the students' task was, among other things, to conduct interviews with people who function in a cross-cultural environment in their professional work, both with Poles and foreigners), defining (based on data collected during the empathization stage, as well as drawing on their own experiences, the students described the main problem from the point

of view of the challenge users), ideation (creative work on developing solutions that respond to the previously defined problem; students used, among others, silent and group brainstorming), prototyping (visualisation of the selected solution, joint creation of a presentation showing the results of the joint work), testing (presentation of the developed solutions with simultaneous feedback, answering questions and collecting suggestions and new ideas that could improve the solutions), taking into account reflection at each stage and placing emphasis on noticing.

Working on the challenge enabled students to identify the primary problems and challenges faced by individuals working in intercultural environments. Among the most important, recurring issues across all groups were:

- problems related to intercultural communication, caused by language differences and different communication styles,
- mutual misunderstandings related to differences in values and attitudes caused by different cultural backgrounds,
- different approaches to decision-making,
- difficulties in building trust.

Students also noted the lack of programs that foster cultural awareness within companies, the absence of activities that allow employees to get to know each other better, and the scarcity of team-building activities, which can be particularly problematic for international employees who feel alienated in a new environment. These issues formed the basis for developing solutions and further testing them.

A significant element of the DT process was reflection, which occurred both orally after each session and in writing at the end. The students were given a questionnaire to fill out consisting of eight questions that concerned what went well and what went wrong in the project, what obstacles occurred, what competences the students discovered in themselves and what new ones they acquired, what they learned from their peers, what they would do differently next time, what they would take with them to future projects, and finally, how they assessed DT as a method for acquiring intercultural competence, and which stage/tool of the process, if any, was the most helpful.

Among the responses regarding what went well in the project, students highlighted teamwork, the division of responsibilities among individual members, the final solution they developed, and the presentation of the results. Quoting selected statements: "The group was well-organised and effective. We are basically happy with the results of our work", "Great group work with good outcomes – synergy effects, everyone focused on what he/she is good at – we had fun", "The interviews went well, they were really informative, in the end everything went well". Negative experiences included communication problems and varying levels of engagement among individual group members, insufficient research before developing a solution, the complexity of the challenge, and difficulties in finding the right interviewees. Sample student statements include: "The topic was a bit difficult, so coming up with a working solution was not as easy as I expected", "Not everyone was as ambitious and caring that much".

The competencies students discovered/acquired while working on the project included leadership and team management, teamwork and time pressure management, language and communication skills in a culturally diverse team, creativity, and unconventional thinking. Students also noted increased cultural awareness and sensitivity, as well as knowledge of intercultural issues: "I gained language development, task management and digital communication skills, cross-cultural awareness and cultural sensitivity", "Creativity on a larger scale and I discovered leadership attributes" and "I can be a leader, when we were working together, I often took the initiative". In the following question, students cited things they learned from their teammates. Responses included diverse perspectives, diverse approaches to problem-solving, communication skills, and understanding the behaviour of representatives of other cultures: "I learned how to communicate better and formulate my thoughts and messages", "I have learned how other cultures behave" and "I've learned that there are always different approaches to specific dilemmas, which helped me better adapt to group projects".

The following questions focused on what group members would do differently and what they would take to future projects. The most common responses to the first question indicated better project planning, notably faster development of the final presentation. Regarding what they would take to future projects, they highlighted good communication with team members, using Mural as a collaborative tool, DT as a problem-solving method, brainstorming, and their approach to making presentations. Quoting selected student statements: "The design thinking methods were beneficial – the steps of empathising, defining, and so on made our process more structured and allowed us to understand the problem more deeply and understand it more easily", "It's important to communicate clearly and gain trust with your team members", "I would use Mural again; it was beneficial and helpful with this type of work".

The final question concerned the importance of DT in developing students' cultural awareness. Most stated that the methodology helped build awareness, learning about other cultures, and understanding the challenges of working in an intercultural environment. Only two participants found the DT methodology to be quite complex, and when combined with the problem being solved, this posed a significant challenge. Regarding the stages and tools students found most helpful, they primarily cited empathy and interviews, which allowed for a better understanding of the interviewees' problems, feelings, and cultural behaviours: "The empathy phase was most helpful. I saw people had difficulty communicating with people from different countries or working in different time zones. I hadn't even considered such problems before", "I liked the empathy map – it allowed me to see various statements, feelings, and actions of people from all the interviews. It gave me a broad overview of the perspectives and cultural issues people face when working with foreigners". Students also cited problem definition and ideation as valuable experiences in building cultural awareness, particularly due to the opportunity to learn about perspectives of colleagues from other countries, communicate in English, consider different communication styles, approaches to work organisation,

deadlines, and problem-solving. One participant noted that collaborative work and discussions allowed for challenging previously persistent cultural stereotypes.

In summary, the entire process and students' feelings about using the DT methodology to build intercultural competence should be assessed positively. Students could practically verify their theoretical knowledge, develop empathy, openness, cultural self-awareness, and learn about other cultures, including different perspectives and behaviours. The development of communication skills and intercultural teamwork is also significant. Limitations of the DT methodology include uneven engagement among individual team members, difficulties in measuring this engagement, and challenges in selecting and recruiting the right participants for interviews (in some cases, students conducted interviews with colleagues who had limited intercultural experience). Moreover, the challenge was general, not company-specific, and the ideas developed were not implemented. A much better solution would have been a challenge implemented for a specific company, which would have had an even more practical impact and would also have contributed to increasing the university's social impact (in the coming years, it is planned to work on challenges for specific entities).

5. Summary

Well-developed intercultural competence seems essential in today's world. The analysis and case study indicated that Design Thinking is a promising teaching method for developing students' intercultural competence. The essence of Design Thinking – combining a user perspective with creative problem-solving – promotes the development of skills such as empathy, openness to diversity, the ability to collaborate in a group, and critical reflection on one's own cultural assumptions. In a climate of increasing internationalisation and expectations for universities to respond to societal challenges actively, the use of Design Thinking can improve the quality of the teaching process and strengthen the university's social impact. By working on real-world intercultural problems, students can develop their competencies in this area and co-create solutions with implementation potential that can serve businesses, institutions, and the community as a whole.

From an educational perspective, there is ample room for further development of Design Thinking in higher education. The DT methodology can be successfully integrated into curricula across various fields, not only economics, creative studies, or management, but also in technical fields and the exact sciences, where interdisciplinarity is increasingly being pursued and project work is standard practice. Combining DT with other teaching methods is also a good idea. Combining Design Thinking with Collaborative Online International Learning (COIL) may be particularly promising, enabling students to collaborate in intercultural teams online. This type of collaboration enables the development of communication skills, cultural

awareness, and the building of international networks with peers from other countries. Integrating DT with COIL can strengthen the process of developing cultural competence, broadening participants' perspectives to include the development of digital skills and a transnational dimension.

At the same time, research limitations and gaps must be identified. Existing analyses focus on individual teaching projects, making it difficult to assess the long-term impact of DT on the development of intercultural competence. There is a lack of systematic comparative research examining the effectiveness of DT compared to other teaching methods and research that captures the sustainability of acquired skills. There is also a lack of research on the impact of cultural differences on the use and reception of DT methodology. What is well-received in one cultural group may have a completely different dimension in another, raising questions about the need to adapt the method to other cultural contexts.

Another area requiring further exploration is the analysis of the impact of DT on the social dimension of university activities. The literature still lacks studies demonstrating how DT-based projects implemented by students can contribute to fundamental changes in the socio-economic environment of universities, for example, through collaboration with local entities or the creation of social innovations. This issue is essential in the context of growing demands and expectations towards higher education, so that its activities are not limited to the academic sphere, but also influence the formation of more inclusive and open communities.

In summary, DT can be viewed as an effective teaching method supporting the development of intercultural competence and a tool for increasing the social impact of universities. Further empirical research, encompassing broader participant samples, diverse cultural contexts, and innovative teaching methods such as COIL, seems necessary to fully understand the possibilities and limitations of this methodology. In this way, DT's potential can be harnessed in building future competencies that will determine the quality of intercultural collaboration, graduates' competitiveness in the labour market, and the social role of universities in a changing world.

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A MULTIDIMENSIONAL PORTRAIT OF THE VIDEO GAME PLAYER: A QUALITATIVE STUDY OF PERCEPTION, MOTIVATION, EXPENDITURES, AND THE EXPECTED FUTURE OF VIDEO GAMES

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Purpose: To create and analyse a multidimensional portrait of the video game player, thereby identifying potential new research areas for future inquiry.

Design/methodology/approach: The grounded theory methodology was used. Qualitative studies were performed using the method of individual-in-depth-interviews (N = 21). They were followed by semi-structured interviews and field note-taking. The interview scenario was the measurement tool.

Findings: The qualitative findings demonstrate a profound correspondence between player experiences and the established economic drivers and psychological/sociological frameworks of the video game industry. Core motivations - such as flow, escapism, and socialising - directly underpin the success of the Games-as-a-Service (GaaS) economic model. The study confirmed the existence of polarised financial habits and the high profitability derived from "High Spenders", whose uncontrolled expenditure on microtransactions (e.g., P2W mechanics) raises ethical concerns. The results also reflect the ongoing normalisation of gaming alongside the persistence of the negative gamer stereotype.

Research limitations/implications: The main limitations stem from the methodology: the purposive sampling of a small group (N = 21) precludes statistical generalisation. Data relies on self-reported accounts, susceptible to bias, particularly regarding sensitive topics like expenditure and potential "psychological harm." Furthermore, the cross-sectional nature of the analysis cannot capture the dynamics of motivational change or long-term impacts.

Practical implications: It is suggested that ethical redesign of GaaS business models is necessary to mitigate manipulation risks among "High Spenders" and address P2W criticism. To maintain competitiveness, developers should enhance features that foster immersion and implement flexible engagement models suited to adult players' unpredictable schedules.

Social implications: Despite the trend of normalisation, the study highlights the need for continued public discussion regarding the psychological risks and developmental benefits of video games, given the persistence of the negative stereotype.

Originality/value: The study's value lies in providing a rich, qualitative portrait of the player, primarily within the Polish context. It offers empirical evidence of how modern GaaS business models exploit intrinsic player motives (e.g. achievement and escapism) for revenue generation, forming a valuable basis for subsequent quantitative verification.

Keywords: video games, consumer behaviour, perception, gaming, motivation, player, gamer.

Category of the paper: Research paper.

1. Introduction

The heightened academic interest in video games as a subject of scientific inquiry emerged following their debut as a commercial product in 1971 (Kent, 2010). Initially, the discussion in the literature focused exclusively on purely technical and engineering aspects, specifically the technology underpinning the games themselves, ranging from microprocessors to display systems (Smith, Mitchell, 1978; Foley, Van Dam, 1982). However, one of the first scientific publications to directly investigate what makes computer games engaging and how these elements could be leveraged for learning appeared as early as 1980 (Malone). The subject matter of publications appearing throughout the period 1980-2000 was heavily polarised. On one hand, research explored the potential negative impact of video games on the user (Anderson, Dill, 2000; Dominick, 1984), while on the other, studies investigated their cognitive and applicational potential (Subrahmanyam, Greenfield, 1994; Jones, 1984). During this era, interest in hardware technology gave way to a focus on the user (the player) and the influence of games on their behaviour.

It should be emphasised that video games and their popularity have remained in a close relationship with technological development essentially since the first video game appeared on the market in the 1970s. For example, the mass popularisation of networked games (including MMORPG, MOBA, Battle Royale, etc.) was directly tied to the development of the Internet infrastructure, while the emergence of mobile games was directly associated with the widespread adoption of smartphones. Both of these phenomena contributed to a significant expansion and diversification of research problems in publications concerning video games, starting from the early 21st century. Studies conducted within this framework shifted from concentrating purely on harms to analysing complex engagement mechanisms (Brockmyer et al., 2009; Travaglino et al., 2020), positive effects (Dye, Green, Bavelier, 2009; Bonnechère et al., 2016), and the influence of games on identity and society (Kaye, Kowert, Quinn, 2017; Liao et al., 2020).

Despite numerous publications focused on video games, several research gaps persist, including, but not limited to: the influence of new technologies (VR/AR/Metaverse) on players' perceptions of video games; the relationship between players' personality traits and preferred game genres; the impact of game monetisation mechanisms on perceived value; and the lack of research on the psychological profiles and motivations of older players (i.e. those aged 50 plus).

Consequently, video games remain a relatively interesting research area that not only requires continuous monitoring but also exploration, particularly through the use of qualitative research methods (McCaffrey, 2023).

The main objective of the paper is **to create and analyse a multidimensional portrait of the video game player**, which consequently would allow for the determination of potential new research areas for planned future research. The paper is interdisciplinary and exploratory

in nature, and while closely related to economics and studies on consumer behaviour, it also covers the fields of psychology, sociology, and management.

Specific objectives of both a cognitive and methodological nature also defined in the research process include:

- exploring and analysing the conceptualisation of video games and understanding the respondents' general perception of them,
- examining the respondents' perception of the typical player stereotype,
- identifying and classifying the main reasons/motivations for playing video games among active players,
- investigating the respondents' expenditure on and in video games,
- determining the respondents' preferences regarding video game genres and platforms, and assessing their engagement levels,
- gathering and analysing players' opinions and expectations concerning the future of video games and the industry,
- and finally, exploring and defining specific research avenues, providing the foundation for subsequent quantitative work, thereby enabling quantification of the analysed variables and verification of the research hypotheses generated during the qualitative phase.

2. Literature Review

2.1. Video Games – Economic Aspects

Video games allow players to precisely control actions at a distance (similar to remotely controlling a device, but with greater detail). Cognitive research suggests that this detailed mechanism of remote action leads to the feeling that the player's mind and body are extending to actually enter that new virtual space (Clark, 2003). This is an undoubted advantage that video games hold over books and movies which, for all their virtues, cannot replicate this effect (Gee, 2003). It is, moreover, one of the reasons for the dynamic growth and increasing popularity of video games among consumers in the entertainment market.

The video game industry, while relatively young at 54 years since the introduction of the video game as a commercial product in 1971 (Wolf, 2017), is simultaneously one of the fastest-growing segments in the media and entertainment market. The industry remains an industry bright spot with the global video games market exceeding the movie and music industry combined (pwc.com). The global player base is projected to reach 3.6 billion in 2025 (+4.4% YoY), representing 61.5% of the world's online population, while the total global revenue is expected to reach \$188.8 billion in 2025 (+3.4% YoY) (2025 Global Games Market Report). By 2029, revenue could approach \$300 billion (+5.7% YoY) (pwc.com).

For comparison, global revenue in the music industry is estimated to reach only \$29.6 billion in 2025 (Rechardt, 2025), and revenue in the film industry is projected at \$56.37 billion (boardroom-business.com).

It is worth noting that the results achieved by the video game industry over recent years are all the more impressive when considering that it shares more than a few economic drivers (including high and increasing production and marketing costs, strongly seasonal patterns, long development cycles, and hit-driven economics) with other entertainment segments. Additionally, to fully understand how the video game industry has been able to develop so dynamically, it is necessary to mention the two eras in which disruptive consumer technologies were introduced (Van Dreunen, 2020).

During the first period (1984–2008), product-based revenue represented the largest source of income for all entities in the industry. In this model (known as traditional game publishing), publishers sold physical discs and cartridges through retailers to consumers, who primarily played on consoles. This was the dominant form of monetisation for the first three decades. Due to steadily rising game development costs, this model became heavily dependent on the market launch of hit productions. Consequently, this led to a relatively high rate of market consolidation, with key entities controlling the majority of the market (Van Dreunen, 2020).

The second period (beginning roughly in 2009) was closely linked to the widespread adoption of the Internet and the general digitisation of entertainment. This shift consequently enabled the development of video games as a service (networked game publishing). The value chain in this instance is entirely different from the first era: the consumer can download the game directly from the network onto their device (mobile, console, PC). Once in the game, they can then make payments for additional content and in-game items. Following this change, a multitude of new market entities emerged, which began offering video games cheaply or entirely for free (F2P), and subsequently monetising them through so-called microtransactions - MTX (Van Dreunen, 2020).

As a consequence of these industry changes, video games are now an easily accessible experience: often available for free, quick and easy to install, and not requiring high hardware specifications. Successful examples in this model (including games like League of Legends or Fortnite) clearly point to the immense importance of building long-term relationships with the player base (e.g. through numerous events and tournaments). The Games-as-a-Service (GaaS) model itself remains almost in full opposition to the model used in the first period because it emulates the software industry, allowing for ongoing iterations of a game. These iterations, in turn, compel publishers to continuously maintain servers, customer support, and constant marketing and sales activity. On the other hand, the video game industry has become free from the physical and logistical constraints that shaped it between 1984 and 2008, with the result that a large part of the entities operating under the first model gained additional digital distribution channels (Van Dreunen, 2020).

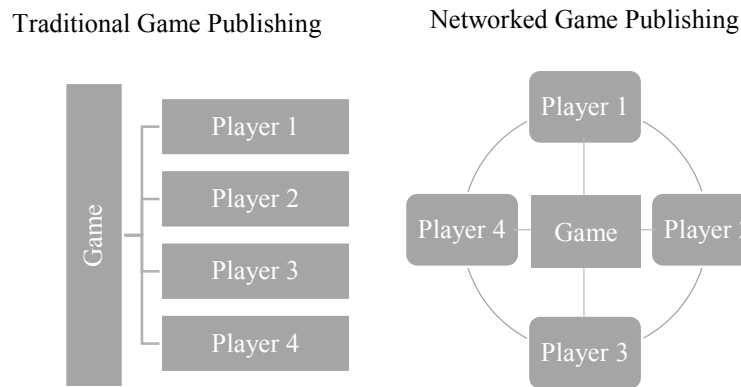


Figure 1. Traditional and networked game publishing.

Source: Van Dreunen, 2020.

Regarding the shift in business models within the video game industry, it is also important to note that the change towards GaaS not only brought numerous success stories for new market entities (including Tencent, NCSoft, Nexon, and HoYoverse) but also opened the door to controversial solutions in the realm of Pay-to-Win (P2W). The term "Pay-to-Win" is relatively often criticised by players themselves, as it signifies the ability to gain an advantage in a video game through dedicated microtransactions (e.g. loot boxes or other paid bonuses that give a player an edge over others). Consequently, P2W has also become the subject of numerous academic publications in recent years, which emphasise, among other things:

- pay to win microtransactions may change “the game from a competition where the best player wins to . . . who wants to and can pay the most” (Heimo et al., 2018),
- attitude toward virtual goods and the beliefs about peers’ attitudes strongly increase the willingness to purchase virtual goods (Hamari, 2015),
- the need for continuous research into loot boxes, which, given the complexity of the issue, should be conducted particularly using qualitative research methods (McCaffrey, 2023).

Based on the aforementioned articles regarding the use of MTXs, it can be assumed that contemporary commercial success in the video game industry depends on the skillful balancing act between company profit and player satisfaction.

However surprising the statistics cited above may be, it must be noted that as early as the mid-1990s, the first scholarly opinions emerged regarding the potential future significance of the video game industry, which, it was predicted then, should become a leader within the entertainment and media market (e.g., Shuker, 1996). Contemporary research, almost 30 years later, confirms that video games are playing an increasingly important role in the lives of people, especially those born after 2000 (Bu, Ding, 2024). Moreover, the time spent using video games had grown significantly after the COVID-19 pandemic (Lewicki, 2020; Romanowski 2020; Pallavicini, Pepe, Mantovani, 2022). Despite the fact that the call for serious consideration of research in this area emerged as early as 2004, when Newman (2004) identified

at least three key arguments supporting video game studies - namely: the size of the video game industry, the popularity of video games, and video games as a prime example of human-computer interaction - it is only recently that the associated research has been properly taken as a consequential form of visual culture worthy of historical, theoretical, and cultural attention (Murray, 2023).

2.2. Psychological and Sociological Contexts of the Video Game Player Experience

Contemporary video games are capable of providing players with extraordinarily elaborate experiences. The sources of these experiences can be highly diverse and are strongly linked to the players' motivation to continue playing a particular video game. As early as the mid-1990s (Bartle, 1996), an attempt was made to define how varied these motives can be, based on the inter-relationship of two dimensions of playing style: action versus interaction, and world-oriented versus player-oriented. Considering these dimensions, four player types were identified (Fig. 2):

1. **Achievers** who regard points-gathering and rising in levels as their main goal, and all is ultimately subservient to this, they are interested in doing things to the game, i.e. in **acting** on the **world**,
2. **Explorers** who delight in having the game expose its internal machinations to them, they are interested in having the game surprise them, i.e. in **interacting** with the **world**,
3. **Socialisers** who are interested in people, and what they have to say, they are interested in **interacting** with other **players**,
4. **Killers** who get their kicks from imposing themselves on others they are interested in doing things to people, i.e. in **acting** on other **players**.

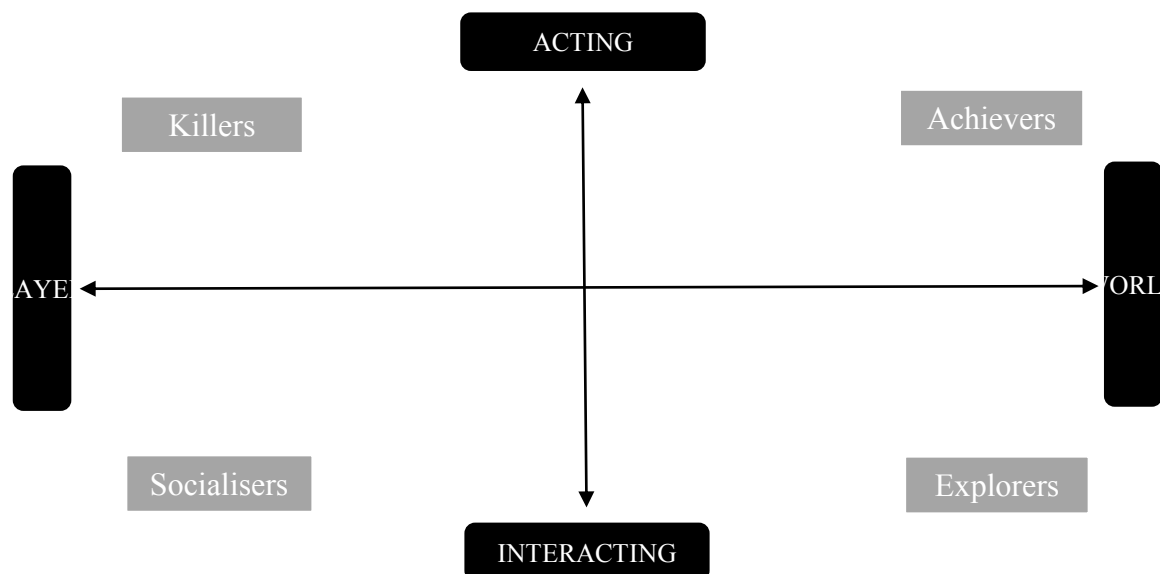


Figure 2. Basic types of video gamers based on their preferred playing style.

Source: Bartle, 1996.

This typology can provide a framework for the strategy of creating a new video game, depending on the creators' preference regarding the type of player they aim to attract. However, Bartle (1996) emphasises that regarding the number of each player type within a given game, an appropriate balance is desirable. This balance is crucial because the commercial success of the video game depends on it.

Research into the psychological and social context of video game player experiences continued in subsequent years, often using the aforementioned player typology as a foundation. Its development included the statistical analysis of five factors (Yee, 2006) that motivate players of Massively Multiplayer Online Role-Playing Games (MMORPGs), specifically:

1. **relationship** - the desire to form meaningful, supportive relationships with other users and the willingness to disclose real-life problems,
2. **manipulation** - the tendency to objectify and exploit other users for personal gain and satisfaction, including cheating, harassment, and dominating,
3. **immersion** - enjoying the fantasy world and being "someone else" a fondness for storytelling, and creating avatars with elaborated backgrounds consistent with the video game's lore,
4. **escapism** - using the virtual world as a way to temporarily avoid and escape from real-life stress and problems,
5. **achievement** - the desire to gain power and influence within the virtual environment by accomplishing goals and collecting items that bestow this power.

In a subsequent study concerning video game player motivation, the authors (Ryan, Rigby, Przybylski, 2006), aiming for a more general picture (i.e. detached from a strictly defined, single type of video game), highlighted the need to reference widely established theories of motivation in the literature, such as Self-Determination Theory - SDT (Deci, Ryan, 2013). Through a series of four distinct studies (referencing four selected game types), they found, among other things, that the ultimate influence of games on well-being does not have to be inherently negative, but rather depends on whether the gameplay itself allows the individual to satisfy their psychological needs. Moreover, when a video game fulfilled these psychological needs, and when its control system and mechanics were intuitive enough for the player to focus on the action rather than the technical aspects of operation, the highly desirable phenomenon of immersion (i.e. being fully absorbed in the game world) occurred. From a developer's perspective, inducing the player into a state of immersion often constitutes a key objective in the evolution of video games. From the players' perspective, this state can be described as optimal experience. Csikszentmihalyi (1990) defines such an experience as a state where the person feels a sense of exhilaration and a deep sense of enjoyment that is long cherished. Such a state does not come through passive, receptive, relaxing times but usually occurs when a person's body or mind is stretched to its limits in a voluntary effort to accomplish something difficult and worthwhile. The concept of immersion can be equated with the concept of flow state (Michailidis, Balaguer-Ballester, He, 2018). Within both phenomena, players report

feeling, among other things, increased concentration, loss of time perception, and loss of self-awareness (Brown, Cairns, 2004). It is worth noting that a player's deep engagement with the video game world may also depend on the level of control over the character in that game, including the possibility of making decisions with a real impact on the character's fate. This emotional and temporal investment appears to be the strongest motivation that drives a player towards perseverance and the pursuit of mastery in the game (Gee, 2003). Additionally, the influence of technology itself on a player's ability to achieve a state of immersion cannot be overlooked, including the potential application of VR technology (Slater, Sanchez-Vives, 2016). This is especially relevant given the fact that the VR games market is experiencing a resurgence due to more affordable hardware and software, more high-quality content, and ties with the metaverse (Knezovic, 2025).

It should no longer be debated today that games have the potential to yield both psychological harms and benefits to players (Ryan, Rigby, Przybylski, 2006). Moreover, the long - dominant stereotype of video game players - who were often caricatured and associated with negative connotations (e.g. unpopularity, unattractiveness, idleness, and social incompetence) - lacks full empirical confirmation (Kowert, Festl, Quandt, 2014). As demonstrated by an extensive study covering a group of 2,550 individuals, most stereotypical traits correlate more strongly with individuals deeply engaged in online games (i.e. a narrow subgroup of players) rather than with all video game players. There is thus an empirical basis for a unique stereotype, but only in reference to this specific subset of players. Consequently, publications increasingly appear in the literature pointing to the positive aspects of video games (e.g. Johnson et al., 2013; Granic, Lobel, Engels, 2014; Bowman, Rieger, Lin, 2022). A player's reception of a given video game will always depend on many variables that make up their profile. However, in the context of player well-being, particular significance has been attributed to variables such as: motivation for gaming, outside variables and the presence of violence, social interaction, and physical activity (Halbrook, O'Donnell, Msetfi, 2019).

It must be emphasised that the psychosocial context of video game player experiences, as presented in this section of the article, and the understanding thereof, constitutes an essential element for the interpretation of the qualitative findings of the author's own research.

3. Data and method

Primary research was conducted to create a multidimensional portrait of the video game player. In the process of the research performance, the grounded theory methodology was used. Qualitative studies were performed using the method of individual-in-depth-interviews (with elements of observation). They were followed by semi-structured interviews and field note-taking. The interview scenario was the measurement tool. The following research

problems were distinguished: attitudes of the respondents towards video games, perception of the typical gamer, reasons for playing video games, expenditure on and in video games, preferences and engagement in video games, the future of video games. This study was conducted for 1 month in 2025. The exploratory nature of the research necessitated the adoption of a purposive sampling criterion in order to ensure the broadest possible representation of players, especially in light of data suggesting that typical gamers tend to be males, rather introverted, and younger – i.e. under 30 years old (De Grove, Courtois, Van Looy, 2015; Ribeiro, Veloso, Brinson, 2023). The main criteria for selecting the respondents to the sample were being an active video game player; furthermore, in the selection of the sample, the aim was to obtain the broadest possible representation in terms of age and a roughly equal representation in terms of gender.

A total of 21 individual interviews were conducted. 10 women and 11 men participated in the study, the youngest person was 19 years old, and the oldest person was 50 years old. Five of the interview participants were of a nationality other than Polish. The characteristics of the people participating in the study are presented in table 1 (see: Annex). It is worth noting that the respondents had varying levels of knowledge regarding the meaning of popular video game acronyms (such as P2W, F2P, PVP, and PVE); furthermore, most of them were interested in video games and played on a daily basis, and they also had clear preferences regarding the platform on which they played video games.

The analysis of the content of the collected material was performed according to the principles developed by Miles and Huberman (1984), with the use of the descriptive, attribute and process coding of statements in accordance with Saldana's recommendations (2021). QDA Miner Lite software was used in the data analysis.

It should be added that the research was prepared and implemented in strict adherence to ethical standards. The primary concern was to ensure that participants suffered no psychological harm as a result of their involvement. They were fully informed about key aspects, including voluntary participation, the methods of observation and registration used (covering both verbal statements and electronic documentation), data protection and privacy (guaranteeing anonymity), the method of publishing the results, and the commitment not to use the data for commercial purposes (Malhotra, Miller 1998).

4. Results

4.1. Conceptualisation of Video Games and Their Perception

In the process of conceptualising the term "video games", participants were first asked to provide their spontaneous associations related to video games and compare them with other forms of entertainment such as books, films, or music. Several recurring motifs and similarities were observed in the participants' statements. Most individuals treat video games as a way to spend free time, relax, or de-stress. Phrases that appeared relatively frequently in their statements included: *free time, entertainment, rest, a break, a way to de-stress* and *killing time*. A portion of the respondents explicitly pointed to video games as a method of relaxation, particularly after work, for instance: *when I am exhausted after work, I prefer to turn off my brain with a game* (res. 12).

Based on the collected interviews, it can be concluded that the interactivity of video games constitutes one of their most significant distinguishing features when compared to other forms of entertainment. Participants indicated that video games allow players not only to participate but also to decide and create within the game world: *the game allows you to go through worlds, the mind doesn't work so intensively; in the game, you decide the scenario, there is a feeling that you are a co-creator of that world, and that is cool* (res. 21). For some, it is even considered an art form because it combines elements of music, film, and literature: *in a game, you have both the image and the sound and the plot, and on top of that, interaction, and that makes it my favourite form of art* (res. 10).

When comparing video games with other forms of entertainment, respondents most frequently referred to books. On the one hand, they emphasised that books are a *more valuable way to spend free time* (res. 17) and simultaneously more mentally developing: *For video games, it's different compared to books (books are made to imagine, make our brain work) in video games, it's the scenario of the developers. We only control a part* (res. 7). On the other hand, there were also statements indicating video games as the preferred form of entertainment over books: *[I]...don't find any joy in books or movies whatsoever, like books and video are fine, but there's absolutely no point to them, whereas in video games, you actually have something to work towards* (res. 19) and *I don't read books much, I can't get into them, and playing games is a relief/break for me* (res. 8).

Furthermore, some participants highlighted the social aspect of the video game experience: *I always play video games online, they allow me to get to know more people compared to reading books or watching television* (res. 5) or *I love the social side of video games* (res. 7). It is also noteworthy that when asked about their associations with video games, participants often described their memories or emotions related to playing. They were able to name specific game titles, for instance: *when I remember Final Fantasy 7 from high school, my jaw dropped and I was blown away* (res. 10), *The first association with video games is a console and,*

for some reason, Angelina Jolie's face from years ago, square-ish [the game Tomb Raider] (res. 8), or Prince of Persia, spending free time, and Super Frog, comparable to other forms of entertainment, but more engaging, it's hard to pull yourself away when you're passing a stage (res. 18).

In summary, the analysis of participants' spontaneous associations shows that video games are evaluated in a differentiated manner and evoke both positive and negative feelings. Moreover, a clearly ambivalent attitude towards this form of entertainment was observable in some of the respondents' statements: *...I think games can be developmental, but you have to be careful not to get hooked, because once you start, you can sit there for 3-4 hours* (res. 14), *Fun and rest. I believe they can be quite manipulative, in terms of behaviour, social and financial understanding* (res. 6) and *It's definitely entertainment, but it's decidedly less developing and imagination-stimulating than other forms, especially a book* (res. 15).

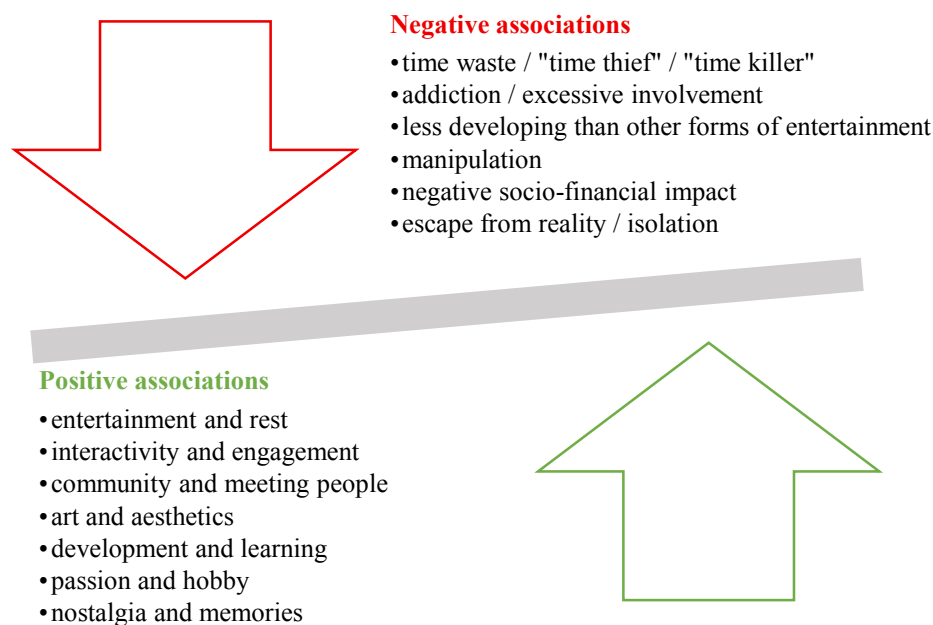


Figure 3. Ambivalence in Spontaneous Associations with Video Games.

Source: Based on Own Research.

4.2. Perception of the Typical Gamer

In the conducted interviews, participants were asked for their opinion on the typical video game player (i.e. the perceived image/stereotype). In the original version of the interview script, this question was directly aimed at the respondent, asking them to describe themselves as a video game player. Unfortunately, during the testing of the script, it turned out that this question caused the participants too many difficulties, and as a result, this form was abandoned in favour of a more indirect approach.

Based on the collected statements, three approaches to perceiving the typical video game player can be presented:

1. Negative Perception.
2. Positive Perception.
3. Normalising Perception.

The first approach shapes the image of the typical gamer through the lens of negative social and physical traits. The typical gamer was relatively often associated with the word *nerd* by the participants. It is worth noting that this word, according to the dictionary definition (Cambridge Dictionary), carries both positive (“a person who is extremely interested in one subject, especially computers, and knows a lot of facts about it”) and negative associations (“a person, especially a man, who is not attractive and is awkward or socially embarrassing”). However, for the respondents in this group, considering especially the tone of the statements, the word was associated exclusively negatively: *First thing, a nerd, even though I don't actually believe that because it's not really true* (res. 3), *The first thing that comes to mind is what has been adopted in society, which is a nerd, 'I'm gonna play a game,' 90% of society will tell you that* (res. 10). Other individuals noted that the typical gamer is someone who is rather lost and detached from the real world, and quickly succumbs to negative emotions: *For me, a gamer, gamer, is a person who is lost in the world of games, not interested in the real world, I don't have good associations, often irritating, annoying, rather negative [association]* (res. 2). The typical gamer was more frequently perceived as an introverted person: *An introvert, a person who prefers to live in an unreal world rather than the real one, plus a person who doesn't have much of a private life, so they escape into the virtual one* (res. 12), rather than an extroverted one, and requiring specific conditions for playing: *Dark room and controller, eh, usually loud or extroverted, stay up late, dark rooms, monitors, LED lights, controller*. One of the strongest statements fitting the negative perception of the gamer came from a person who completely abandoned playing video games at the beginning of 2025 after 7 years of continuous playing: *A loser, I hid myself with that game for so long, my resignation also stemmed from that, I didn't want to boast about it...* (res. 21). Interestingly, later in the same statement, this respondent had a completely different opinion about players participating in games other than video games: *...if I had to give a second association, if we were talking about traditional [games, e.g., board games, card games], it would be a person with passion* (res. 21). It can be assumed that, according to the respondent, such games hold significantly greater value than video games. Similarly, another respondent held a strongly negative opinion, especially regarding players who had already reached adulthood, emphasising the importance of maintaining a certain balance between gaming and other activities: *Thinking of such dedicated gamers, to me, it's kind of a person who has no life, no social contacts, no responsibilities - it's okay in the teenage years, but as an adult, it's not serious; if someone plays from time to time and it's intertwined with other activities, then it's okay* (res. 17). Additionally, it is worth noting that individuals with negative associations with video game

players were simultaneously more inclined to describe such a person through the lens of their appearance and surroundings: *Young, a boy, unshaven, surrounded by various dirty glasses and dishes, 40-year-old men plus, who have a lot of money for these games and play all night* (res. 15), *Rather glasses, longer hair, unkempt, hard to say...* (res. 14), *I associate it more with a man than with a woman, less frequently [with a woman], someone in the 15-30 age range, rather introverted* (res. 16).

Respondents most frequently identified the positive image of the video game player with someone who is ambitious and stubbornly pursues goals: *...stereotypical gamers, stubborn people striving for a goal, for finishing the game...* (res. 1), *Determined, ambitious, cognitively curious – seeking interesting things* (res. 9). Furthermore, the commitment of typical gamers and their desire for competition were also highlighted: *Committed, I would say competitive* (res. 6), *Good equipment [gaining good in-game equipment as an expression of commitment] and the desire to play as soon as the person has time* (res. 7). One of the study participants described herself as a gamer precisely through the lens of the aforementioned traits: *I am quite a competitive player, especially in MOBA-type games. I play Dota 2, Mobile Legends, and League of Legends, and I always strive to achieve the highest rank or MMR [a system used in player rankings] I can reach or maybe even make it to the top of the leaderboard* (res. 5). In addition, positive associations referred to perceiving gamers as video game enthusiasts: *...a computer gamer is a computer game enthusiast, there are many types of gamers, for one, in-game achievements will be important, but for me, that doesn't matter at all* (res. 10), for whom games constitute a hobby: *...hobbyist, a game lover* (res. 18).

In the statements normalising the perception of video game players, respondents attempted in various ways to emphasise that a video game player is just like any other person. They pointed directly to a lack of prejudice towards gamers, sometimes with unconcealed surprise that a specific individual turned out to play video games: *...lack of prejudice, I've seen many different people who play, and I wouldn't have expected it from them* (res. 20), *...stereotype is a stereotype, I know people who play, and I would never have thought that they spend so much time on games* (res. 14). The gamer was perceived as a normal person, and the diversity within the social group of video game players itself was also highlighted: *A typical person... I don't associate them with any bad things, a normal person who sometimes plays games, but there are also hardcore people who play for 20 hours* (res. 13), *To me, they are normal people, I don't know if there is any type, there is no type for me, I am more of an occasional player, my husband is a gamer, who plays completely differently than I do, my brother is also a completely different gamer, I know few people who don't play at all* (res. 8). The final group of statements in this segment consisted of assertions regarding the non-existence of a typical video game player: *There is no typical player... everyone will tell you something different* (res. 1), *there is no typical player in my opinion* (res. 11), or a lack of interest in the subject: *A gamer, I'm not very interested in other players or what they represent* (res. 4).

4.3. Reasons for Playing Video Games

Based on the conducted interviews, several main reasons for participants engaging with video games can be identified. Importantly, these reasons clearly correspond with specific needs that can be fulfilled through the product that is a video game (Fig. 4.).

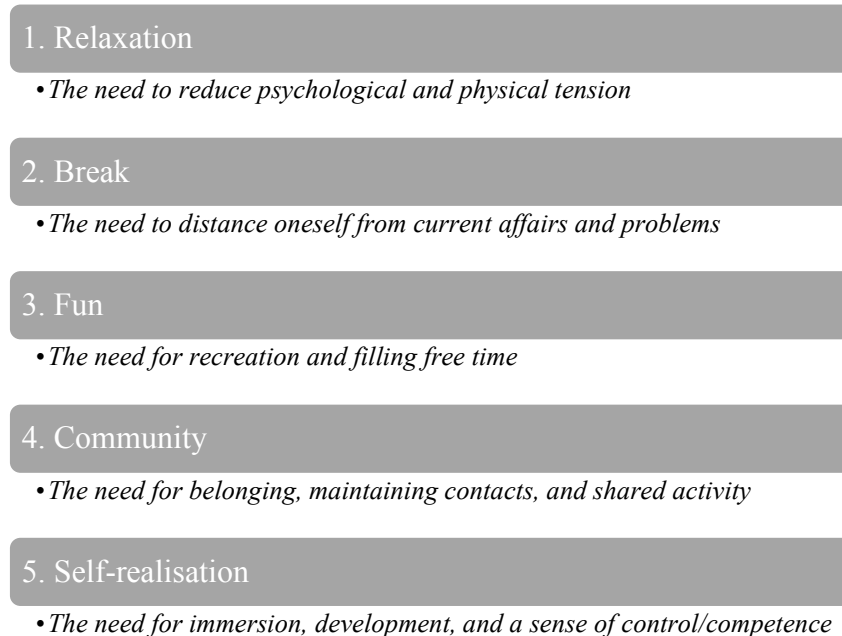


Figure 4. Frequency of Main Reasons for Video Game Use Among Participants and Their Corresponding Needs.

Source: Based on Own Research.

The relatively most frequently cited reason was relaxation, which respondents identified with rest: *I rest while playing games, even though I work all day as a programmer, for entertainment, every day, unless I'm on vacation, I don't have a computer, or access* (res. 1), and de-stressing: *...to relieve some stress after work...* (res. 11). It is worth noting that the specific game title may be significant in this context. One respondent pointed out that a game can produce the exact opposite of the intended effect: *...for relaxation and pleasure and rest, well, unless it's FIFA [a football game with online competition], then no, because it unleashes aggression* (res. 18).

Video games undoubtedly constitute a way for participants to break from reality: *escape from worries* (res. 21), *...because I need to switch off for a bit...* (res. 13), or what is referred to as a reset: *after an influx of information at work, I need to clear my mind, I try to reset myself and switch off from work* (res. 12), *the desire to turn off my brain, it's definitely easier for me than starting a series or a movie...* (res. 14), *when I want to reset, with games like a zombie staring at the screen, sometimes I need it, but I'm too tired* (res. 15).

It should not be a major surprise that fun was also cited as one of the main reasons provided by this product: *...it gives me joy when I'm bored* (res. 13), *...to have fun...* (res. 6; res. 11), *...Bananza [a game on Nintendo Switch 2] is fantastic...* (res. 8).

Respondents repeatedly emphasised the social aspect of video games in this topic as well: *...the social aspect and playing with friends are important...* (res. 9), *...the desire to play with someone, then I will choose a game even if I have started a book* (res. 2), *...because I really like the game community* (res. 7), *...[to] have fun with friends who live in different countries* (res. 11), *...for the people in it... lead my alliance, and speak to my friends...* (res. 19).

Furthermore, during the interviews, the possibility of self-realisation through video games was highlighted. Self-realisation was perceived in a variety of ways and was identified, among other things, with adventure, plot, or engaging with art: *For adventure, for the plot... for engaging with art, I like games that are beautiful, with nice music...* (res. 10), testing new strategies: *since I am part of a competitive team in Mobile Legends, practicing and trying out new strategies is part of my responsibility as a pro player* (res. 5), a sense of control (res. 11), or even the desire for revenge: *...to get revenge...* (res. 19).

In summary of the analysis regarding the primary reasons why respondents turn to video games, it must be emphasised that they very often cited several different reasons simultaneously in their statements. Nevertheless, taking a more holistic view, it can be concluded that entertainment in the broadest sense was the dominant element for the interview participants in this aspect.

4.4. Expenditure on and in Video Games

Analysing the respondents' answers regarding the scale of expenditure on/in video games, four groups of players can be identified:

1. **High Spenders:** Uncontrolled expenditure.
2. **Moderate Spenders:** Reasonable expenditure.
3. **Low Spenders:** Occasional expenditure.
4. **Non-Spenders:** No expenditure at all.

In the first group of players, attention is drawn not only to the extreme sums cited by some participants as having been spent within just one video game (these were mobile games) but also to the way they described this expenditure i.e. by emphasising a lack of control: *Yes, I buy PS5 games occasionally, but I spend a lot within Age of Empires Mobile (over 10000 US dollars), much more than I should, we can even say in a somewhat uncontrolled way* (res. 6), justifying the size of the expenditure: *Yes I spend some money on games, but depends on the type of games I played, like for Mobile Legends I spent already 1500 US dollars, but I don't spend it every day or week or month it's just a total spending I have done* (res. 5), or openly admitting that the scale of these expenditures is worrying: *My spending on games is terrifying, sometimes in games, on packs in FIFA [an implemented loot box system in FIFA]* (res. 18).

The largest group among the study participants (i.e., 9 individuals) consisted of those who spent money on/in video games in a reasonable manner. Representatives of this group often highlighted various issues related to this matter in their statements. For example, one respondent

clearly and immediately expressed their negative, uncensored attitude towards any form of micropayments in games: *I despise micropayments, unless it's DLC in Forza [the game Forza Horizon 5] – a car pack, you get something concrete for it, it's not some skin or crystals that speed up your game, I don't give a f*** about micropayments, to put it crudely...* (res. 1). In the next interview, the importance of the social aspect of video games in the context of expenditure was emphasised: *I don't spend too much, it depends on several factors, I play for companionship, I often buy a game because friends buy it, it's just a few titles a year, I sometimes spend money on microtransactions, but very small amounts, in F2P games to honour the creators, and very rarely, I spend reasonably, not much* (res. 10). Another respondent was able to precisely define the acceptable scale of these expenditures for himself: *On games, yes, I try not to buy games for \$100, the range of \$20-30 per game is okay, I am willing to spend a small amount, 3.80 PLN [i.e. ≈\$1] for some cosmetics would be okay, I'll spend up to 20 PLN [i.e. ≈\$5], but I don't need to spend more* (res. 9). A large portion of the representatives of this group also used phrases emphasising the rationality of their spending, e.g. *...I spend responsibly...* (res. 14), *...I wait for promos...* (res. 12), *I'm spending a moderate amount each month* (res. 11), *Reasonable...* (res. 20), etc.

In the group of individuals who spend sporadically and small amounts, one respondent noted that the character of these expenditures directly results from the fear that one might spend too much money: *It happened that I paid in a game on my mobile phone, but I don't remember; if I get too hooked on a game, I delete it because I'm afraid I'll spend my entire salary there, recently I bought something on Nintendo on sale for 4 PLN [i.e. ≈\$1], very sporadic expenditure* (res. 8). Another person, however, noted that despite avoiding in-game payments and having a negative attitude towards this form of video game payment, expenditure in the game may be justified by the desire to support the creator: *In games, I'll be honest with you, no. Once there was a game about taking care of kittens, I'll support the creator because it was free, otherwise I don't spend money in games, I think it's poor, I often use Game Pass, I spend very little* (res. 13). Seeking justification, or even more so, an excuse for the decision to buy a video game was a common characteristic of statements on this topic - even despite the sporadic nature and relatively small amount of money: *Sporadically, a maximum of 20 PLN [i.e. ≈\$5] per month, I rather try not to, I excuse myself with the fact that I didn't buy magazines or other things that could serve for entertainment, and here I could spend a few PLN once* (res. 17).

The last group consisted of individuals who spent nothing or amounts close to zero. In some cases, the statements were very brief: *Nope, no spending whatsoever* (res. 19). In other cases, the expenditure was only incurred by the player at the beginning of the game, resulting from their adopted financial discipline before starting it: *...the assumption was that I wouldn't spend, I watched ads not to spend, I bought a starter pack* (res. 21). Another person, in turn, emphasised that game purchases are most often made by their life partner: *I generally don't spend on games, sometimes I happen to buy one, but it's a negligible amount over the year, buying one game is the maximum, usually my partner buys them* (res. 2). An interesting

statement within this group was the confession of a person who stressed that they are still trying not to succumb to the temptation of spending money on video games: *No, but I am tempted sometimes, extra lives and saving time, I still haven't broken* (res. 16).

To conclude the topic of expenditure on/in video games, based on the collected statements, it is necessary to highlight the relatively strong polarisation of attitudes and actual spending on/in video games. Differences were visible in the scale of expenditure (high vs. none), the manner of spending (lack of control vs. control), and the focus of the spending (game purchase vs. in-game purchase). Furthermore, there were also statements that were difficult to definitively classify into one of the four groups distinguished above. An example is a statement that would allow the individual to be classified into both the first group (high expenditure - lack of control) and group 2 (moderate expenditure - control): *I spend, in my opinion, too much, because I shouldn't, and I noticed that if you pay once, later you are not able to get through without it; I bought a few games on Nintendo, but those aren't even 200 PLN [i.e. ~\$50] annually, I wait for promos* (res. 12). In relation to the quoted statement, it is also worth noting that the respondent had issues with expenditure control regarding in-game payments (mobile games), but was able to maintain control over the purchase of full game versions (Nintendo games). This observation is consistent with the previously cited statements, where extremely high expenditure amounts were linked to mobile games, as was the accompanying sense of guilt observed during the interview.

4.5. Preferences and Engagement in Video Games

Based on the conducted research, it can be stated that respondents generally had clearly defined preferences regarding video games. With the exception of one respondent who stated that: *If I like a game, I want to smash it, get all the achievements... but I don't have a favourite genre, it's like with music, good music defends itself, and it's similar with games* (res. 1), the participants were able to indicate their favourite video game genre and title. Respondents also specified the game title they were currently playing and identified the video game title they had played for the relatively longest period, considering their overall experience with the product.

It is worth citing one statement that highlighted the issues of time management when there is too much involvement in video games: *...[I have] quit all of them to make time for Call of Antia actually... running three accounts and managing an alliance isn't easy* (res. 19). This situation forced the participant to give up playing other titles.

Equally interesting is the statement: “Legion TD, for me, it's not so much playing as it is a time filler, in that sense, I'm not playing anything, I'm just running a round here and that's it...” (res. 1). In this quote, the participant clearly indicated that a kind of distinction is possible between what can be understood as actual video game playing. For this respondent, 'playing' involved significantly greater commitment (primarily temporal) than merely “running a round”.

There are numerous reasons why a particular genre or video game is designated as a favourite by a respondent. Such a reason might be an entirely new approach to game mechanics solutions: *I have this one beloved game for many, many years, Black and White 1, when it came out it was a pioneer of the genre, a bit of economy, you are God there and you manage the world...* (res. 2). A video game might be cited as a favourite due to a positive attitude towards a specific publisher (e.g., Nintendo games) or the unforgettable impressions derived from engaging with the game environment, which in this case could faithfully recreate a real location: *Everything by Nintendo, Zelda and Mario and Bananza is also fantastic, Assassin's Creed, the one who ran across the roofs in Venice... I could walk through those cities without a map, I love it when there is a collecting element, I remember that square was very well reflected, Florence was similarly great too* (res. 8). The reason for designating a video game as a favourite can also be a specific sentiment, e.g., a memory related to it being the first video game one played: *I definitely like fantasy the most, I have the greatest weakness for Diablo 2, the first game I played...* (res. 13), or in the case of a relatively younger gamer (23 years old), the desire to continue playing a game that one of their parents previously played: *...I remember when Dad played World of Warcraft, I took over the account and I'm still playing* (res. 14). Finally, such a reason can also be the existence of a challenge within the video game: *Tactics and strategy, roguelike, because there is a challenge* (res. 9), *my best was hitting the opponent, exploring the world independently is also interesting, but still player vs player, I liked wars the most* (res. 21).

Considering the respondents' answers in this part of the interviews, it must be emphasised that the range of favourite genres and titles was highly diverse, covering RPG (Role-Playing Games) as well as strategy, puzzle, simulation, and sports games. The responses from participants regarding the game with which they spent the most time were equally varied.

In some cases (including res. 1, 3, 4, and 18), participants, using access to their accounts on video game platforms (such as Steam or PSN), were able to state precisely how many hours they had spent on a given video game title: *Cyberpunk 2077 (1100 h), Forza Horizon 5 (1600 h), Hades (191 h)* (res. 1), *FC24 (380 h), The Witcher 3 (over 100 h), Elden Ring (over 100 h)* (res. 18).

At other times, they estimated roughly how long they had been playing a particular game, referring not so much to the exact number of hours spent in the game, but to how long they had been regularly engaged with it. In the case of starting a video game on the day of its global release, this time can reach up to 20 years: *I still play World of Warcraft, so that's 20 years with breaks, about 5 years of breaks total, I started 2 weeks after the release* (res. 10).

Beyond commitment measured in years, some participants also simultaneously mentioned the time spent in a single, uninterrupted session with a game. Respondents often experience a complete loss of time awareness during individual video game sessions (immersion state): *Candy Crush Saga, recently I got a bonus [because] I sat on my phone for 12 hours and didn't even know where I was when I stopped, I started Candy Crush Saga years ago, I don't remember*

when, 18 years ago, Farm Heroes Saga is the same (res. 12), GTA 5, one marathon was a good few hours, I think I didn't see the sun all day... (res. 20). Furthermore, it may happen that certain specific conditions must be met for a longer video game session to occur: *Empire and Puzzles, 7 years, the longest single session was 6 hours, that must have been somewhere without my wife (res. 21).*

The vast majority of participants, considering their previous experience, have completed at least one video game. A significant portion of respondents declare that they often or almost always finish story-driven games if they become invested in them: *I would bet that I finish 90% of games, unless I don't get hooked; I definitely finished The Witcher, I'll finish Bananza soon, I finished the Tomb Raiders, I practically always finish games, or I abandon them at the beginning (res. 8), ...recently I finish everything... (res. 18), Yes, many, Hogwarts Legacy, all parts of Fallout, I happen to complete all story-driven ones (res. 3).*

On the other hand, a large group among the participants admits that most of their time is spent on titles that are endless by nature, or they only finish short games: *...mostly I play games that don't have an ending, because they are usually online games, not single player (res. 4), Yes, often they are small tactical games, e.g., Inscription, a card game, I did all the achievements, I have it organised on Steam, most often they are short games... (res. 9), No, because I play that kind of game... and mobile games don't have an end (res. 15), the games I play now don't end, neverending story (res. 12), the video games I've played don't have ends, they're 'play everyday type' games, either that or a zillion lvls! (res. 19).*

The reasons why respondents abandon video games before reaching their conclusion are varied and can include:

- **So-called material fatigue:** *I don't usually complete long games because there is material fatigue, e.g., in The Witcher 3 I collect flowers in the first region and I can't move on because I want to buy all the weapons, etc. (res. 9).*
- **Loss of pleasure/challenge:** *FF7 I finished, Bullet Storm I went through twice in a row, the texts they were throwing around, what a stream of insults was going on, how the main character and the general were calling each other names, oh, that was funny. Out of the number of games I've played, maybe 2% I completed, because I play games as long as they give me pleasure. A good example is the Fallout series, I played until my build was completed, I was too strong, there was no worthy opponent, so why play, and for example, I stopped three-quarters of the way through the plot without regret (res. 10).*
- **Simple loss of interest:** *I lose interest quickly and I'm not a hardcore gamer... (res. 19).*

4.6. The Future of Video Games

The future of computer games in the short-term future (up to 5 years) elicits extreme opinions among respondents, concentrating around three main areas: 1. technological development, 2. social impact, 3. business model.

Many respondents predict significant technological progress, focusing on greater realism: *In the next five years, video games will certainly become more futuristic. As we know, video games are no longer played only with a keyboard and PC or just on game consoles, but with VR and AI technology, video games in the future will become more realistic and lifelike* (res. 5), immersion in the game world: *They must become more immersive Using hardware such as VR or AR systems* (res. 6), and the abandonment of physical media or the development of new university courses: *They will be more popular, they will completely move away from DVD media, everything will be more virtual, and there will be special university courses dedicated to games...* (res. 18). On one hand, participants show some optimism in this regard: *I think people like to play to detach from their reality, I think they will rather develop, it will move towards VR, and they will be doing very, very well for a very long time* (res. 13). On the other hand, the lack of time needed for the appropriate technology to develop was also emphasised: *I think they'll stay relatively the same, people have been blabbing about 3D video games for a while now, but no progress, lol, also, graphics don't improve within 5 years, that's too little time* (res. 19).

When discussing the future of video games, participants repeatedly raised issues related to the broad social impact of video games. A continued increase in the number of players and the significance of games as a form of spending free time is commonly predicted: *I think it will be one of the main entertainments. When I already see the scale it has gained in recent years* (res. 7), which, in their opinion, should be closely linked to the development of subsequent generations of gamers: *I think [video games] have a chance to be a more popular form of entertainment due to the generation that is growing up; my brother has a 10-year-old daughter, and she can play Roblox all day on the phone; as far as I can see these kids, it is becoming more and more popular, the success of various games proves this; it used to be harder to play, although the fact that children are bought a PS [PlayStation] for their First Communion also proves something* (res. 8), *Gamers will play more, they will spend more time on games, they are more likely to have more friends in games than in life; such a generation is growing up, 'playground climbing frames are going into oblivion* (res. 12). It is worth noting that these statements usually had a pessimistic tone: *Unfortunately, they will play more, the brains of young people will be corrupted; I already see with my younger child that the game wins over everything, less focus, less attention, because of the game* (res. 15), *It will develop, because as we have already established... society is getting dumber and will need increasingly simpler forms of entertainment* (res. 16). One participant, referring to their own example and one of the reasons they completely abandoned video game playing, pointed to the need for games to adapt to players' schedules: *...I'll tell you why I left games... [the game creators] changed the schedule, you couldn't speed up time, because I work, I couldn't freely adjust the time when I play; if games take into account the player's daily schedule, they will develop, but if they have a very rigid one, the player will have to adapt; people don't read books but play games, they want to participate in other worlds, in this respect they will develop* (res. 21).

The statements of participants who reduced the future of video games to issues related to the implemented business model had a distinctly negative tone. One respondent stated directly: *I don't predict anything good, I think big studios will fall, reducing gameplay to cosmetics and typical gambling psychology, loot boxes, skins, raffles, e.g., FIFA, typical P2W. Big studios will strive in this direction, hope lies in indie studios, small, independent ones, or CDPR* (res. 1). This pessimistic narrative was continued in subsequent statements: *...games are currently becoming and will continue to be increasingly poorly polished, less and less optimised, more MTX [microtransactions], and there will be more and more 'leftism' in them. I hope that in 5 years the situation will be fixed or this medium will only get worse and worse; the current state is already quite tragic, when games often serve as a money-making machine to squeeze money out of suckers and push propaganda* (res. 4) and *Looks pretty grim, with some rare exceptions, mostly money grab* (res. 11). However, hope is placed in the collapse of studios that are often responsible for introducing aggressive monetisation mechanisms into the gameplay (including EA Sports): *...I hope that these commercial studios like EA Sports will perish, but probably not because they are targeted at casual gamers...* (res. 10).

To conclude, while the majority of respondents agreed that the video game industry should continue to develop, the directions of this development were generally viewed through the lens of negative consequences. This was the case in two (namely, the area related to social impact and the one related to the business model) out of the three dimensions mentioned.

5. Discussion

The qualitative findings across the paper (Sections 4.1-4.6) demonstrate a consistent and profound correspondence with the established economic drivers (Section 2.1.) and the psychological and sociological frameworks (Section 2.2.) governing the video game industry. Player experiences, motivations, financial habits, and future expectations are collectively shaped by the unique economic models and underlying human psychological needs.

Addressing the economic and market dynamics (2.1.), the structural success of the industry, particularly the Games-as-a-Service (GaaS) model, is both validated and challenged by the research data. The perceived superiority of interactivity and the capacity for co-creation (4.1.) is the core technological factor driving the industry's dynamic growth, surpassing other entertainment sectors (Clark, 2003). This technological advantage is efficiently leveraged by the GaaS model, which uses motives like relaxation and escape (4.3.) to secure the long-term player retention necessary for continuous revenue (Van Dreunen, 2020). Expenditure patterns (4.4.) starkly illustrate the GaaS model's dependence on high-revenue players (so called "whales"). Extreme spending, often in F2P titles using loot boxes and P2W mechanics, confirms the financial efficacy of these systems. The "High Spenders" self-reported

"uncontrolled" behaviour and guilt align with academic concerns that P2W can be manipulative, exploiting player investment (Heimo et al., 2018). Conversely, the majority of "Moderate Spenders" demonstrate rational resistance, demanding tangible value and explicitly rejecting pure cosmetics, underscoring the necessity for publishers to balance profit with player satisfaction. Future predictions (4.6.) are heavily influenced by this economic landscape. The predominant pessimism regarding the business future stems from the belief that large studios will intensify their focus on "purely psychological gambling" and P2W. This perceived systemic flaw drives demand for alternative, less aggressive models from indie studios. Furthermore, the player demand for games that accommodate flexible daily schedules could be seen as an economic imperative; strict time requirements force players to adapt or quit, risking player retention crucial for the GaaS structure.

Turning to the psychological, motivational, and sociological frameworks (Section 2.2.), player engagement and perceptions confirm the validity of established motivational typologies and reflect the ongoing normalisation of the medium. The primary motives of fun, control, and escape are mechanisms for achieving the flow state (Csikszentmihalyi, 1990). The frequent reporting of the complete loss of time perception is the direct behavioural hallmark of this optimal experience. The desire for greater realism and immersion through VR/AR reflects a deep psychological demand to intensify this flow state and presence (Clark, 2003). The positive perception of the gamer (4.2.) - associating players with ambition and competitiveness - aligns with the "Achievers" and "Killers" types (Bartle, 1996) and the "Achievement" motive (Yee, 2006). This pursuit of mastery is evident in the preference for challenging genres and the tendency to quit games once the challenge is lost. The appreciation for the "social side of video games" confirms the significance of the "Socialiser" type (Bartle, 1996). The simultaneous existence of the negative stereotype and the normalising perception (4.2.) reflects a society in transition. The prediction (4.6.) that gaming will become "one of the main entertainments" and a primary social sphere underscores the medium's growing cultural dominance, confirming the shift noted in the literature (Kowert et al., 2014). Finally, the underlying ambivalence (4.1.) regarding developmental potential versus manipulative risk reflects the literature's conclusion that video games yield both psychological harms and benefits (Ryan et al., 2006). This tension is evidenced by the fear of excessive spending and the pessimistic social predictions (4.6.) that increased engagement will lead to cognitive decline.

Based on the synthesis of the study's findings (Sections 4.1.-4.6.) and their correspondences with the established literature (Sections 2.1.-2.2.), several critical and complex areas emerge as high-priority avenues for future research. These potential gaps primarily lie at the intersection of psychology, ethical economics, and changing social dynamics.

The most urgent research gap concerns the dynamic relationship between monetisation and psychological wellbeing, necessitating deeper, potentially longitudinal, studies focusing on the negative consequences of aggressive Games-as-a-Service (GaaS) monetisation. While the current study notes the ethical strain and the existence of "High Spenders" reporting

“uncontrolled” behaviour (4.4.), a specific quantitative and qualitative investigation is needed into P2W ethics and player attrition. This should explore how the perceived unfairness of P2W mechanics impacts the long-term engagement and satisfaction of the highly competitive “Achievers” segment, quantifying the balance point where P2W generates maximum profit without causing critical alienation and loss of this core player base. Furthermore, determining the precise psychological and behavioural mechanisms that cause the “Escapism” motive (Yee, 2006) to cross into harmful, uncontrolled spending (4.4.) is crucial, addressing the escapism vs. addiction threshold. This requires exploring the link between the frequency of the flow state (4.5.) and the compulsion to engage monetarily with microtransactions, using models like prospect theory (Tversky, Kahneman, 1992) or nudge theory (Thaler, Sunstein, 2009) for empirical testing.

The findings also suggest a fundamental shift in how players manage their time and friendships, necessitating research into the socio-cognitive impact of GaaS engagement models and the cognitive and social costs of continuous engagement. Further exploring the respondent concern regarding the rigid time demands of GaaS titles is warranted to assess the impact of GaaS on time management and stress. Research should quantify the impact of such schedules on player stress, work-life balance, and overall cognitive load, particularly for older players whose life demands conflict with “play everyday type” games (4.5.). Although the normalisation of gaming (4.2.) is widely observed, research should investigate the long-term implications of the predicted shift where individuals form more friendships online than in real life, focusing on the psychological costs of normalisation. This requires examining the quality and resilience of “Relationship” motives fostered primarily through virtual interaction compared to traditional social ties. A necessary exploration into why the negative stereotype (4.2.) persists despite massive demographic diversification, addressing stereotype resilience vs. real - world harm, should focus on whether the stereotype is sustained by observed societal anxieties regarding low attention spans and cognitive “laundrying”, thus linking a perceived social harm to the persistent cultural stigma (Kowert et al., 2014).

Finally, the high expectations for future technological immersion require focused research on consumer response to technological and design innovation and consumer readiness and adoption. While respondents express a desire for greater realism and immersion through VR/AR, research is needed to quantify the specific barriers (cost, required space, motion sickness) hindering mass adoption, addressing VR/AR adoption vs. investment barriers. This would inform the economic timeline for large-scale investment in the next generation of interactive hardware (4.6.). Given that interactivity is the core defining feature (4.1.), future studies should investigate how players define and quantify the “value” of this co-creation experience (Clark, 2003) versus the passive consumption of traditional media, which addresses defining the value of interactivity. This could provide publishers with non-monetary metrics for success that focus on intrinsic player satisfaction beyond financial return.

The limitations of the present study are directly inherent in the adopted qualitative research methodology and the principles of Grounded Theory. The research is fundamentally exploratory and qualitative in nature. Consequently, while the findings offer rich contextual detail and in-depth insights into the studied group's experiences, they cannot be extrapolated to the entire player population. It must therefore be stressed that the results represent a portrait of the investigated group rather than representative population data.

Furthermore, the generation of theory from data implies that the conclusions are context-dependent and subject to the researcher's subjective interpretation during the coding process. Crucially, all collected material relies solely on verbal accounts and field notes. This inherent reliance on self-reported data introduces a susceptibility to subjective distortion and the social desirability bias. This is particularly critical when addressing sensitive topics such as declared expenditures, the perception of stereotypes, and self-identified potential "psychological harm".

The limitations extend to the sampling and temporal scope. Although an attempt was made to secure the broadest possible age range (19-50 years) and include five respondents of a nationality other than Polish, this still constitutes a highly restricted cross-section. As a result, fine-grained analysis of cultural differences or precise age-based distinctions remains infeasible.

The selection criterion required respondents to be "active players". This indirectly excluded individuals who play sporadically, potentially leading to an overrepresentation of players with a strong "engagement" motive and omitting the perspective of those who use games as a marginal form of entertainment.

Finally, the study is a single-time analysis (cross-sectional). It is therefore incapable of capturing the dynamics of motivational change, the evolution of expenditure patterns, or the long-term impact of video games on the participants' lives.

Given all these inherent limitations, it is deemed relevant and necessary to conduct quantitative research as the subsequent stage of inquiry by the author of this paper, aiming to validate and generalise the generated qualitative findings.

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Appendix

Table 1.

Characteristics of the surveyed respondents

Res.	gender	education	age	nationality	frequency of playing video games	video game interest	I know acronym:				preferred platform
							F2P	P2W	PVE	PVP	
1	male	primary	36	Polish	every day	yes	yes	yes	yes	yes	PC
2	female	secondary	36	Polish	several times a week	no	no	yes	no	yes	PC
3	male	higher	36	Polish	every day	yes	yes	yes	yes	yes	PC
4	male	secondary	27	Polish	every day	yes	yes	yes	yes	yes	PC
5	female	higher	25	Indonesian	every day	yes	yes	yes	yes	yes	Mobile Phone and Console
6	male	secondary	30	Brazilian	every day	yes	yes	yes	yes	yes	Mobile Phone and Console
7	female	higher	36	Belgian	every day	yes	yes	yes	yes	yes	Mobile Phone and PC
8	female	secondary	34	Polish	irregularly	rather no	no	no	no	no	Console
9	male	secondary	41	Polish	every day	yes	yes	yes	yes	yes	PC
10	male	higher	40	Polish	every day	yes	yes	yes	yes	yes	PC and Console
11	male	secondary	30	German	every day	yes	yes	yes	yes	yes	PC
12	female	higher	38	Polish	every day	no	no	no	no	yes	Mobile Phone
13	female	secondary	34	Polish	irregularly	rather no	yes	no	yes	yes	PC
14	male	higher	23	Polish	every day	yes	yes	yes	yes	yes	PC
15	female	higher	38	Polish	irregularly	no	no	no	no	yes	PC and Mobile Phone
16	female	higher	46	Polish	every day	no	no	no	no	no	Mobile Phone
17	female	higher	37	Polish	several times a week	no	no	no	no	no	Mobile Phone
18	male	higher	39	Polish	every day	yes	yes	yes	yes	yes	Console
19	female	secondary	23	American	every day	yes	yes	yes	yes	yes	Mobile Phone and PC
20	male	primary	19	Polish	several times a week	yes	yes	yes	yes	yes	PC
21	male	higher	50	Polish	following seven years of daily engagement, the respondent ceased all gaming in early 2025	no	no	no	no	no	PC and Mobile Phone

Source: Based on Own Research.

SEMIOTICS OF SIGNS IN CONTEMPORARY GLASS FACADES APPLICATION OF APPLIED LINGUISTICS

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Purpose: The paper investigates the semiotic dimension of contemporary glass facades and defines their visual language through the perspective of applied linguistics. It aims to identify and classify the main graphic and linguistic elements — lettering graphics—used in glass architecture, and to analyze their communicative, cultural, and symbolic functions within real social and cultural environments.

Design/methodology/approach: The study applies a qualitative, interdisciplinary approach combining semiotics and applied linguistics. Case studies include public, educational, and cultural buildings featuring printed or coated glass facades. The research uses comparative semiotic analysis and interpretative visual analysis to examine how typographic and composition of construct spatial narratives and visual metaphors.

Findings: The results reveal that glass facades act as complex communicative systems integrating language, image, and material. lettering graphics - dominant visual elements—direct perception and convey meaning beyond aesthetic or functional purposes. The visual language of architecture operates analogously to verbal language through rhythm, metaphor, and structure, creating spatial discourse and identity.

Research limitations/implications: The research is limited to selected case studies in Europe and North America. Future studies should include diverse typologies and quantitative perception analysis to better understand user interpretation and cognitive response to visual communication in architecture.

Practical implications: The findings support architects and designers in integrating semiotic and linguistic principles into façade design. Understanding the communicative role of visual elements enhances clarity, identity, and narrative coherence in public architecture.

Social implications: The research demonstrates how glass facades contribute to social communication, cultural identity, and educational value. By embedding symbolic and linguistic signs, buildings can promote inclusivity and intercultural dialogue in the urban landscape.

Originality/value: The paper introduces a novel interdisciplinary framework applying applied linguistics to architectural semiotics. It expands the concept of language to the visual-spatial domain, offering a new perspective on architecture as a real communicative and cultural medium.

Keywords: glass façade semiotics; applied linguistics; visual language; architectural communication; cultural identity.

Category of the paper: Research paper.

1. Introduction

Contemporary architecture constitutes a complex system of visual communication (Barthes, 1977) in which meanings are constructed through spatial forms, materials, light, and image. Glass façades—owing to their transmissive and reflective properties—have evolved from structural components into communicative media and instruments for shaping the visual identity of places and institutions. In the context of rapid technological and cultural transformations, architecture begins to function as a language with its own grammar of forms, symbols, and meanings that the viewer can read and interpret.

This phenomenon becomes particularly significant in public spaces, where façades not only influence users through their function and form but also communicate—employing visual codes (Lipowicz-Budzyńska, 2021), textual elements, colours, and symbols embedded in their surfaces. Contemporary architectural projects increasingly use glass surfaces as visual interfaces that merge aesthetic, social, and technological messages. Graphics, text, and symbols applied to glass acquire the status of signs that direct the viewer's attention, construct spatial narratives, and shape perceptual experience (Wright, 2017).

This article seeks to define and describe the visual language of glass façades from the perspective of applied linguistics and semiotics. A linguistic approach enables the façade to be treated as a cultural text—a communicative structure in which signs, codes and organisational rules shape the message. Applied linguistics, which examines linguistic mechanisms in practical social contexts, provides a basis for interpreting contemporary architecture as a form of visual discourse. In this perspective, architecture not only reflects cultural processes but actively participates in them, becoming an integral component of public communication.

2. Methods

The aim of the study is to identify and analyse the elements that constitute the visual language of contemporary glass façades, with particular emphasis on their communicative and cultural functions. The objectives of the research are to:

- categorise letter-based graphics based on semiotic and linguistic analysis,
- develop their classification according to form and modes of visual impact,
- determine their role in shaping the visual language of architecture and in the process of spatial perception,
- demonstrate the relationships between visual signs and the social, educational, and cultural contexts in which they operate.

The research adopts a qualitative approach based on case-study methodology and semiotic analysis. A triangulation of methods was applied, including:

- visual analysis (structure, composition, and relationships between image and architecture),
- content and meaning analysis (interpreting the role of signs within social and cultural contexts),
- comparative analysis (identifying shared communicative strategies across different objects).

The literature on architectural semiotics and visual language reveals strong connections between sign theory, spatial communication, and the cognitive processes involved in image perception. The analysis is grounded in classical concepts of visual semiotics developed by U. Eco (Eco, 1976, 1986), R. Barthes (Barthes, 1977) and M. Krampen (Krampen, 1976), who describe architecture as a system of meanings functioning analogously to natural language, based on relationships between signs, form, and cultural context. These authors emphasise that reading space requires interpretative competence, and that architecture may be approached as a cultural text.

A significant contribution to understanding how meaning is generated in space is offered by cognitive linguistics, particularly the theory of conceptual metaphor developed by G. Lakoff and M. Johnson (Lakoff, Johnson, 1980) and further elaborated by M. Johnson (Johnson, 1987). Their work demonstrates that metaphor is not merely a rhetorical device but a fundamental mechanism for organising experience and thought, which directly informs the interpretation of architectural forms and typographic structures in visual space.

In the field of architectural communication, important perspectives are provided by the work of C. Jencks (Jencks, 1986; Jencks, Kropf, 1997), who examines the relationship between architectural form, symbolic systems, and visual narrative, as well as by studies conducted by M. Wigginton (Wigginton, 1996) and S. Laube (Laube, 2016), which focus on the specificity of glass as a medium of visual communication in contemporary architecture. These authors highlight that the transparency, reflectivity, and layered nature of glass enable the creation of complex visual messages based on the interplay of text, image, and spatial structure.

The findings will make it possible to determine how the visual elements of contemporary building façades contribute to the formation of spatial narratives, support processes of spatial identification, and influence the perception of architecture from social and cultural perspectives.

The research material comprises ten buildings in which façade graphics were executed using various graphic techniques on glass. In all cases, the dominant motif is letter-based graphic composition.

The scope of the study includes an analysis of selected examples of contemporary architecture in which façade graphics function as integral elements of visual and cultural communication. The analysed objects differ in purpose and geographical location, and include: Veenman Printer, Ede, the Netherlands; Metropole, Copenhagen, Denmark; POLIN Museum

of the History of Polish Jews, Warsaw, Poland; University Library in Cottbus, Germany; Parkland Hospital, Dallas, United States; Teacher's Union Conference Center, Oslo, Norway; Inholland University, Rotterdam, the Netherlands; SUVA Headquarters, Basel, Switzerland; Church of the Sacred Heart of Jesus, Munich, Germany; and Arup Fitzrovia, London, United Kingdom.

3. Result

3.1. Architecture as a System of Signs

The semiotics of architecture examines how elements of architectural form convey meaning (Sanders, 2008). In the case of glass façades, two fundamental levels of communication can be distinguished:

- the denotative level, referring to the function and physical structure of the building,
- the connotative level, linked to symbolic and cultural layers of interpretation.

In this context, typographic signs acquire particular significance. Letters—emphasised through graphic form and compositional arrangement (text, symbol, motif, graphic rhythm)—guide the viewer's perception and shape the reading of the architectural whole (Gibbons, 2019). They may function as visual dominants, points of reference, or metaphors within the architectural "sentence." Their role is analogous to that of emphasis in spoken language: they indicate which elements of the message are salient and how remaining components should be interpreted (Kress, van Leeuwen, 2006).

3.2. Semiotics and Applied Linguistics: A Shared Analytical Framework

Applied linguistics—understood broadly as the study of language functioning within social practice—can be effectively employed in the analysis of visual and spatial phenomena that use language in non-linear, pictorial, or symbolic forms. From this perspective, examining architecture through the tools of applied linguistics makes it possible to interpret the glass façade as a cultural message whose reception requires a form of "linguistic competence" within the visual domain.

Contemporary research on the visibility of language indicates that the process of interpreting visual messages operates analogously to the reading of written text: the viewer identifies signs, decodes their arrangement, and seeks meaning based on context. In architecture, this code is constructed through elements such as letters, symbols, colours, and compositional rhythms. Their configurations create a language in which meaning emerges from relationships between individual components.

The combination of semiotics and applied linguistics therefore enables architecture to be described as a form of intersemiotic communication—one that integrates image, text, and space within a unified message (Mitchell, 1994). In glass façades, this mode of communication becomes particularly pronounced, as the material itself encourages the interpenetration of layers: the physical interior, the reflected surroundings, and the applied graphic image.

3.3. The Significance of Metaphor and Symbol

A key element of the visual language of façades is metaphor—a means of conveying indirect meanings through images and visual forms (Lipowicz-Budzyńska, 2023b). In architecture, as in language, metaphor enables the expression of abstract ideas through concrete shapes. The use of a tree motif in hospital graphics, a pattern of letters in a library, or a symbolic word in a museum represents a form of visual metaphor that links functional content with emotional resonance.

Symbol, in turn, operates as a semantic shorthand—its meaning does not arise from direct resemblance but from cultural convention. Consequently, understanding the symbolism of a façade requires familiarity with its social and historical context. It is precisely at this point that semiotics and applied linguistics intersect: both disciplines examine the processes by which meanings—linguistic as well as visual—are decoded within specific social environments.

In summary, the visual language of glass façades can be understood as a semiotic system in which form, content, and context collectively shape a cultural message. Analysing this phenomenon from the perspective of applied linguistics allows not only the identification of visual elements (letters, symbols, images, rhythms), but also an understanding of their function within broader processes of social communication. As a result, architecture becomes a space in which language—in its visual, spatial, and symbolic forms—finds concrete application within social and cultural settings.

3.4. Case Study Analysis: Visual Language and the Functions of Letter-Based Signs in Selected Glass Façades

The case study method forms the core of the research on the visual language of glass façade graphics. This approach enables the interpretation of both formal and semantic aspects while taking into account functional, cultural, and social contexts. Each of the presented buildings represents a distinct way of employing letter-based graphics within the façade.

Veenman Printer, Ede, the Netherlands (2002)

Image Construction and Composition:

Letters forming a fragment of K. Schippers' poem are arranged vertically across the façade (Veenman Drukkers, 2025). The letters operate as individual modules, generating a rhythmic typographic structure.

Semiotic Analysis:

The letter ceases to function solely as a carrier of linguistic content; it becomes a visual figure and a sign referring to the printing process. The façade operates as a visual poem that foregrounds the materiality of the written word.

Linguistic Analysis:

The decomposition of poetic lines into individual letters and their vertical arrangement disrupts the linear mode of reading. The text loses continuity and shifts from language to ornament, transforming the function of the linguistic sign.

Metropole, Copenhagen, Denmark (2010)

Image Construction and Composition:

The façade forms monumental letters composed of a raster of small signs. From close proximity, the viewer perceives a microstructure; from a distance, large-scale, uniform symbols emerge.

Semiotic Analysis:

The typographic sign adopts the role of ornament and a symbol of urban energy. The shift in scale produces an effect of interference and flicker, transforming the façade into a dynamic screen.

Linguistic Analysis:

The letter loses its semantic function—its meaning derives not from textual content but from rhythm and repetition. Readability is reduced, and language is transformed into a purely visual structure.

POLIN Museum of the History of Polish Jews, Warsaw, Poland (2013)

Image Construction and Composition:

The glass panels feature the repeated word “Po-lin” in two alphabets—Hebrew and Latin—forming a subtle ornamental pattern.

Semiotic Analysis:

The sign functions as a symbol of memory and refuge, deeply rooted in cultural and historical meaning. Through repetition, the word becomes a metaphorical texture.

Linguistic Analysis:

This is a bilingual message employing the interference of writing systems. The letters remain readable, and the meaning is grounded in the etymology and connotations of the word.

University Library, Cottbus, Germany (2004)

Image Construction and Composition:

The façade is covered with overlapping alphabets from various language groups (Laube, Widrig, 2016), creating an abstract typographic texture.

Semiotic Analysis:

The resulting palimpsest alludes to linguistic diversity, knowledge, and academic culture. Letters operate as symbolic signs.

Linguistic Analysis:

Disrupted textual linearity, overlapping scripts, and the absence of a continuous sequence produce a non-linear message. Here, language functions through the presence of signs rather than through semantic content (Zender, 2014).

Parkland Hospital, Dallas, United States (2010)**Image Construction and Composition:**

The façade forms a complex botanical image built from the names of individuals involved in the creation of the hospital (Boyd, 2015). Letters of varying transparency create a multilayered, organic composition.

Semiotic Analysis:

Personal names serve as elements of a collective narrative—the façade functions as a symbolic “monument” to the institution’s contributors. The combination of botanical motifs and typography constructs a metaphor of growth, care, and continuity of life.

Linguistic Analysis:

Names operate as linguistic units but undergo decomposition and repetition, becoming visual material. The structure loses textual linearity and assumes the form of a typographic texture.

Teacher’s Union Conference Center, Oslo, Norway (2009)**Image Construction and Composition:**

The façade features a composition of letters arranged in a positive–negative system. The letters form a repetitive motif with a pronounced light–shadow structure.

Semiotic Analysis:

The typographic elements act as decorative identity markers, reinforcing the formal character of the institution. The contrast between forms creates a clear and assertive visual message.

Linguistic Analysis:

The letters are detached from communicative linguistic function—they do not form words but compose a purely visual arrangement. This constitutes an example of “de-linguistification”, where the letter is used as a graphic unit.

Inholland University, Rotterdam, the Netherlands (2008)**Image Construction and Composition:**

The façade is covered with a dual-layer screen print depicting elongated graphic signs, simplified mathematical and chemical patterns, forming a dense typographic–symbolic grid.

Semiotic Analysis:

The superimposition of abstract sign systems creates a visual metaphor of science—structures of knowledge, analysis, and logic. The façade operates as a symbol of an academic metacode.

Linguistic Analysis:

These signs do not form a linguistic text but constitute an alternative system of notation—a quasi-alphabet. This is an example of transforming symbolic (mathematical) systems into a spatial communicative form.

SUVA, Basel, Switzerland (1993)

Image Construction and Composition:

The façade repeats three word sequences that create an ordered, rhythmic typographic surface. The letters share a uniform colour, forming a repetitive texture.

Semiotic Analysis:

Repetition functions as an ornament of meanings—the verbal sequences construct the institution's identity, suggesting stability, regularity, and transparency of operation.

Linguistic Analysis:

Linguistic repetition occurs—linguistic devices (repetition, parallelism) are used as tools of visual composition. The text is intelligible but operates more through rhythm than semantic content.

Church of the Sacred Heart of Jesus, Munich, Germany (2000)

Image Construction and Composition:

The composition of a cross (Mages, 2013) is constructed from letters resembling cuneiform script, incorporating the motif of a nail. The graphic forms a transcription of a passage from the Passion of St. John (18-20) (Herz Jesu, 2024).

Semiotic Analysis:

The façade becomes a symbolic sign of the Passion of Christ. Colour and light build a theological narrative in which form conveys spiritual meaning.

Linguistic Analysis:

The interior inscription employs stylised script that simultaneously fulfills ornamental and textual functions. The biblical quotation loses linear readability, forming a multilayered symbolic message.

Arup Fitzrovia, London, United Kingdom (2008)

Image Construction and Composition:

The façade consists of repeated symbols that reference a simplified numerical code (The code 16, 2024), accompanied by coloured bands emphasising rhythm.

Semiotic Analysis:

The sign serves as a component of visual identity, referencing the company's history and engineering tradition. The code possesses symbolic and narrative character.

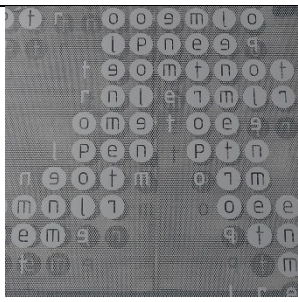
Linguistic Analysis:

The signs constitute a coded system resembling a numerical alphabet. This is a transformation of the language of engineering into a visual language—abstract yet ordered.

When analyzing the text of the lettering graphics in terms of typographic procedures, the following were distinguished:

- typographic figuration (the construction of figurative images from letters),
- atomisation of text into elementary signs (breaking text down to individual letters),
- letter-based ornamentation / typographic texture (creating graphic compositions from typographic forms),
- typographic superposition / layering of letter graphics (overlaying different forms of letters),
- semantic–visual texture (a texture composed of letter-based graphic structures),
- semiotic encoding of the message (text functioning as a cipher, with concealed layers of meaning).

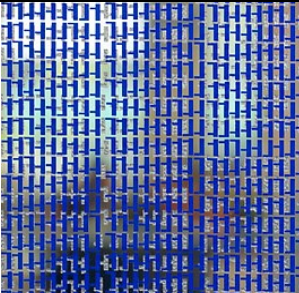
Table 1.
Semiotic and visual analysis of selected glass facades

No.	Object	Form and composition, sign	Sign system / architectural association	Semiotic and linguistic analysis
1	 Veenman Printer, Ede, Holandia (Karel Martens, Neutelings Riedijk Architecten, 2002) Source: Maarten Helle	Fragments of a poem by K. Schippers, letters arranged vertically in modules on the façade. Technique: black screen printing	The letters become a compositional element contrasting with the horizontal structure of the building. A combination of language and space; The façade as a visual poem about the materiality of print.	The graphics include: - atomization of the text to the level of an elementary character - semantic-visual texture - message encoding
2	 Metropole, Kopenhaga, Dania (C.F. Møller Architects, 2010) Source: Maarten Helle	Monumental letters formed from a raster, in the circular elements there are small signs of letters in the negative – positive convention. Technique: white screen printing	The lettering serves as an ornament and a sign of the building's identity / The building communicates through the scale and rhythm of typography – a symbol of urban energy.	The graphics include: - atomization of the text to the level of an elementary character, - lettering ornamentation / typographic texture, - typographic superposition / character layer overlay, - semantic-visual texture, - semiotic message encoding.

Cont. table 1.

3		A bilingual composition of Hebrew and Latin letters forming the word Po-lin. In Hebrew, the word po-lin means to rest here. Technique: black and white screen printing	Letter texture applied to panels at an angle; Light enhances the legibility of the message. / A sign of remembrance and reconciliation; architecture as a carrier of language and culture.	The graphics include: - typographic figuration, - atomization of the text to the level of an elementary character, - lettering ornamentation / typographic texture, - semantic-visual texture.
4		Outline of superimposed alphabetical systems located on two layers of glass. Technique: Double-layer white screen printing	The letters, as an abstract ornament, create a rhythm corresponding to the structure of the façade. / A metaphor for knowledge and linguistic diversity; building as a text symbolizing the combination of different cultures.	The graphics include: - typographic superposition / character layer overlay, - semantic-visual texture.
5		The painting contains the names and surnames of people who took part in the construction of the hospital. The lettering texture creates an organic plant element. Technique: screen printing in white with different transparency	Lettering as a material for creating a graphic image - a plant motif./ Praise for collective work and recognition for those involved in the construction of the hospital.	The graphics include: - typographic figuration, - typographic superposition / character layer overlay, - semantic-visual texture.
6		Composition of letters in a positive-negative arrangement. Letters treated in a decorative way. Technique: white graphics	Playing with a composition made of printed letters. In texture, we distinguish such treatments as mirror reflection, negative transformation, compositional inserts. A metaphor for knowledge and education, formal searches.	The graphics include: - atomization of the text to the level of an elementary character, - semantic-visual texture.

Cont. table 1.

7		A composition composed of elongated graphic signs, processed mathematical and chemical formulas. Technique: double-layer white and ultramarine screen printing	The texture of letters creates orthogonal compositional arrangements and is related to the exact sciences.	The graphics include: - semantic-visual texture
8		Arrangement of repeated three word sequences: SUVA, INSA, CNA forming rows – lines of text. Technique: white screen printing	The text is an identification character related to branding	The graphics include: - semantic-visual texture.
9		An element of the texture is a nail motif used as a cuneiform sign, a transcription of a quote from the <i>Passion according to St. John</i> Technique: Double-layer ultramarine screen printing	The painting is set in a monumental door. A composition of different shades of ultramarine forms a cross. The façade as a sign of the Lord's Passion and spiritual light; a combination of symbol and language; Glass becomes a medium of transcendence.	The graphics include: - typographic figuration, - atomization of the text to the level of an elementary character, - lettering ornamentation / typographic texture, - typographic superposition / character layer overlay, - semantic-visual texture, - semiotic message encoding.
10		Geometric signs created from a vertical element and a horizontal element placed at different heights. The texture of the image creates vertical stripes. Technique: double-layer screen printing in white and ultramarine colors	The characters differ in the height of the transverse position of the element, which allows them to represent numbers from 1 to 9, creates a mathematical code.	The graphics include: - semantic-visual texture, - semiotic message encoding.

Source: Author's own elaboration based on design documentation and materials provided by the architects.

3.5. Synthesis and Comparative Analysis of Findings

The analysis demonstrates that letter-based graphics in glass façades function as a complex sign system characterised by substantial formal and semantic diversity. Despite differences in fabrication technologies and architectural contexts, the examined projects share a common framework in which the letter serves as the primary meaningful unit. Three dominant strategies of visual and communicative expression can be identified: (1) the atomisation of the letter and its transformation into a compositional module; (2) the figurative use of text, in which letters construct an image, metaphor, or symbolic motif; and (3) the creation of typographic textures and multilayered palimpsests that operate as cultural codes or institutional messages.

A comparison of the analysed examples shows that letter-based graphics do not constitute a uniform phenomenon. In some projects (e.g., Veenman Printer, the Cottbus Library), the graphics take on an intellectual and narrative character; in others (such as Metropole or SUVA), they serve to build visual identity; while in yet others (Parkland Hospital, the Church of the Sacred Heart in Munich), they fulfil symbolic and emotional functions. A shared denominator, however, is the letter's capacity to link architectural materiality with cultural layers and to co-create the visual "text" of place. Projects such as POLIN or Parkland Hospital demonstrate that letters can serve as carriers of collective memory and community identity.

It is noteworthy that in most of the analysed objects, deliberate strategies were employed to hinder or even prevent linear reading—an essential component of their linguistic character. Fragmenting text into individual signs, multiplying letters, layering forms, altering scale, or transforming typography into ornament produces messages intended not for literal reading but for visual interpretation. Such strategies correspond to the tendency of "textual resistance"—an approach in which the linguistic layer intentionally loses its original informational function and becomes a carrier of emotion, symbolism, rhythm, and spatial structure. Consequently, most façades operate not as texts to be read, but as texts to be viewed, where meaning is constructed in a non-linear, polysemic manner rooted in visual perception.

The analysis further indicates that the projects with the greatest semantic complexity employ typographic layering (superposition), which generates multi-level messages and enhances the dynamism of the composition.

4. Discussion

The findings confirm that contemporary façade graphics based on letterforms constitute a significant field of interdisciplinary visual communication, where semiotics, applied linguistics, cultural narrative, and architectural aesthetics intersect. The analysed projects demonstrate that the process of interpreting a façade operates analogously to reading written

text—it requires the recognition of signs, the establishment of relationships between them, and their placement within social and cultural contexts. This supports the assumption that façade graphics may function as a cultural text, in which visual elements construct a complex intersemiotic message.

An important aspect revealed by the study is the role of visual metaphor and symbol as tools of meaning condensation. The use of letter-based motifs enables the construction of emotional, historical, and identity-driven narratives, while shaping the viewer's perception through rhythm, scale, and compositional strategies.

The analysis also emphasises that the glass façade—due to its transparency, reflectivity, and capacity for layering—serves as an ideal medium for visual communication. The multilayered nature of letter-based graphics allows the construction of messages that shift with perspective, light, or the movement of the observer, rendering the façade an interactive element. For this reason, projects employing typographic superposition or semantic encoding can be viewed as analogous to linguistic communication processes in their dynamic and context-dependent dimensions.

From the perspective of design practice, the results suggest that the integration of semiotic principles and applied linguistics can support the development of façades with high communicative clarity, strong visual identity, and deep cultural grounding. This points to the growing need for interdisciplinary analytical and design tools that connect visual language with architectural theory.

5. Summary

The article presents an analysis of the visual language of contemporary glass façades from the perspective of semiotics and applied linguistics. Based on ten case studies, it demonstrates that letter-based graphics play a crucial role in constructing architectural communication, integrating aesthetic, symbolic, cultural, and narrative functions. The study identifies the main typographic strategies used in glass façades, including text atomisation, typographic figuration, multilayered sign structures, and various forms of message encoding.

The analysis of ten selected glass façades reveals a clear dominance of specific typographic techniques in shaping the visual language of architectural graphics. The most frequently employed technique is the semantic–visual texture, present in 90% of the examples, confirming that modular letter-based structures constitute a primary tool for visual communication on glass surfaces. Text atomisation, reducing language to elementary signs, occurs in 50% of the objects, while typographic superposition—layering of sign systems—appears in 40%, indicating a widespread use of complexity and meaning interpenetration. More specialised procedures—

typographic figuration, ornamental letter patterns, and semiotic message encoding—were identified in 30% of the projects, mainly in those with a strong narrative or symbolic identity.

The results show that contemporary letter-based façade graphics primarily rely on textural structures, while more advanced formal techniques are applied selectively to reinforce the individual character of specific buildings.

Linguistic analysis of the individual cases demonstrates that letter-based graphics fulfil varied yet functionally coherent communicative roles in architecture. In projects such as Veenman Printer or Metropole, the dominant strategies rely on the deconstruction of language—letters lose their original semantic function and operate as visual units, corresponding to the “de-linguistification” processes described in visual linguistics. Projects such as POLIN or SUVA use repetition and symbolic value of signs to create messages rooted in cultural memory and institutional identity. Meanwhile, the most formally complex designs—such as the Cottbus Library, Inholland University, or Arup Fitzrovia—employ multilayered sign systems resembling non-linear texts, where meaning emerges through the interference of codes and their contextual interpretation. As a result, the research confirms that contemporary glass façades operate as semiotic–linguistic environments: each building constitutes a distinct “visual text” that may be analysed in terms of language, metaphor, rhythm, and sign interaction.

In the analysed objects, letter-based graphics often deliberately hinder linear reading, which is a defining component of their linguistic character. Text disintegration, sign multiplication, and layered structures produce messages designed not for conventional reading but for visual interpretation. Consequently, the façades operate as “texts to be viewed,” where meaning is constructed through rhythm, structure, and visual perception rather than through traditional linguistic semantics.

The findings confirm that the letter, as a visual sign, enables the creation of façades with complex structures of meaning that are interpreted similarly to cultural texts. Contemporary glass façades thus function as communicative media—carriers of memory, identity, and values—and, owing to their material properties, allow the construction of multilayered and interactive narratives. The article demonstrates that applying tools of applied linguistics to architectural analysis opens new interpretative perspectives and may serve as a foundation for further research on visual perception and communication within the built environment.

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SPORT BRIDGE: MOTIVATIONS FOR ONLINE PLAY IN POLANDLeonard LUBINA¹, Robert ROMANOWSKI^{2*}¹ Poznan University of Economics and Business, Student Marketing Society; 89001@student.ue.poznan.pl,
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Purpose: The aim of this paper is to assess the propensity to play bridge online among Polish players. In assessing the propensity, the study sought to answer three research questions: whether the game's identity has been preserved in the online environment; whether the game continues to satisfy needs for intellectual entertainment and social interaction; and whether online play enables fair competition and skills development.

Design/methodology/approach: To achieve this objective, a literature review was conducted on e-sports and online gaming, including bridge, based on 80 scientific publications (including 8 from 2020-2025) from the Scopus database and 16 industry statistical reports. Based on the literature review, an original online survey questionnaire (CAWI) was prepared, completed by 124 Polish bridge players, with a breakdown by gender and age. The survey link was sent in March 2026 to members of bridge clubs in Poznan, Warsaw and Cracow, and to participants in the Polish Junior Championships. Purposive sampling with a snowball variant was used.

Findings: The overall propensity to play bridge online is high (88.71%). In the youngest (10-19 years) and the 40-49 age group it reaches 100%; among those who began playing during the pandemic (2020) it stands at 95.83%. Competition ($M = 5.06$) and Personal Development ($M = 4.91$) emerge as the dominant motivational dimensions, confirming the achievement-oriented sporting identity of the game. Online platforms are broadly endorsed as effective training tools ($M = 5.58$), most strongly by elite players. The implementation of systems such as EDGAR in 2024 significantly affects the combating of unfair practices online.

Originality/value: This paper analyses the evolution of bridge from a social game to a digital sport, pointing to the synergy between tradition and modernity and the impact of moving play online on players from social, gameplay and skills perspectives.

Keywords: online games, sport bridge, players' motivation.

Paper category: research paper.

1. Introduction

For centuries, card games have been a beloved form of entertainment, skill development and social interaction. Whether using a traditional 52-card deck or special sets such as tarot or collectible cards, cards have fascinated people of all ages. In the current era, however, the digital revolution has influenced almost every aspect of life, including the scope and intensity of card games, which have seamlessly migrated to the digital world, combining the elegance of traditional play with the boundless possibilities of technology.

The digital revolution of recent decades has profoundly changed the way people spend their leisure time. Online games have become one of the most popular forms of entertainment in the world, engaging – according to Newzoo (2025) – more than 3.43 billion active players generating revenues of 225.7 billion USD (Fortune Business Insights, 2025). In Poland alone, according to Statista (2025) data, more than 17 million people play online regularly, representing nearly 44% of the country's population. The COVID-19 pandemic (2020-2022) was an unprecedented growth catalyst – Newzoo (2021) estimates a 23% increase in game sales in 2020 alone, and the impact on players' behaviour and users' mental health became a major research topic in publications indexed in Scopus between 2020 and 2025.

The phenomenon of online gaming attracts the attention of researchers from various fields: psychology, sociology, health sciences and education. A particularly interesting group is players of classic games such as bridge, chess or poker card variants, which have undergone digital transformation. The Bridge Base Online platform recorded an increase in daily users in March 2020 from around 13,000 to about 35,000 (BBO, March 2020).

The aim of this paper is to assess the propensity to play bridge online among Polish players. In assessing the propensity, the study sought to answer three research questions:

1. Has the game's identity been preserved?
2. Does the game still satisfy needs for intellectual entertainment and social interaction?
3. Does online play allow for fair competition and skills development?

2. Literature Review – Motivations in the Gaming Industry

2.1. Industry Growth Dynamics

The years 2020-2025 represent an exceptional period for the online gaming industry. In 2020, according to Newzoo (2020), the global market was valued at 159.3 billion USD with a base of 2.71 billion players (Table 1). The COVID-19 pandemic accelerated the digitalisation of entertainment (Lewicki, 2020), and in 2021 Newzoo (2021) recorded growth to 180.3 billion USD and 2.96 billion players. Following a correction in 2022-2023, a new growth impulse

emerged: in 2025, Fortune Business Insights (Fortune BI, 2025) estimates the market value at a record 225.7 billion USD, while Newzoo (2025) puts the number of players at 3.43 billion. The cumulative growth in the number of players between 2020 and 2025 stands at +26.8%.

Table 1.

Online gaming market dynamics in 2020-2025 – key statistics

Year	Players worldwide	Market value (bn USD)	YoY growth	Key event / research finding	Source
2020	2.71 bn	159.3	+6.6%	COVID-19 pandemic: +23% game sales; BBO grew to 180k daily users; 82% of consumers played or watched games (Nielsen, 2020)	Newzoo, 2020; Nielsen, 2020
2021	2.96 bn	180.3	+13.2%	Peak pandemic activity; WHO ICD-11 with gaming disorder; IGD: 3.05% globally (Stevens et al., 2021); Vuorre et al.: objective increase in play hours – moderate	Newzoo, 2021; Stevens et al., 2021
2022	3.09 bn	184.4	+2.3%	Post-pandemic stabilisation; Alimoradi et al.: increase in behavioural addictions; Savolainen et al.: social motives as predictor of problematic gaming	Newzoo, 2022; Alimoradi et al., 2022
2023	3.22 bn	184.0	-0.2%	Scopus publications on online gaming doubled vs 2019; Limone et al.: 19% of boys and 7.8% of girls with addiction symptoms; Oceja et al.: no clear evidence of IGD increase	Newzoo, 2023; Limone et al., 2023
2024	3.32 bn	187.7	+2.1%	AI in 52% of development projects; microtransactions: 97.7 bn USD; VR market: 7.8 bn USD; mobile games: 51.2% of sector revenue	Newzoo, 2024; Grand View Research, 2024
2025	3.43 bn	225.7	+20.3%	E-sports market: 4.78 bn USD; game streaming: 1.42 bn viewers; 58% of Gen Z players consider gaming their primary social activity	Fortune BI, 2025; Newzoo, 2025

Sources: own elaboration based on Newzoo (2020-2025); Fortune Business Insights (2025); Statista (2025); Nielsen (2020).

The mobile segment consolidated its dominance – in 2025 it accounts for 51.2% of total sector revenue (Statista, 2025). Poland, according to Statista (2025) data, grew its online gaming population from around 14.5 million in 2020 to more than 17 million in 2025, with nearly 30% growth in the card gaming market between 2020 and 2024 (Sensor Tower, 2024).

2.2. Player Motivations

In the present literature review, source searches were conducted in the Scopus database using the keywords: "online gaming motivation", "online card games", "bridge game psychology", "digital games social interaction", "gamification cognitive training", "COVID-19 gaming" and "internet gaming disorder 2020-2025". The inclusion criterion covered publication

in a peer-reviewed journal between 2003 and 2025, availability of full text and thematic alignment with the research area. In total, over 80 scientific publications were analysed (including 8 from 2020-2025) along with 16 industry statistical reports. Based on the literature review, ten main motivation categories were identified (Table 2).

Table 2.

Main motivations of online players – synthesis of research findings (own work based on Scopus)

Motivation	Description	Source (Scopus)	% of players	Year of study
Entertainment & pleasure	Immediate reward, sensory stimulation, fun	Yee, 2006; Kuss, Griffiths, 2012	87%	2006-2012
Social interaction	Building relationships, sense of group belonging	Hussain, Griffiths, 2009	74%	2009
Competition & challenge	Competing with others, improving skills, rankings	Przybylski et al., 2010	68%	2010
Escapism	Stress reduction, detachment from problems, relaxation	Kardefelt-Winther, 2014	61%	2014
Cognitive & intellectual development	Problem solving, strategy, cognitive training	Aaen-Stockdale, 2012; Mayer, 2019	55%	2012-2019
Achievement & prestige	Earning badges, levels, community recognition	Yee, 2006	52%	2006
Immersion & exploration	Exploring virtual worlds, narrative, roleplay	Yee, 2006; Hussain, Griffiths, 2009	48%	2006-2009
Social compensation	Filling emotional gap for shy/lonely individuals	Kuss, Griffiths, 2012	34%	2012
Accessibility & convenience	24/7 access without leaving home	Griffiths et al., 2004	71%	2004
Nostalgia & tradition (bridge)	Continuing a hobby, preserving classic games in a digital environment in time of pandemic	Snellgrove, Punch, 2024	70%	2024

Source: own elaboration.

The dominant motive remains entertainment and pleasure (87% of indications; Yee, 2006; Kuss, Griffiths, 2012). Kuss and Griffiths (2012) emphasise that social motives more strongly predict gaming regularity than hedonic motives. Savolainen et al. (2022) confirmed that social motives were the key predictor of problematic gaming during the pandemic. Worthy of note too is the aspect of competition and challenge (Przybylski et al., 2010) and cognitive and intellectual development (Aaen-Stockdale, 2012; Mayer, 2019). These four key motives for online gaming activity (besides escapism) will be subject to analysis in the study carried out as part of this paper.

Table 3.*Key Scopus publications on online gaming in 2020-2025 including the pandemic*

Study (Scopus)	Year	Journal	N / type	Key finding
Vuorre et al.	2021	Royal Society Open Science	Large	Objective console API data: increase in play time during UK lockdown was moderate – refuting 'moral panic'
Stevens et al.	2021	Clinical Psychology Review	Meta-analysis	Global IGD prevalence: 3.05% (CI 2.38-3.91%); higher rates in Asian populations and males
Alimoradi et al.	2022	Current Addiction Reports	Meta-analysis	Rise in prevalence of behavioural addictions; gaming and gambling increased proportionally with social isolation
Savolainen et al.	2022	Comprehensive Psychiatry	1200	Social motives – main predictor of problematic gaming during the pandemic; no effect found for escapist motives
Pallavicini et al.	2022	Cyberpsychology Behav. Social Netw.	48 studies	Video games reduced stress, anxiety and loneliness in the early stages of COVID-19; most effects positive or neutral
Oceja et al.	2023	Sustainability	31 studies	No clear evidence of increased problematic gaming during lockdown; too much variation in measurement tools
Limone et al.	2023	Int. J. Mental Health Addict.	Syst. review	19% of boys and 7.8% of girls with gaming addiction symptoms after the pandemic; key predictors: depression, anxiety, low social support
Michellini et al.	2023	Addictive Behaviors	7 countries	Measurement invariance of gaming motives across 7 countries; achievement motive most strongly linked to IGD cross-culturally

Sources: own work based on articles from the Scopus database.

The pandemic inspired a wave of scientific research. The meta-analysis by Stevens et al. (2021) estimated the global prevalence of IGD at 3.05% (CI: 2.38-3.91%), with markedly higher rates in East Asia and among males. Limone et al. (2023) found that after the pandemic, 19% of boys and 7.8% of girls showed symptoms of gaming addiction. Pallavicini et al. (2022) in a review of 48 studies found that video games reduced stress and loneliness in the majority of players during the early stages of COVID-19.

2.3. Number of Online Players in Poland – Statistical Data

As mentioned, the global online gaming market reached a value of 225.7 billion USD, with the number of active players standing at 3.43 billion in 2025 (Newzoo, 2025). The industry's growth stemmed mainly from activity in the mobile segment (Table 4) – 51.2% of revenues (Statista, 2025). Asia Pacific dominates with a 51.2% market share (Fortune Business Insights, 2025). In Poland, more than 17 million people play regularly (Statista, 2025), and the domestic games market is valued at around PLN 3.1 billion annually (PricewaterhouseCoopers, 2024). According to GUS (2023), 41% of Poles aged 16-74 declare playing digital games. Poland is the seventh-largest games market in Europe.

Table 4.

Number of online players worldwide and in Poland by game category

Category / Game	Players worldwide	Players in Poland	YoY growth	Source
Online games (total)	3.43 bn (2025)	~17.2 m (2025)	+8.5%	Newzoo, 2025
Mobile online games	2.5 bn (2025)	~12 m (2025)	+12.1%	Statista, 2025
MMORPG / multiplayer	~470 m (2024)	~2.9 m (2024)	+5.3%	DFC Intelligence, 2024
Online card games (total)	~130 m (2024)	~1.3 m (2024)	+9.7%	Sensor Tower, 2024
Online bridge (BBO, registered)	~5.5 m (BBO, 2023)	~80,000 (PZBS, 2023)	+14.2%	BBO; PZBS, 2023
Online chess	~80 m (Chess.com 2025)	~650,000 (2025)	+23%	Chess.com, 2025
E-sport (viewers + players)	~578 m fans (2024)	~2 m fans (2024)	+11.5%	Newzoo, 2024

Sources: Newzoo (2025); Statista (2025); DFC Intelligence (2024); Sensor Tower (2024); BBO (2023); PZBS (2023); Chess.com (2025); Newzoo (2024).

Among online games, mobile games attract the greatest interest. However, in the case of traditional games such as chess or bridge, the migration of players to the online format produces significant growth dynamics: in the case of chess, 2025 saw a 23% increase in players compared to 2024 (Chess.com, 2025), while for bridge the figure was more than 14% in 2023 compared to 2022 (BBO, 2023).

2.4. Online Bridge – Characteristics and Player Motivations

Bridge is a card game recognised by the World Bridge Federation (WBF) as a sporting discipline. Bridge is a technical and challenging game, that takes years of diligent play in order to reach elite level (Punch, 2021). The Bridge Base Online (BBO) platform, founded in 2001 by Fred Gitelman, had gathered over 5.5 million registered users from more than 140 countries by 2023 (BBO, 2023). In Poland, the Polish Bridge Sports Association (PZBS) has around 10,000 licensed players (PZBS, 2023), and the number of active online bridge players is estimated at around 80,000 (PZBS, 2023).

Verghese et al. (2003) demonstrated that regularly playing card games was associated with a 38% reduction in dementia risk in an elderly group (Table 5). Aichele et al. (2016) confirmed this result in a long-term Norwegian study.

According to the Entertainment Software Association (ESA, 2023), the dominant group among all online players is those aged 18-34 (38% of players; Newzoo, 2024; Table 6). AARP (2022) research indicates that online bridge is dominated by people aged 55-74 (42% of players), which represents a reversed structure compared to the industry as a whole.

Table 5.

Motivations characteristic of online bridge players

Bridge-specific motivation	Research finding / description	Author / Source	% of respondents
Cognitive training / anti-aging	Associated with 38% reduction in dementia risk; working memory stimulation	Verghese et al., 2003; Aichele et al., 2016	65%
Tradition & cultural identity	Bridge as part of family heritage; e-bridge enables continuation	Kitayama, Salvador, 2017	58%
Senior age & activity	Dominance of 55+ players; platforms replace clubs for those with limited mobility during pandemic	Snellgrove, Punch, 2024	70%

Sources: Verghese et al. (2003); Aichele et al. (2016); Kitayama, Salvador (2017); Snellgrove, Punch (2024).

Table 6.*Demographic profile of online players by age group*

Age group	% of online players (world)	% of online bridge players	Dominant motives	Source
13-17	26%	2%	Entertainment, competition	ESA, 2023
18-34	38%	12%	Community, e-sport	Newzoo, 2024
35-54	24%	31%	Relaxation, cognitive challenges	GfK / Statista, 2024
55-74	10%	42%	Cognition, social activity	AARP, 2022
75+	2%	13%	Anti-aging, accessibility	AARP, 2022

Data: ESA (2023); Newzoo (2024); GfK / Statista (2024); AARP (2022).

The data point to a reversed age structure in online bridge – the dominant group is people aged 55-74 (42% according to AARP, 2022).

The literature review and statistical data allow several key conclusions to be drawn. First, the motivations for playing online are multidimensional and are rooted in fundamental human psychological needs. The COVID-19 pandemic revealed both the protective and risky aspects of online gaming – the compensatory function of games alleviated loneliness in the majority of users, but in a vulnerable group it escalated to problematic gaming (Snellgrove&Punch, 2024). Second, online bridge represents a fascinating case of a classic game that, thanks to digitalisation, is alive and attracting new players. The growth of BBO activity by about 300% during lockdowns (BBO, March 2020) confirms this.

3. Research Method – Motivation to Play Bridge Online

Based on the literature review and using Yee's (2006) motivation taxonomy model, which proposed a three-component taxonomy related to gaming: (1) achievement, (2) social interaction, (3) immersion (a model cited over 3000 times in the Scopus database,

and confirmed by Michelini et al. (2023) for measurement invariance across 7 countries), the Authors decided to conduct a survey of the motives stimulating Polish bridge players to play online. In the adopted research instrument, respondents were asked to assess their propensity to play bridge online, with particular emphasis on the entertainment, social, competition and development aspects.

Table 7.
Characteristics of the study population

Characteristic	Categories	Number of respondents
Gender	Female	31 (25%)
	Male	92 (74.19%)
	Other	1 (0.81%)
Age	10-19	24 (19.35%)
	20-29	46 (37.1%)
	30-39	14 (11.29%)
	40-49	14 (11.29%)
	50+	26 (20.97%)
Qualification Coefficient (QC)	Up to 5 QC	97 (78.23%)
	Above 5 QC	27 (21.77%)
How long have you been playing bridge?	Since 2024	11 (8.87%)
	Since 2020	24 (19.35%)
	Since 2016	33 (26.61%)
	Started before 2016	56 (45.16%)
Do you play online?	Yes	110 (88.71%)
	No	14 (11.29%)

Source: Own work.

In the study, approximately 75% of respondents were Polish male bridge players and 25% – female ones. The age distribution allows analysis of variation in players' approaches to playing bridge online. The survey also included a question about the Qualification Coefficient (QC), which is a numerical indicator of a player's strength based on qualification points earned. The range of the indicator spans values from 0 to 24, where 0 refers to a beginner and 24 to a World Grand Master (according to MSCezar, 2026 data, with only 48 such titles awarded in the entire post-war history of Polish bridge up to March 2026). It is assumed that a QC in the range of 0 to 5 refers to players active in domestic competitions, while a QC of 7 to 24 characterises players active at the international level. The survey also included a question about when the respondent began playing bridge, taking into account: the last 3 years (since 2024), the pandemic period (since 2020), the last 10 years (since 2016) and earlier (before 2016).

4. Findings – Propensity and Motives for Playing Bridge Online In Poland

The following section presents an analytical discussion of the empirical results captured in Tables 8, 9, and 10. The analysis is structured around the three research questions formulated in the introduction: (1) whether the identity of the game has been preserved in the online environment; (2) whether the game continues to satisfy players' needs for intellectual entertainment and social interaction; and (3) whether online play enables fair competition and skill development.

Table 8.

Propensity to play online among Polish bridge players

Feature	Category	Does not play online	Plays online
Gender	Female	9.68%	90.32%
	Male	11.96%	88.04%
	Other	0.00%	100.00%
Age	10-19 yrs	0.00%	100.00%
	20-29 yrs	10.87%	89.13%
	30-39 yrs	35.71%	64.29%
	40-49 yrs	0.00%	100.00%
	50+ yrs	15.38%	84.62%
Qualifying Coefficient (QC)	Up to 5 QC	10.31%	89.69%
	Above 5 QC	14.81%	85.19%
How long have you been playing bridge?	Since 2024	27.27%	72.73%
	Since 2020	4.17%	95.83%
	Since 2016	9.09%	90.91%
	Before 2016	12.50%	87.50%
Total		14 (11.29%)	110 (88.71%)

Source: Own elaboration.

Table 8 reveals a markedly high overall propensity to play bridge online among Polish players: 88.71% of the 124 respondents reported playing online, while only 11.29% ($n = 14$) did not. This result substantially confirms the findings reported by AARP (2022) and Nethery & Punch (2023), who documented a surge in online bridge activity during and after the COVID-19 pandemic.

A gender-disaggregated view shows minor but noteworthy variation. Female respondents demonstrated a slightly higher propensity to play online (90.32%) than their male counterparts (88.04%), suggesting that online platforms reduce gender-related participation barriers, possibly by eliminating the need for physical attendance at bridge clubs. The single respondent identifying as 'other' reported online play, though the negligible sample size precludes generalisation.

The age-group breakdown produces the most analytically compelling pattern. Two cohorts – players aged 10-19 and 40-49 – recorded a 100% propensity to play online, indicating universal adoption within these segments. The youngest cohort's result is consistent with broader evidence that Generation Z treats digital platforms as the default social environment (Newzoo, 2025). The 40-49 age group's complete adoption may reflect a pragmatic orientation: these are professionally active adults who benefit most from the flexibility and time-efficiency of online play. Conversely, the 30-39 age group displayed the lowest propensity (64.29%), a result that diverges sharply from the trend and invites further qualitative investigation. One plausible explanation is that this cohort, while digitally literate, faces the heaviest combination of professional and family obligations, limiting discretionary time for both online and offline bridge. The 50+ group reached 84.62%.

Analysing propensity by the Qualifying Coefficient (QC) – a numerical indicator of competitive ranking – reveals that players with lower competitive standing ($QC \leq 5$) exhibit a slightly higher propensity to play online (89.69%) compared to advanced players ($QC > 5$, 85.19%). This may reflect that recreational and club-level players exploit online platforms primarily as an accessible training resource, whereas elite players might have reservations about the full competitive equivalence of online formats.

The most striking result in terms of when respondents began playing concerns the 2020 cohort – those who started during the pandemic: 95.83% of them play online. This is the highest sub-group propensity in the entire table and strongly suggests that the pandemic not only accelerated digital adoption but permanently shaped the habits of a generation of bridge players who were initiated in the online environment from the outset. Players who started most recently (since 2024) showed the lowest overall propensity within the experience-based breakdown (72.73%), possibly because they are still in an early exploratory phase or have not yet fully integrated online play into their routine.

Table 9.

Perceived importance of bridge game aspects among players (Likert scale 1-7)

Feature	Category	Social	Entertainment	Competition	Personal Development
Gender	Female	5.03	4.94	4.52	6.00
	Male	4.77	4.60	5.27	4.55
Age	10-19 yrs	4.33	5.04	4.92	5.42
	20-29 yrs	4.72	4.70	4.63	4.67
	30-39 yrs	5.64	4.71	5.07	4.71
	40-49 yrs	5.07	4.64	5.57	5.21
	50+ yrs	4.81	4.23	5.69	4.81

Cont. table 9.

QC	Up to 5 QC	4.87	4.74	4.89	5.06
	Above 5 QC	4.59	4.37	5.70	4.37
How long have you been playing bridge?	Since 2024	5.00	5.09	5.09	5.27
	Since 2020	4.54	5.17	4.62	5.29
	Since 2016	4.82	4.21	4.76	4.97
	Before 2016	4.88	4.62	5.43	4.64
Total		4.81	4.66	5.06	4.91

Note. Responses recorded on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). Q refers to the four aspects: Social (A1), Entertainment (A2), Competition (A3), and Personal Development (A4). Source: Own elaboration.

Table 9 addresses the central question of whether the sporting identity of bridge has been preserved in the transition to the online environment. Respondents rated four aspects of bridge on a 7-point Likert scale. The aggregate results reveal a clear hierarchy: Competition ($M = 5.06$) and Personal Development ($M = 4.91$) rank above Social interaction ($M = 4.81$) and Entertainment ($M = 4.66$). This ordering is theoretically significant: it suggests that Polish bridge players primarily identify with the competitive and developmental dimensions of the game, aligning with the classification of bridge as a sport by the World Bridge Federation (WBF) and the International Olympic Committee (IOC).

Gender differences produce one of the most striking findings in the entire dataset. Female players rated Personal Development at a mean of 6.00 – the highest single value recorded in the table across any sub-group and dimension – while valuing Competition markedly lower (4.52). Male respondents displayed the inverse pattern, rating Competition highest (5.27) and Personal Development (4.55) below the overall mean. These differences suggest that the motivational profile of bridge is distinctly gendered: women approach online bridge as a primary vehicle for self-improvement and cognitive development, while men are more strongly driven by competitive outcomes. This finding resonates with the broader gaming motivation literature, where Przybylski, Rigby, and Ryan (2010) documented stronger achievement orientation among male players in competitive online environments.

Age-based variation further enriches the picture. The 30-39 age group assigned the highest rating to the Social dimension (5.64), suggesting that for mid-career adults, bridge serves an important community and networking function. In contrast, the 50+ cohort rated Competition highest (5.69) – a remarkable result that challenges stereotypical assumptions about older players' motivations being primarily social or cognitive. This finding suggests that competitive drive in bridge does not diminish with age; if anything, it intensifies. The youngest group (10-19) placed greatest emphasis on Personal Development (5.42), reflecting the formative, learning-oriented phase of their bridge careers.

The Qualifying Coefficient dimension reinforces the competitive framing: advanced players ($QC > 5$) rated Competition at 5.70 – notably higher than players with $QC \leq 5$ (4.89) – and Entertainment (4.37) and Personal Development (4.37) notably lower. For elite players, online bridge is unambiguously competitive in character. Michelini et al. (2023) confirmed cross-culturally that the achievement motive is the strongest predictor of intense gaming engagement, a finding directly supported by these results.

The experience-based breakdown reveals a temporal dimension in motivational structure. Players who began before 2016 assign the highest weight to Competition (5.43), consistent with long-standing immersion in the sport's competitive culture. Players who entered during the pandemic (since 2020) rate Personal Development highest (5.29), suggesting that for pandemic-era players, online bridge was discovered as a tool for cognitive growth and skill-building rather than purely for competitive purposes. Taken together, the data confirm that the core sporting identity of bridge – anchored in competition and personal development – has been preserved in the online environment, satisfying the first research question.

Table 10.

Effectiveness of online bridge as a training tool (Likert scale 1-7)

Feature	Category	Q1	Q2	Q3
Gender	Female	4.96	2.93	5.57
	Male	4.79	3.22	5.59
Age	10-19 yrs	4.71	3.04	5.08
	20-29 yrs	4.71	2.80	5.68
	30-39 yrs	5.11	2.56	5.56
	40-49 yrs	4.79	4.36	5.71
	50+ yrs	5.05	3.50	5.77
QC	Up to 5 QC	4.85	3.29	5.48
	Above 5 QC	4.70	2.74	5.87
How long?	Since 2024	5.62	3.62	5.38
	Since 2020	4.65	2.74	5.39
	Since 2016	4.90	2.63	5.47
	Before 2016	4.71	3.63	5.73
Total		4.83	3.15	5.58

Note. Q1: 'In your opinion, does playing bridge online improve your sports results?'; Q2: 'In your opinion, does playing bridge online allow you to develop your bridge skills faster than traditional play?'; Q3: 'In your opinion, are online bridge platforms an effective training tool?'. Responses on a 7-point Likert scale. Source: Own elaboration.

Table 10 examines the perceived training utility of online bridge platforms through three items. The aggregate results reveal a consistent and theoretically coherent pattern: online platforms are widely recognised as effective training tools (Q3: $M = 5.58$), are perceived to

improve sporting results (Q1: $M = 4.83$), but are not seen as categorically superior to traditional play in terms of the speed of skill development (Q2: $M = 3.15$).

The high Q3 mean (5.58) indicates broad consensus on the practical training value of online platforms. This result is consistent across gender (Female: 5.57; Male: 5.59) and across all age cohorts. The near-identical Q3 ratings across genders suggest that the training utility of online bridge is perceived as gender-neutral, offering equitable developmental value to all players. Notably, advanced players ($QC > 5$) assign the highest Q3 score of any sub-group (5.87), indicating that elite competitors are the most convinced of the efficacy of online platforms as training environments. This finding has a clear practical implication: online bridge is not a compromise medium but a high-quality training tool endorsed most strongly by those with the greatest competitive experience.

The Q1 results ($M = 4.83$) confirm a moderate-to-strong consensus that online play improves sports performance. The newest players (since 2024) rate Q1 highest (5.62), possibly because, having learned the game primarily in digital environments, they associate online play most directly with competitive improvement. The 40–49 age group registers the highest Q2 score (4.36), markedly above the overall mean of 3.15 and the only sub-group to approach a neutral-to-positive rating on this item. This anomaly may reflect that middle-aged players – combining higher time constraints with sufficient digital fluency – derive relatively greater efficiency gains from online play compared to the time investment required by traditional club-based formats.

The low overall Q2 mean (3.15) is the most nuanced finding in the table and warrants careful interpretation. A mean close to the midpoint of the Likert scale (4.0) indicates that the sample does not broadly endorse the view that online play accelerates skill development compared to traditional play. Advanced players ($QC > 5$) record the lowest Q2 score (2.74), suggesting that elite players actively resist the notion that online environments offer a developmental shortcut. This is consistent with the importance they assign to the competitive dimension (Table 9): for expert bridge players, the deliberative, face-to-face dynamics of traditional play likely remain the gold standard for developing the highest-order strategic and psychological skills of the game.

Overall, Table 10 answers the third research question affirmatively with qualification: online bridge does enable fair competition and skill development, and its platforms are broadly endorsed as effective training tools. However, the digital environment is not perceived as a wholesale replacement for traditional play in terms of developmental speed, particularly among experienced and advanced players.

5. Conclusions and Discussion

The present study set out to assess the propensity of Polish bridge players to engage in online play and to examine whether the online transition has preserved the core identity, motivations, and developmental utility of the game. Drawing on a survey of 124 Polish bridge players and grounded in a systematic review of over 80 scientific publications from the Scopus database, the findings converge on three principal conclusions that respond to the research questions and extend the theoretical framework established in the literature review.

First, the propensity to play bridge online in Poland is high and broadly distributed. An overall adoption rate of 88.71% considerably exceeds baseline expectations for digital uptake in traditional games and confirms Poland's positioning as an active participant in the global digitalisation of leisure (Statista, 2025; PZBS, 2023). The pandemic cohort's near-universal adoption (95.83%) validates characterisation of COVID-19 as a 'digital renaissance' for bridge and suggests that the attitudinal and behavioural shifts induced by the pandemic are durable rather than ephemeral. The heterogeneity of propensity across age groups – most notably the unexpectedly low rate among 30-39-year-olds – indicates that structural life-course factors (professional and family obligations) remain a meaningful constraint on digital participation that platform designers and the Polish Bridge Federation (PZBS) should consider when designing outreach initiatives.

Second, the sporting identity of bridge has been preserved in the online environment. The primacy of the Competition ($M = 5.06$) and Personal Development ($M = 4.91$) dimensions over Social interaction ($M = 4.81$) and Entertainment ($M = 4.66$) is a theoretically robust finding. It confirms that Yee's (2006) Achievement component of his three-part motivational taxonomy – the most cited framework in the online gaming motivation literature – is the dominant motivational axis for Polish bridge players, irrespective of their age, gender, or competitive level. This result is particularly noteworthy given that the broader online gaming literature frequently identifies social motives as the strongest predictor of regular engagement (Kuss, Griffiths, 2012; Savolainen et al., 2022). Bridge, as a sport, appears to constitute an exception to this pattern: its players are primarily achievement-oriented, and this orientation survives the transition to digital platforms intact. The cross-cultural invariance of the achievement motive documented by Michelini et al. (2023) across seven countries provides additional external validity to this conclusion.

Third, online bridge platforms are recognised as effective training tools, albeit not as categorical substitutes for traditional play. The high Q3 mean ($M = 5.58$) endorsing online platforms as effective training environments – strongest among elite players ($QC > 5$: $M = 5.87$) – provides empirical support for the practical integration of digital play into formal bridge training programmes. This finding is consistent with the cognitive training literature reviewed in Section 2: Verghese et al. (2003) and Aichele et al. (2016) identified regular card game

engagement as associated with reduced dementia risk, and the present results suggest that the developmental benefits of the game are perceived as transferable to the online context. The qualified neutrality on Q2 ($M = 3.15$), however, counsels against overstating the case: online platforms supplement and enrich traditional practice; they do not supplant it, at least in the perception of the most experienced players.

Taken together, these findings make a twofold contribution to the literature. Theoretically, they extend Yee's (2006) motivational taxonomy to the specific context of competitive card games, demonstrating the dominance of the achievement motive in a population not previously examined in the gaming motivation literature at this scale. Empirically, they provide the first survey-based evidence on the online propensity and motivational profile of Polish bridge players, complementing the demographic and platform-level data available from PZBS (2023) and BBO (2023) with attitudinal and perceptual insight.

Several limitations of the study must be acknowledged. The sample was recruited through a purposive snowball method via bridge clubs in Poznań, Warsaw, and Kraków, and from participants of the Junior Polish Championships, which introduces a degree of selection bias toward more active and institutionally affiliated players. The underrepresentation of players from smaller cities and recreational players without formal club affiliation limits the generalisability of the results to the full population of Polish bridge players. Furthermore, the cross-sectional design does not permit causal inference: it is not possible to determine from these data whether online play shapes motivational profiles or whether pre-existing motivational profiles predict the degree of online engagement.

Future research should address these limitations through: (1) a larger, more geographically and institutionally representative sample; (2) a longitudinal design tracking motivational change across the online–offline continuum over time; (3) qualitative methods to investigate the anomalous low propensity among the 30–39 age cohort; and (4) cross-national comparative studies, enabled by the international reach of platforms such as Bridge Base Online (BBO), to test whether the achievement-dominant motivational profile of Polish bridge players is culturally specific or reflects a universal feature of competitive bridge culture.

In conclusion, the evidence presented in this study supports the assertion that bridge has made a successful and identity-preserving transition to the online environment. The game retains its character as a competitive intellectual sport, its digital platforms are perceived as genuinely useful training tools, and its players – across age groups, genders, and competitive levels – engage with online bridge for fundamentally the same reasons they engage with the traditional game: to compete, to develop, and to master one of the most complex and rewarding card games ever devised.

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DEVELOPMENT OF DIGITALLY DELIVERABLE SERVICES AND EU-US TRADE RELATIONS

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Purpose: The aim of this article is to compare foreign trade in digitally deliverable services between the United States and the European Union and to characterize EU–US trade relations in the exchange of digital services, including an identification of the reasons for the EU’s weaker position.

Design/methodology/approach: Research methods were used: critical analysis of source literature, comparative analysis and secondary data analysis, as well as logical reasoning and deduction. The study was conducted on the basis of data available in national and international reports, including those of the UN, WTO, EC and public statistics. The time frame of the research covered the years 2010-2025.

Findings: The EU achieved higher values for exports and imports of digital services, but it was the US that “earned” from the exchange of these services as a net exporter. The reasons for the EU’s weaker position are: low investment in intangible capital and the ICT sector, high energy costs, lower productivity, and regulations on digital services. Trump’s tariff policy has ushered in a new era of international trade operating in unpredictable and difficult market conditions.

Research limitations/implications: The research was also limited by gaps in statistical data on trade in digital services between selected economies and the reporting of export and import volumes in different currencies, i.e., US dollars or euros.

Social implications: The results of the study may increase awareness among businesses of the need to invest in intangible capital and the ITC sector in order to develop digitally deliverable services (DDS) and remain competitive in today’s economy. Public awareness may be increased regarding the importance of acquiring and developing digital skills.

Originality/value: The value of the work lies in the findings based on a long-term analysis of the digitally deliverable services and a broad and up-to-date approach to EU-US trade relations.

Keywords: digitally deliverable services, digitally services, EU-US trade relations, international trade in digital services.

Category of the paper: Research paper.

1. Introduction

Advancing digitalization, including the development of digital services, is driving global trade in services (Jiang et al., 2022; Autio et al., 2021). According to data from the United Nations Conference on Trade and Development (UNCTAD, 2025), the global value of digital services exports increased from \$1.8 trillion in 2010 to \$4.9 trillion in 2024, representing an increase of over 270%. During the same period, global imports of digital services increased from \$1.7 trillion to \$4.1 trillion, an increase of over 240%. Thus, the growth rate of exports was higher than that of imports¹. Digitally deliverable international trade has been on a sustained rise since 2010, further boosted by the COVID-19 pandemic. Boston Consulting Group (BCG, 2025) forecasts a further acceleration in the growth of foreign sales of services, including digital services. The value of services crossing borders is projected to grow by around 5.6% annually through 2032 - twice as fast as trade in goods. Digitally deliverable services (DDS²) accounted for 56% of all services exports worldwide in 2024. This share is therefore significant. Exports of digitally deliverable products are growing faster in developed than in developing economies.

Exports of services, including digital services, are having an increasing impact on the economic development of some countries and thus determine the need to adapt their trade policies to the changing reality (Chen et al., 2025; Lei et al., 2024; Sepashvili 2020; Lee et al., 2019). The United States (US) and the European Union (EU)'s 27 Member States share a \$7.1 trillion economic relationship, the largest economic relationship in the world. The digital economy underpins practically every aspect of it (International Trade Administration US, 2024).

In the third decade of the 21st century, due to geopolitical conditions (including new tariffs introduced by Donald Trump from 2025 and the issue of Greenland, which the US President is demanding), the discussion on EU-US trade relations has gained momentum. The issue of digital services plays an important role in this debate. Europe is a key market for American tech giants, and the US has a significant and growing trade surplus in the digital services sector (European Digital SME Alliance, 2025). Hence, the European Commission is working on a plan to possibly correct the imbalance in trade relations.

The aim of this article is to compare foreign trade in digitally deliverable services between the United States and the European Union and to characterize EU–US trade relations in the exchange of digital services, including an identification of the reasons for the EU's weaker position.

¹ In this work, data is given in US\$.

² At work, the acronym DDS stands for digitally deliverable services.

2. Literature review

The definition of services has evolved over time from being perceived as “service/duty” to include elements of digitization and artificial intelligence (AI) (Tokarz-Kocik, 2024), but there is still a lack of clarity in this regard in international trade. Various entities in the global economy, including the UN and the WTO, define services or digital services differently, which determines the statistical data. The definition of services trade under the GATS (2026) is four-pronged, depending on the territorial presence of the supplier and the consumer at the time of the transaction: (1) Cross-border trade/service; (2) Consumption abroad; (3) Commercial presence; (4) Presence of natural persons. In summary, these are methods of providing services in international trade. For the purposes of this paper, the UNCTAD (2025) definition has been adopted. Digitally deliverable services (DDS) include: insurance and financial services, telecommunications, computer and information services, intellectual property charges, research-and-development services, trade-related, technical, managerial, consultancy, engineering, scientific and architectural services, audiovisual services, as well as health and education personal services, and cultural heritage and recreational services.

The modern global economy is undergoing a paradigm shift in which traditional mechanisms of commodity exchange are being systematically replaced by the dynamic expansion of digitally delivered services. These are mainly identified with services provided via the Internet or electronic networks, which are automated and require minimal human involvement. This phenomenon, defined as all transactions ordered or delivered electronically, now forms the foundation of global value chains (GVCs) and is a key determinant of GDP growth. The digital transformation taking place in every sector of the economy is an opportunity to stimulate productivity growth in businesses and economies, stimulate innovation, and create global social benefits (Heuser et al., 2017; Freund et al., 2002).

Numerous studies indicate that DDS drive the centralization of GVCs by improving productivity and reducing resource allocation errors, especially in developed countries. The development of the digital economy increases the length of GVC chains and supports advancement in the value hierarchy, but in many cases it deepens inequalities between individual economies (Garrote Sanchez et al., 2021; Antràs, 2020). The impact of the development of the digital economy on the labor market is particularly noteworthy. The development of artificial intelligence has a substitutive effect on the need and opportunities for human capital utilization. This is particularly true for traditional labor-intensive industries. This may lead to an increase in unemployment and structural changes in labor demand (Acemoglu et al., 2022; Dauth et al., 2020). At the same time, the possibility of developing regional markets through the use of the internet in the creation of GVCs is emphasized (Gan et al., 2025; Egwuonwu et al., 2022). The digitization of services promotes the matching of supply and demand and supports cooperation at the local and global levels, giving new impetus to glocalization processes (Foster, 2024; Stryabkova et al., 2021).

Research also shows that attitudes toward digital data are changing. It is no longer treated solely as a factor of production, but as a valuable strategic resource that is subject to dynamic market circulation. Data is a new form of capital whose value increases as digital ecosystems develop. It is the essential fuel for the dynamic development of AI and machine learning. It drives innovation and optimizes processes in organizations and entire economies. It allows for a deeper understanding of customer needs and enables them to be met. Digital data (processed by AI algorithms) allows for the generation of new products, the optimization of services, and more accurate business decisions (Nayak et al., 2024; Sadowski, 2019).

In the regulatory context, the literature analyzes the issue of legal frameworks aimed at regulating the digital services market and global trade in digital services (Robbins, 2018; Talar 2018). In particular, there are growing geopolitical tensions between the main players on the global stage – the United States, the European Union and China. The emergence of a “digital trade imbalance” resulting from the asymmetry between the pace of innovation and the regulatory capabilities of states is emphasized (Zu et al., 2022; Aaronson, 2016). Lack of trust in the use of digital data, the growing role of artificial intelligence, and problematic internal policies adopted by Big Tech companies are contributing to the tendency to extrapolate regional regulations to the global market. An example of this is the European Union's policy leading to the implementation of the Digital Markets Act (DMA) and the Digital Services Act (DSA), which fundamentally changes the rules of access to the European market (Jaskiernia, 2025). Through the implementation of regulatory instruments, the EU seeks to impose values such as transparency, AI ethics, and privacy protection. China is actively pursuing external expansion through the implementation of the “Digital Silk Road” project, exporting its own standards for digital services to developing countries (Eguegu, 2022; Triolo et al., 2020). The American model of digital services is based on the ideology of complete freedom on the internet. In this view, the internet is a space where large corporations from Silicon Valley shape the conditions for the development of the digital market. It is based on defending the free flow of data and opposing any attempts by third countries to tax digital services.

An international rules system on digital trade that can satisfy multilateral interest appeal has not been formed yet despite the rapid growth of digital services trade (Wang et al., 2024). The rivalry between superpowers for dominance in cyberspace manifests itself through the implementation of antagonistic political and technological models. However, the further development of digital services trade requires the creation of multi-layered agreements (Digital Economy Agreements – DEA) that will regulate not only market access, but also data transfer and AI standards (Burri et al., 2025; Lafuente et al., 2024). Given the extremely different approaches to trade regulation represented by the US, China, and the EU, this task appears to be very difficult. The strategic challenge remains to develop globally acceptable Data Free Flow with Trust, which will enable trade to continue in conditions of growing systemic mistrust.

3. Methods

This study attempts to answer the following research questions:

1. What are the differences and similarities in the development of the value and dynamics of foreign trade in digitally deliverable services between the European Union and the United States in the years 2010-2024?
2. What is the significance of foreign trade in digital services for the EU and US economies, including in the context of mutual trade?
3. Is there a need to increase protectionism in the European Union's relations with the United States in the digital services sector in the context of the process of shaping new international trade rules after 2024 initiated by D. Trump?

To verify the research question and achieve the set objective, the following research methods were used: critical analysis of source literature, comparative analysis and secondary data analysis, as well as logical reasoning and deduction. The analysis examined, among other things, the shares in global exports and imports of digital services; growth rates of EU and US exports and imports of digitally delivered services for the years 2010–2024; the shares of digital service exports and imports in total EU and US trade in services, the ratios of exports/GDP and imports/GDP and US trade in digitally delivered services by the European Union. The study was conducted on the basis of data available in national and international reports, including those of the UN, WTO, European Commission (EC), and public statistics. The basis was provided by the databases of the United Nations Conference on Trade and Development (UNCTAD) and the Commerce Bureau of Economic Analysis in the U.S. Department of Commerce. The time frame of the research mainly covered the years 2010-2024, but relevant data and information for 2025 were also taken into account.

The issue addressed is broad and multifaceted, therefore, due to editorial requirements, this article focuses on presenting the most important and selected issues. The research was also limited by gaps in statistical data on trade in digital services between selected economies and the reporting of export and import volumes in different currencies, i.e., US dollars or euros. These limitations were partially overcome by using various data sources and currency conversions where necessary.

4. Results

4.1. Foreign trade in digitally delivered services – a comparative analysis of the United States and the European Union

The United States is the leader in foreign trade in digital services, with a 15.5% share of exports and an 11.4% share of imports in 2024. Among EU members, Germany ranks highest in both exports (4th place) and imports (3rd place). (Table 1). The European Union's share of digital services exports was 38.7% and 42.9% of imports. Comparing the data in this way, the EU was the clear favorite.

Table 1.

Leading exporters and importers of digitally delivered services in 2024

Rank	Exporters	Value [Billion USD]	Share [%]	Rank	Importer	Value [Billion USD]	Share [%]
1	USA	741	15,5	1	USA	455	11,4
2	United Kingdom	488	10,2	2	Ireland	402	10,1
3	Ireland	425	8,9	3	Germany	273	6,9
4	Germany	280	5,9	4	United Kingdom	220	5,5
5	India	276	5,8	5	Netherlands	194	4,9
6	China	221	4,6	6	France	178	4,5
20	Poland	54	1,1	22	Poland	41	1,0

Source: WTO (2025).

In 2024, US exports in digitally deliverable services generated \$759.9 billion, up from \$329.3 billion in 2010. Thus, the US recorded a 230% increase. Analyzing the data in a chain-linked manner, a clear upward trend can be seen. Digitally deliverable services exports represented 64% of all US services exports in 2023. The value of digital services purchased followed a similar pattern. It increased by 213%, from \$219.6 billion in 2010 to \$468.4 billion in 2024. In this case, a steady upward trend was also observed, with the exception of a slight decline in 2018 (see fig. 1).

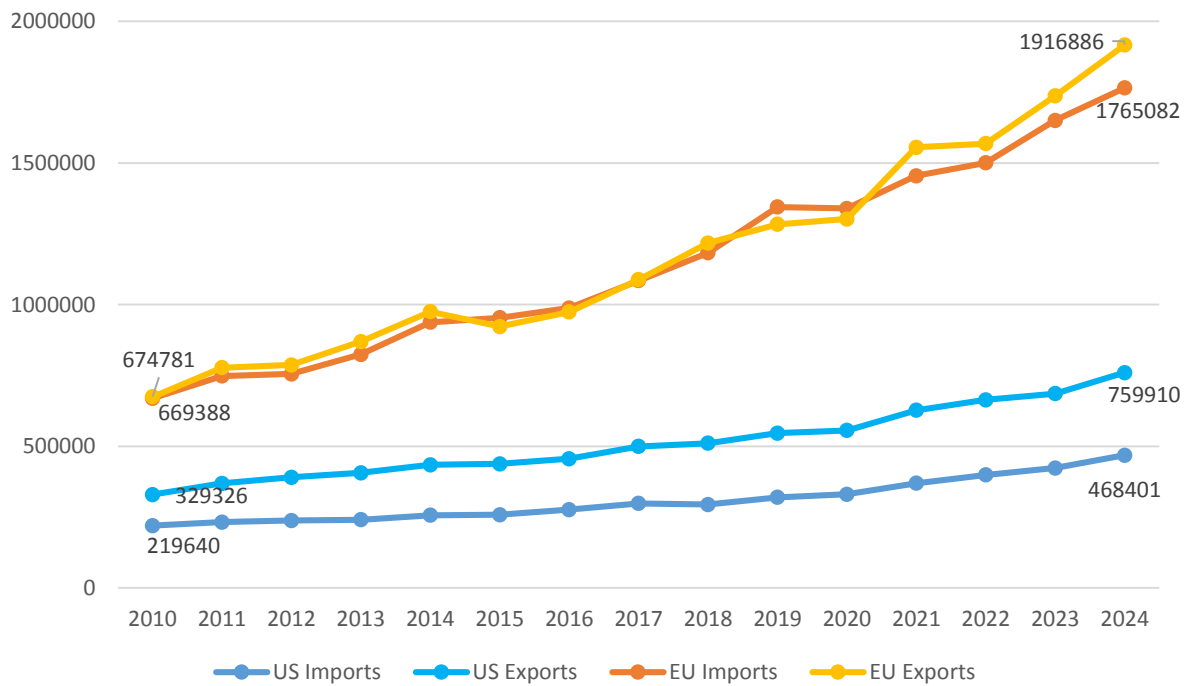


Figure 1. US and UE exports and imports in digitally delivered services in the years 2010-2024 [in millions USD].

Source: the author's own work based on UNCTAD Data Center (UNCTAD, 2025).

According to data for 2022, the largest share in creating US added value in the digital economy was contributed by: e-commerce (35.9%), telecommunications services (27.9%), cloud services (11.5%), Internet and data services (9.3%) and all other priced digital services (15.4%) (United States Chamber of Commerce, 2024). The most crucial parts of technology and online services are: (1) Software and Services on the Cloud (2.) Money-Related Technology (Fintech); (3.) The Places for Streaming and Making Things (4.) Using AI and Looking at Data (Import Globals, 2025). The US Department of Commerce (2024) estimates that approximately 8.9 million people work in jobs related to the digital economy in nearly every sector and industry.

Fig. 1. also presents data on the European Union's foreign trade in digital services. In 2010, exports of digital services generated revenues of \$674.8 billion, and in 2024, this figure rose to \$1,916.9 billion. The EU thus recorded an increase of 284%. Between 2020 and 2024, there was a steady increase in revenues from exports of digital services, with the only exception being a slight decline in 2015. The value of digital services purchased by the EU also increased during the period analyzed, from \$669.4 billion in 2010 to \$1,765.1 billion in 2024. Over the 15-year period studied, EU imports of digital services increased by almost 264%. Slight declines were recorded in 2019-2020.

In 2024, more than 10 million people in the EU worked as ICT specialists, representing 5% of total employment. The share of ICT specialists in the EU has been increasing over the last decade, and has risen by 1.6% since 2014. Among the EU countries, the share of employed

ICT specialists was the highest in Sweden (9%), Luxembourg and Finland (both 8%). The smallest shares were observed in Greece and Romania (both 3%) (EC, 2025).

A comparison of US and EU foreign trade data for digital services shows that exports and imports grew in both cases, but the EU recorded higher growth rates. The EU also generated higher values for both exports and imports throughout the entire period under review. The growth rate of the share of DDS exports in total trade in services was higher for the EU (an increase of 11.4 pp) than for the US (an increase of 9.34 pp). The growth rate of the share of DDS imports in total trade in services was also higher for the EU (an increase of 9.83 pp) than for the US (an increase of 5.38 pp) – see Table 2.

Table 2.

Share of digital services in total trade in services [in %]

Economy	United States		European Union	
	2010	2024	2020	2024
Exports	56.58	65.92	46.49	57.93
Imports	50.32	55.70	50.43	60.29

Source: the author's own work based on UNCTAD Data Center (UNCTAD, 2025).

However, an important element in the comparative analysis of foreign trade is the trade balance. Data in this regard is presented in fig. 2. The US trade balance in digitally deliverable services was positive throughout the period 2010–2024 and grew steadily, which should be viewed positively. In the base year, the US trade surplus was \$109.7 billion, and in the target year it was already \$291.5 billion. The US recorded an impressive increase of 266%.

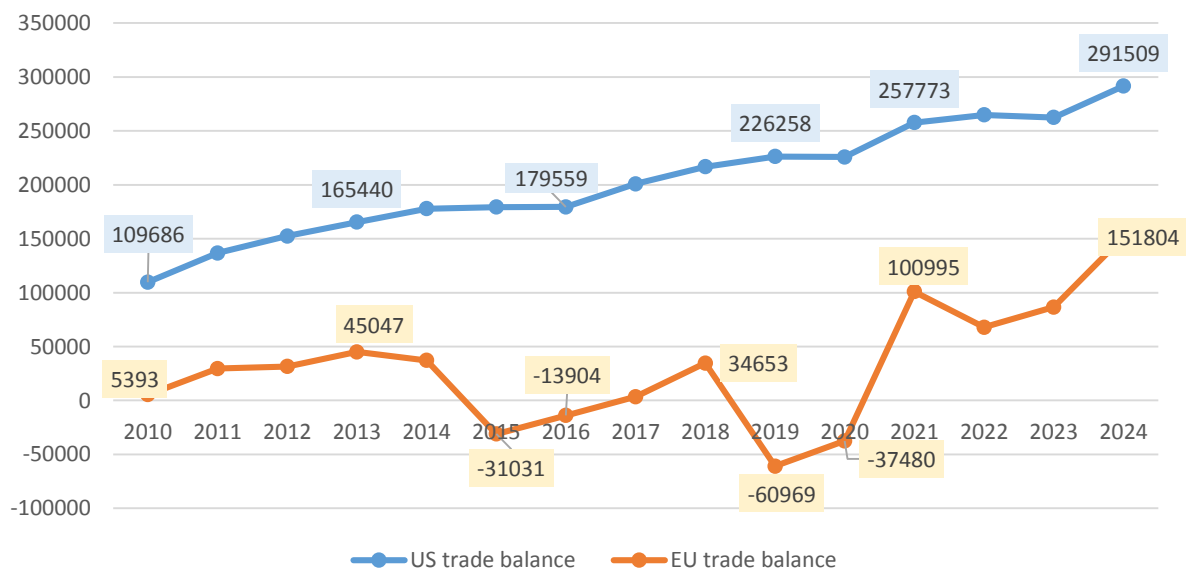


Figure 2. US and UE trade balance in digitally delivered services in the years 2010–2024 [in millions USD].

Source: the author's own work based on UNCTAD Data Center (UNCTAD, 2025).

In turn, the EU's trade balance in digitally deliverable services varied during the period analyzed. In 2020, it amounted to \$5.4 billion, and in 2024, to \$151.8 billion. The EU thus recorded an impressive increase of over 2800%. The growth rate of the balance under review was higher than in the US, but the value of the digital services balance was significantly higher throughout the period in favor of the US. In addition, it should be noted that the EU recorded a trade deficit in the following years: 2015 (-\$31.0 billion); 2016 (-\$13.9 billion) and 2020 (-\$37.5 billion).

The export rate indicates a country's economic potential and its competitiveness in relation to its trading partners. The higher it is, the better for the economy. During the period under review, the export rate of DDS increased. In the case of the US, from 2.2% in 2010 to 2.6% in 2024, and for the EU from 5.5% to 10.7%. The export rate and its growth dynamics were more favorable for the EU (see tab. 3).

Table 3.

The ratio exports/GDP and imports/GDP [in %]

Economy Year	United States		European Union	
	2010	2024	2020	2024
Exports/GDP	2.2	2.6	5.5	10.7
Imports/GDP	1.5	1.6	5.4	9.9

Source: author's own calculations.

The years under review also saw an increase in the import rate: from 1.5% to 1.6% for the US and from 5.4% to 9.9% for the EU (tab. 3). In relation to the US, this indicator is relatively low, which should be viewed positively from the perspective of the US economy. The lower it is, the lower the economy's dependence on foreign imports. The import rate indicates a greater dependence of the EU on imports of digital services. At the same time, it should be emphasized that these imports can improve the structure of services available to a given economy, which may have a positive impact on further economic growth.

4.2. UE-US trade in digital services

In 2024, total EU-US trade in services was worth around \$964 billion. \$569 billion was worth of EU imports from the US and \$395 billion worth of EU exports to the US. With regard to trade in services (including digital services), the EU had a deficit of almost \$175 billion. The main services in both export and import mostly fall into the category of digital services. These include, among others: Professional, scientific, and technical services; Telecommunications, computer and information services and Charges for the use of intellectual property (tab. 4.)

Table 4.*Top services the EU exports to the US and the EU imports from the US*

Top services the EU exports to the US	Top services the EU imports from the US
Professional, scientific, and technical services	Charges for the use of intellectual property
Telecommunications, computer and information services	Professional, scientific, and technical services
Transport	Telecommunications, computer and information services

Source: UE-US trade..., (2025).

The latest data (tab. 5) also show that the US trade balance with the European Union in digitally delivered services amounted to \$104.5 billion in 2023. Thus, the EU market accounted for approximately 41% of the US trade surplus in digitally delivered services. For the euro area, the balance was \$97.3 billion in 2022 and \$107.6 billion in 2024, respectively.

Table 5.*USA trade in digitally delivered services by European Union or selected countries in the years 2022-2024 [in Millions of dollars]*

Item	Digitally deliverable services exports			Digitally deliverable services imports			Digitally deliverable services trade balance		
	2022	2023	2024	2022	2023	2024	2022	2023	2024
All countries	641503	659675	729646	382689	404753	447589	258815	254923	282057
EU	191641	(D)	(D)	87181	97755	104938	104459	(D)	(D)
Euro area	176015	(D)	199678	78666	87606	92061	97349	(D)	107617

(D) Suppressed to avoid the disclosure of data of individual companies. Release Date: July 3, 2025.

Source: the author's own work based on: U.S. Bureau of Economic Analysis..., (2025).

Although some of the data in tab. 5. is covered by statistical confidentiality, the available data provides a sufficient description of the issue in question. In summary, the EU achieved higher values for exports and imports of digital services, but it was the US that “earned” from the exchange of these services as a net exporter, which usually has a positive impact on gross domestic product (GDP) growth and strengthens the national currency.

5. Discussion

Guinea and Sharma (2025) point out that the EU's weaker position compared to the US in terms of effective trade in digital services stems from the fact that the economic contribution of the European ICT sector remains significantly lower than that of the US ICT sector. The reason for this is insufficient investment in European Union's intangible assets, which is strongly linked to lower overall productivity and digital regulations adopted at the EU level. Erixon et al. (2024) point out that between 1995 and 2020, the share of investment in intangible capital relative to gross value added (GVA) was on average 5 pp higher in the US than in the EU. There are also differences in investment in ICT infrastructure. Between 2015 and 2020 alone, US investment in this area increased by almost 16 pp, while in Europe it increased by only

3 pp (Thales, 2024). In addition to EU's declining productivity relative to the US and China, Draghi (2024) highlights factors such as high energy costs, excessive regulation of businesses, and fragmentation of the internal market. The result is weaker EU productivity growth and a slowdown in the diffusion of ICT, which slows down the digital transformation.

Sisto et al. (2024) point to two global forces changing Europe's digital future. First, the growth in demand for European Union digital services from outside Europe. Secondly, the maturation and development of digital service industries at an extraordinary pace, where capital investment is now on par with many manufacturing sectors. It is therefore clear that the EU must take strategic action to further Europe's digital transformation, including the development and foreign sales of digitally deliverable services. The EU has set itself two main goals for the digital transformation of businesses by 2030, as indicated in the Digital Decade Program: more than 90% of SMEs should reach at least a basic level of digital intensity, and 75% of EU companies should use cloud computing services, perform big data analysis, or use big data.

Since 2025, there has been a lively debate on restrictions on trade in services between the EU and the US, triggered by Trump's introduction of tariffs on goods (Kokuashvili, 2026; Alcidi, 2025; Bickenbach et al., 2025; Hong, 2025). Despite the existence of international agreements, average barriers to trade in services are higher than in trade in goods (Kersan-Škabić, 2020). According to a recent report from the OECD (2024), barriers to digitally-enabled services increased by 25% globally between 2014 and 2023, a trend “driven by increasing regulatory hurdles that affected communication infrastructures and data connectivity”. It is also known that certain barriers have a dampening effect on the export performance of digital services, e.g., barriers related to payment systems and intellectual property rights (Wang et al., 2024).

The new US trade policy, formulated in early 2025 by Donald Trump's second administration, is a continuation and intensification of the “America First” paradigm. Its main objective is to structurally reduce the trade deficit through the use of extensive tariff instruments, strengthen the protection of sectors considered strategic, and favor bilateral negotiations over multilateral mechanisms (Heerman, 2026). The implementation of this policy involves discretionary and executive actions. The consequence of this is uncertainty and risk for global market participants and a lack of predictability.

In response to the new geopolitical conditions, the EU is considering the possible introduction of new trade restrictions (e.g., investment restrictions; license suspensions; exclusion of companies from public tenders; revocation of patents; tax increases for European branches of corporations; financial penalties; or the use of countervailing measures (ACIs), which may largely focus on American tech giants. Europe is undoubtedly an important market for the largest American technology companies. This dependency is also a source of strength in EU negotiations. The possible introduction of further restrictions on trade in digital services would create additional barriers to the international exchange of digital services, which would result in the risk of increased costs for the entire digital economy. Political risks cannot be ruled out either.

6. Summary

The extremely rapid development of digital services, resulting in a systematic increase in digitally delivered services in US and EU trade, justifies the need for in-depth and extensive research in this area. However, the statistical data collected in this field is not homogeneous due to different definitions of digital services, including the inclusion of different categories/types of these services. There is a clear gap in the available public statistics or data sources regarding the clear separation of total digitally deliverable services exports and imports in trade with individual trading partners. Such data are fragmentary or often subject to statistical confidentiality, which hinders the research process and drawing conclusions.

The analyses conducted indicate that foreign trade in digitally delivered services in both the EU and the US has shown a clear upward trend. This applies to exports, imports, and the trade balance. This can be considered a similarity between the entities being compared. The results of the study indicate a clear advantage for the EU in terms of total digitally services exports and imports in 2010-2024 (i.e., with all trading partners). The US achieved lower values over this long period, but during the fifteen years studied, it always achieved an overall trade surplus, which grew steadily. Thus, digitally services trade plays an important role in the economic development of the United States, as confirmed by the growing export rate. These are the main differences identified in the comparative analysis. The reasons for the EU's weaker position are: low investment in intangible capital and the ICT sector, high energy costs, lower productivity, and regulations on digital services. Nevertheless, studies have also shown the growing importance of foreign trade in digital services for the EU economy. Differences in EU-US trade relations also extend to the types of digital services exchanged between the two.

Research confirms the need to increase protectionism in trade in digital services between the European Union and the United States, particularly in the context of Donald Trump's new trade policy. Trump's tariff policy has ushered in a new era of international trade operating in unpredictable and difficult market conditions. Based on the research conducted, it can be concluded that mutual trade in digitally delivered services between the US and the EU also results in a positive trade balance for the United States. That is why American Big Tech companies have recently become the focus of the EU's attention. The EU is considering introducing new instruments to restrict their activities. Decisions in this area are not easy because they require taking into account many factors, including dependence on certain digital services, building relations with the most important economic partner, i.e., the US, but also the unpredictability of Donald Trump's customs policy. There are many dilemmas, and 2025 may go down in the history of global trade as a new era of slowing trade liberalization in favor of protectionism.

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A MODERN APPROACH TO QUALITY CONTROL IN THE ELECTROTECHNICAL INDUSTRY: FROM THEORY TO PROCESS OPTIMIZATION

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Purpose: The aim of the study is to identify the causes of non-compliant products and evaluate the effectiveness of the implemented EOL system. In particular, the work focuses on identifying the causes of non-compliant products and implementing improvements in the form of an End of Line (EOL) system, enabling full control of products. These activities are aimed at improving key quality indicators (PPM - Parts Per Million and FPY - First Pass Yield) and increasing the reliability of products. The evaluation was based on key quality indicators: PPM (Parts Per Million) and FPY (First Pass Yield).

Design/methodology/approach: The study was of an applied nature and was based on the analysis of the internal documentation of the company, participant observation of the production process and the analysis of PPM and FPY quality indicators. In order to identify the causes of quality problems, quality management tools were used, in particular the Ishikawa diagram and process data analysis. Then, an improvement was implemented in the form of an EOL database system enabling 100% control of products and recording of results in real time.

Findings: As a result of the implementation of the EOL database, the effectiveness of the quality control process in the cable harness manufacturing company was significantly improved. Before implementation, the average PPM was around 8500, which meant a relatively high number of defective products reaching customers. After the implementation of the system and stabilization of the process, the PPM value dropped to 0 in weeks W41-W44, which confirmed the complete elimination of non-compliant products shipped to recipients. At the same time, FPY initially declined significantly, as closer control allowed to detect previously hidden quality problems. After stabilizing the process, FPY reached a level of about 93-97%, which indicates improved production efficiency and greater efficiency in detecting and eliminating defects in the process.

Limitations/implications of research: The limitation of the conducted research is its implementation in one manufacturing company, which may limit the possibility of direct generalization of the results to other industries or organizations with different specifics of production processes. At the same time, the results obtained indicate a great potential for the use of integrated IT systems and full product inspection as an effective tool for improving quality processes in industrial enterprises.

Practical implications: The implementation of the EOL system made it possible to significantly increase the effectiveness of quality control through full traceability of products and the elimination of defective products before they were shipped to the customer. The results obtained indicate that the integration of IT tools with the quality control process can significantly reduce the costs of complaints, improve product reliability and increase the competitiveness of the company.

Social implications: The implementation of more effective quality control systems contributes to increasing the safety of end users, especially in highly responsible industries such as the medical sector. At the same time, improving product quality and reliability strengthens customer confidence in manufacturers and supports the development of responsible and safe technologies in society.

Originality/value: The originality of the work consists in combining classic quality management tools with the practical implementation of an IT solution supporting full product control in the manufacturing company. The value of the study is to present a real case of optimization of the quality control process and to confirm the effectiveness of the solutions used on the basis of measurable quality indicators.

Keywords: quality control, quality management, electrotechnical industry, Industry 4.0, process optimization.

Category of the paper: Empirical article.

1. Introduction

Modern manufacturing companies, including those in the electrotechnical industry, operate in conditions of growing market competition and increasingly stringent customer requirements regarding the reliability and quality of products. In highly responsible industries such as medical, telecommunications or automotive, ensuring flawless quality control is no longer just an optional choice, but an absolute necessity under international standards such as ISO 9001 or IATF 16949. Any non-compliance of a product that reaches the customer – e.g. in the form of defective cable harnesses used in electronic devices – generates not only direct costs of complaints and alterations, but above all a long-term risk of loss of consumer trust, a decline in market share and regulatory penalties. The modern approach to quality control is evolving from traditional manual methods towards advanced, integrated digital systems that fit into the concept of Industry 4.0 and Quality 4.0, combining the theory of quality management with technologies such as artificial intelligence (AI), the Internet of Things (IoT), Big Data analysis and vision systems. The following white paper illustrates the process of diagnosing and improving quality control steps using the example of a cable harness company, illustrating the transition from theoretical foundations – such as quality control (defect monitoring) and quality assurance (systematic planning) – to practical process optimization using tools such as FMEA (Failure Mode and Effects Analysis), Pareto diagrams or predictive AI models.

2. The evolution of the concept of quality in the literature on the subject

There is no single, universally accepted definition of quality in the literature, which results from its complexity and subjective nature, and the modern approach presented by newer literature (e.g. Hamrol, 2020; Kowalik, 2017) has evolved from simple compliance with the specification to comprehensive customer satisfaction management.

One way to understand quality is to define it as compliance with a specification, which means that a product or service should meet established requirements and standards in order to be considered high-quality products (Feigenbaum, 1951).

Quality can be defined as achieving the highest level of standard, i.e. the production of a product that effectively fulfils its purpose for the user. It can also be considered by the presence or absence of certain product features, as well as by minimizing and preventing potential losses (Tuchman, 1980; Juran, Gryna, 1988; Taguchi, 1987).

According to C. A. Reeves and D. Bednar, quality can be defined as value, compliance with specifications or meeting the customer's expectations, while K. Ishikawa emphasized that quality control is a process involving research, development and design, which requires the involvement of the entire organization – from top management to operational staff, and in more recent studies (Mroczko, 2012) quality is defined as a feature that determines the degree of excellence of a product or service. A key element of quality management systems are standards such as ISO 9001 (general management system) or the industry-specific ISO 13485 dedicated to medical devices, which force manufacturers to switch from control focused only on detecting errors to preventive actions, and the historical analysis of the concept of quality indicates its dynamic development – from simple technical inspection to comprehensive management systems covering every aspect of the organization's functioning, where quality has ceased to be perceived only as a feature of the finished product, and has become the philosophy of the entire company.

Initially, as can be seen in the genesis of quality systems, the emphasis was mainly on the final inspection of the product, and early standards such as the military standards MIL-Q-9858 of 1959 or the NATO AQAP standards of 1968 began to systematically push this boundary, with the key change in the evolution of thinking about quality being the understanding that the inspection of the finished product itself is a costly and inefficient process. because it only allows you to detect errors that have already occurred. Contemporary literature (Wawak, 2016) indicates that the foundation of an effective system is quality assurance, which means shifting attention from the output of the process (finished product) to its input – i.e. to the parameters of materials, input information and the course of production processes themselves, and such a preventive approach is considered a milestone in the development of management sciences.

The multidimensionality of quality is best reflected in the definitions of the classics, which have evolved with the needs of the market: W. Edwards Deming and Joseph Juran (whose work is the foundation of the modern approach) defined quality as "fitness for use", which for the first time put the consumer and his needs so strongly at the center of the manufacturer's interest, Philip Crosby introduced the concept of "compliance with requirements", which became the basis for many normative systems such as ISO 9001, and Kaoru Ishikawa, who was particularly relevant to the subject matter, revolutionized the concept of quality, claiming that the responsibility for quality control rested not solely with the quality control department, but with all employees – from top management to operational employees, promoting the integration of research, design and development activities into one coherent system aimed at customer satisfaction.

Quality control is a system of activities aimed at maintaining and improving the quality of products and services while meeting customer expectations. Responsibility for its implementation lies with all employees, not just the quality control department. Achieving the appropriate quality of products requires the use of appropriate methods of control and control of the production process. This allows for quick detection of non-conformities and the introduction of necessary corrections in the manufacturing process (Suhaili, 2008; Karaszewski, 2005).

The next stage of evolution was the pursuit of unification of quality requirements at the international level, where the need to assess the quality capabilities of suppliers led to the creation of the British standard BS 5750 in 1979, which became the direct basis for the international ISO 9000 series standards published in 1987, and this evolution led to the creation of industry systems even more restrictive and precise: ISO 13485 – dedicated to the medical industry (key for the audited company), where quality is defined not only through the prism of satisfaction, but above all patient safety and product reliability, IATF 16949 (formerly TS 16949) – in the automotive industry emphasizing the reduction of volatility and losses in the supply chain, and TL 9000 – a standard for telecommunications taking into account specific data transmission parameters.

Currently, the concept of quality in the literature (Hamrol, 2020; Szczepańska, 2011) is inextricably linked to the concept of TQM (Total Quality Management) and the process approach, where quality is no longer a static state, but a process of continuous improvement, and modern companies such as Company XYZ interpret quality through the prism of indicators such as PPM (Parts Per Million) and FPY (First Pass Yield), however, in the era of the fourth industrial revolution (Industry 4.0), quality is also defined by traceability, i.e. the ability to reconstruct the full history of the product: who, when and from what components made it.

3. Quality Control Instruments: Classic and Modern Tools

The research object was the production activity of Company XYZ, which is part of an international capital group operating in the field of electrical components and cabling systems. The processes of manufacturing selected elements of electrical installations, in particular power cables and other cable connectors used in various industries, were analyzed. The research focused on the organization of production in one of the production plants located in Poland, which is a key link in the global production system of Group XYZ. The plants belonging to the XYZ Group supply their products directly to many well-known manufacturers. One of the company's long-term partners is Philips, with which the company cooperates in the production of medical devices, such as defibrillators. The company's products also go to companies involved in the assembly of advanced electronic devices, including companies such as Apple, Microsoft and Dyson. The premise for undertaking the research was the diagnosed high permeability of non-compliant products at the final inspection stage during statistical random control (AQL), which generated unacceptable risks to patient safety and high complaint costs. One of the most important elements of the company's strategy is care for the high quality of the products offered. The company implements a quality policy that is based on continuous improvement of processes, reduction of errors and development of employee competencies. In the field of quality control, various tools and techniques of workshop diagnostics are used, such as 3D measurements, 5Why, FMEA analyses, Pareto diagrams, visual inspection, statistical quality control, non-destructive testing, and traceability systems. Currently, the management systems implemented in the production plant are in accordance with international standards: ISO 9001, ISO 14001, ISO 13485 (Quality Management System for Medical Devices), and ISO 45001.

The research was of an applied nature and was based on the analysis of internal documentation, qualitative indicators and participant observation. Two key indicators were used:

- PPM (Parts Per Million): The number of defective pieces per million products.
- FPY (First Pass Yield): The percentage of products that pass inspection the first time without corrections.

During the analysis of the final inspection stage (Stage III), it was found that the main cause of defects passing inspection was the statistical control used (according to AQL levels). Quality inspectors only checked a random sample from the batch. In the case of scattered (random) defects, there was a high probability that a defective item would not be included in the sample and would leave the plant.

Using the Ishikawa Diagram, the main causes of the problem were identified in the following areas:

- Methods: No 100% control and statistical limitations.
- People: Time pressure and lack of time for inspectors to check more samples.
- Machines: Lack of full test automation.

To systematically identify the root causes of non-compliant products reaching the customer, an Ishikawa diagram was developed (see Figure 1). The primary problem analyzed was the high leakage of defects, evidenced by an average PPM of 8500 during the pre-implementation phase. The analysis of the final inspection stage (Stage III) revealed several critical factors categorized into three main areas:

- Methods: The core issue was the reliance on statistical random control (AQL levels), which allowed scattered (random) defects to bypass inspection since inspectors only verified a sample of the batch.
- People: Inspectors worked under significant time pressure, which limited their ability to conduct more thorough or frequent verifications.
- Machines: A lack of full test automation and the absence of an integrated IT system for real-time data recording prevented 100% control and traceability.

This diagnostic process confirmed that the existing quality control tools were insufficient for the requirements of high-risk industries, such as the medical sector. These findings provided the necessary justification for the implementation of the EOL (End of Line) system, moving the company from statistical sampling to 100% preventive inspection to ensure compliance with ISO 13485 standards.

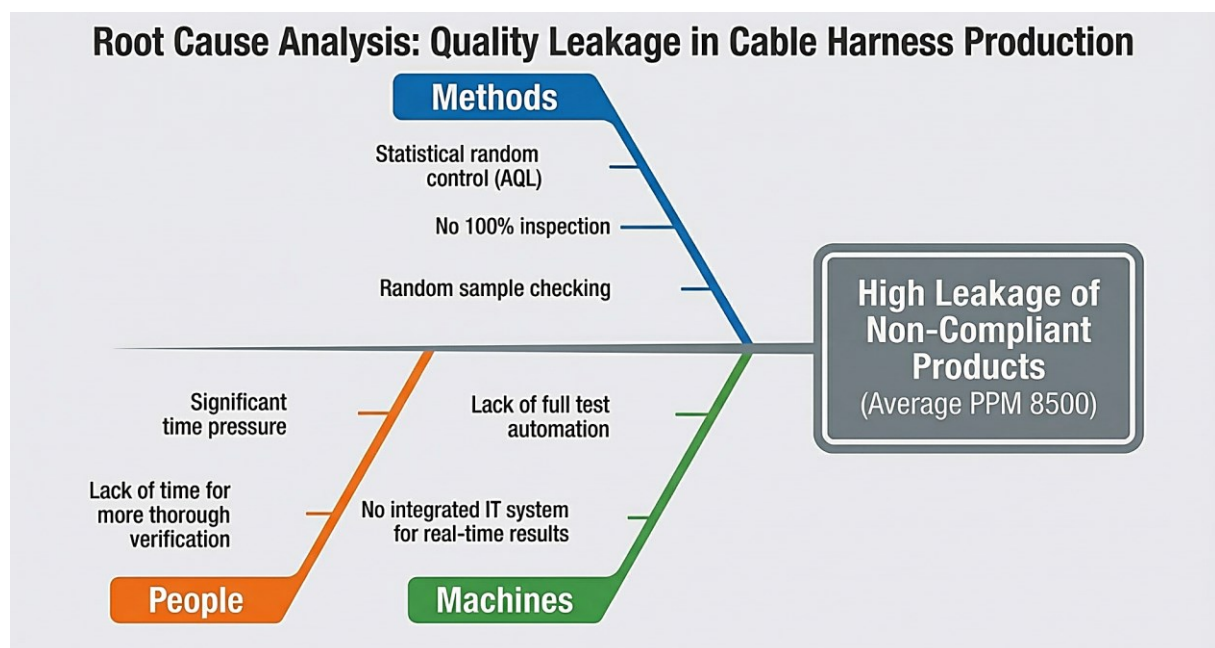


Figure 1. Ishikawa diagram for the causes of high defect leakage.

Source: own study.

4. Implementation of improvements: EOL Database - End of Line

As part of our own research, improvements were implemented in the quality control process by creating and integrating an EOL (End of Line) database at a dedicated control station in a cable harness manufacturing company, while the genesis of the project resulted from the diagnosed high permeability of non-compliant products at the final inspection stage, where the existing system based on statistical random control (AQL levels) did not allow for effective detection of defects distributed population, which in the medical industry – with a key customer such as Philips – generated unacceptable risks to patient safety and numerous complaints. The goal of the implementation was to switch to 100% inspection of each item, eliminating defective products before shipment to the customer, and the EOL database, built in the MS Access system and integrated with ERP, enabled the automation of Shop Order data retrieval, standardization of "Inspection Requirements" for each product model (Item), real-time recording of results with full traceability assigned to the serial number and operator.

The implementation process was carried out in March-April 2025 by an interdisciplinary team (quality, production, engineering) according to the schedule: in the preparation phase (03.03–12.03.2025), a requirements analysis was carried out and a team was appointed; during the installation period (13.03–17.03.2025), a physical station was prepared and the system was integrated with ERP; Subsequently, documentation was developed and training was carried out (18.03–08.04.2025); Finally, a pilot and full implementation (24.03–11.04.2025) was carried out with tests on batches of products and rebalancing of the line. The redefined process of final inspection (Stage III) has become two-stage: in the first step, the operator logs in to the EOL database, enters the order and line number, and then confirms the checklist of activities (no mechanical damage, verification of dimensions/lengths, correctness of contacts/orientations, label check), giving the status "OK" or "N-OK" with a description of the defect – "N-OK" products are placed in the quarantine zone at the engineer's decision. In the second step, the quality inspector performs a statistical verification of the sample as an additional layer of security.

The effects of the implementation were assessed on the basis of key quality indicators: the PPM (Parts Per Million) index dropped from an average of 8500 before implementation to 0 in weeks W41-W44, which confirmed the complete elimination of defective products reaching customers, while the FPY (First Pass Yield) indicator initially revealed real problems (a drop to 62.32% in W24 thanks to reliable detection), stabilizing at about 93% after stabilizing the process, which reflects real improvements in internal efficiency and compliance with Industry 4.0 requirements.

5. Analysis of the effects and conclusions

The results of the implementation of the EOL database in the process of quality control of cable harnesses were analyzed in three key time periods: before implementation (weeks (W) W12–W23 2025), during diagnosis and stabilization (W24–W32) and after full implementation (W33–W44), using industry standard indicators PPM (Parts Per Million) and FPY (First Pass Yield), which allowed for an objective assessment of the effectiveness of changes in the context of Industry 4.0 requirements and ISO 13485 standards for the medical sector. In the pre-implementation period (W12–W23), the average PPM rate reached a high level of 8500, indicating a significant number of defective products reaching customers (m.in. Philips), while the FPY was ostensibly 99.7%, which was due to insufficient error detection by operators on the production line – defects were passed on and only disclosed in external complaints, generating logistics, image and regulatory risks in the critical responsibility industry.

In the diagnosis and initial implementation phase (W24–W32), a sharp decrease in FPY was observed up to 62.32%, which was the result of increased reliability of fault identification within the plant thanks to the introduction of the EOL database and checklist – operators began to catch defects earlier, which revealed hidden process problems, at the same time PPM began to systematically decrease thanks to a better selection of "N-OK" products sent to quarantine, confirming the Pareto principle in the analysis of causes sources. After the process was stabilized and fully implemented (W33–W44), the PPM rate dropped to virtually zero (exactly 0 in weeks W41–W44), which meant that defective bundles reaching customers were completely eliminated and zero complaints during this period, while FPY stabilized at a satisfactory level of 93–97%, reflecting the balanced efficiency of the line with an additional 100% inspection step supported by traceability in the database.

Practical conclusions from our own research emphasize that the introduction of the EOL IT tool (integrated with ERP) at a dedicated workstation made it possible to move from statistical to preventive control, completely eliminating complaints and significantly improving reliability in high-risk industry conditions, while despite the increase in labor intensity by about 10–15% on the line (resulting from a full inspection), savings from avoided complaint costs (logistics, alterations, loss of confidence) turned out to be many times higher – an estimated reduction of losses by over 90% in the analyzed period. Further process improvement should focus on the full integration of the EOL database with MES/ERP systems for automatic real-time reporting, the implementation of AI for the analysis of quality trends (e.g. defect prediction based on historical data), and the extension of automation to vision sensors and electrical tests, which will strengthen compliance with the Industry 4.0 concept and allow for further FPY growth above 98%.

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ENERGY TRANSITION MANAGEMENT IN POLAND IN LIGHT OF THE IBERIAN PENINSULA BLACKOUT: SYSTEM STABILITY CHALLENGES IN THE RENEWABLE ENERGY ERA

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Purpose: The purpose of this article is to analyze the implications of the April 28, 2025 Iberian Peninsula blackout for energy transition management in Poland. The study identifies key challenges related to the integration of distributed renewable energy sources (RES) in the context of transmission infrastructure and RES geographical distribution, formulating recommendations for energy policy based on the security of supply principle.

Design/methodology/approach: The study employs a triangulation methodology, combining descriptive case study analysis of the Iberian blackout with comparative analysis of power systems and conceptual modeling. The research procedure includes a systematic literature review (2022-2025), analysis of technical documents and reports from transmission system operators (ENTSO-E, Red Eléctrica de España, PSE), statistical data analysis regarding RES installed capacity structure and geographical distribution in Poland, and development of two conceptual models (ISSM and SETM). Artificial intelligence (AI) (Claude 4.5 Sonnet by Anthropic) was used to support the development of analytical models through: (a) structuring initial drafts of conceptual frameworks based on synthesized literature findings, (b) generating Mermaid diagram syntax for visual representation, and (c) iterative refinement through prompt-based interaction. All conceptual content, analytical insights, and final model structures were developed, validated, and approved by the authors.

Findings: The analysis revealed that the contemporary threat to system stability stems not from generation capacity deficit but from loss of control over power quality parameters (voltage and frequency) in environments with high variable renewable energy (VRE) penetration. Key findings include: the necessity of active RES participation in ancillary services, critical importance of transmission infrastructure synchronized with RES capacity growth dynamics, strategic role of large-scale energy storage, and the need to maintain cross-border resilience. The study identified that Poland's transmission system faces challenges of spatial mismatch between RES concentration areas and consumption centres, with grid connection permits already issued at a level four times the system's current capabilities.

Research limitations/implications: The study covers one case (Iberian blackout) and the Polish power system context, which limits full generalizability of results to other national systems with different configurations. Future research should include empirical verification of proposed models under various RES penetration scenarios.

Practical implications: The article provides practical frameworks for managing energy transition under high RES penetration. Two conceptual models (ISSM and SETM) can serve as reference tools for transmission system operators, energy regulators, and energy policy decision-makers. Recommendations address regulatory modernisation, grid infrastructure development, energy storage deployment, and spatial management of RES installations.

Social implications: Energy transition management requires development of institutional coordination mechanisms, employee digital competency building, and social dialogue regarding infrastructure investments. The study emphasizes the importance of balancing decarbonization objectives with energy supply security and economic competitiveness.

Originality/value: The article fills a research gap in applying lessons from specific power system destabilisation cases to national contexts undergoing intensive energy transition. The work integrates empirical blackout analysis with Poland-specific conditions, developing original conceptual models (ISSM and SETM) that synthesise structural and procedural dimensions of transition management while accounting for geographical RES distribution specifics and transmission system architecture.

Keywords: energy transition, power system stability, renewable energy sources, variable renewable energy, blackout, grid voltage management, transmission infrastructure, inverter-based resources.

Category of the paper: Research paper.

1. Introduction

Energy transition, defined as the process of transitioning from a system based on conventional sources to one dominated by renewable energy sources, represents a fundamental challenge for contemporary power systems (Wojtaszek, 2025). The April 28, 2025 blackout affecting Spain and Portugal revealed a new category of systemic threats not present in the synchronous generation dominance era (Red Eléctrica de España, 2025). This incident is particularly significant for Poland, a country implementing an ambitious policy to increase the share of renewable energy sources (RES) in its generation mix while simultaneously phasing out conventional capacity (Ministry of Climate and Environment, 2024).

The objective of this publication is a multifaceted analysis of the Iberian Peninsula blackout implications for energy transition management in Poland. Three specific objectives guide the study: identification of the systemic causes of the Iberian failure and assessment of their applicability to Polish power system conditions; development of conceptual frameworks for energy transition management that account for system stability challenges under high renewable energy source share conditions; and formulation of recommendations for Polish energy policy regarding RES integration, taking into account the specifics of geographical source distribution and transmission system configuration.

This study employs a triangulation methodology, combining descriptive case study analysis of the Iberian blackout with comparative power system analysis and conceptual modeling. The research procedure comprises the following stages:

- Stage 1: Systematic Literature Review – Analysis of scientific publications from 2022-2025 concerning energy transition, power system stability, and renewable energy integration was conducted. Literature search was performed in Scopus, Web of Science, and Google Scholar databases using keywords: "energy transition", "grid stability", "renewable energy integration", "voltage control", "system services", "inverter-based resources". A total of 87 publications were identified and analyzed, with 52 included in the results synthesis.
- Stage 2: Technical Document and Report Analysis – Detailed analysis was conducted of official transmission system operator reports (ENTSO-E, Red Eléctrica de España, PSE), European Union strategic documents, and international agency reports (IEA, BloombergNEF, 2025, World Economic Forum) published during 2024-2025.
- Stage 3: Statistical Data Analysis – Data was collected and analyzed regarding RES installed capacity structure in Poland, installation geographical distribution, and transmission infrastructure parameters, drawing on data from URE, PSE, and the Institute of Renewable Energy.
- Stage 4: Conceptual Modeling – Two conceptual models were developed: (a) the Integrated System Stability Management Model (ISSM) and (b) the Strategic Energy Transition Management Model (SETM). These models synthesise conclusions from the Iberian blackout analysis and Polish power system specifics. Artificial intelligence technology (Claude 4.5 Sonnet by Anthropic) was used as a research assistant in three limited, well-defined roles: (i) generating initial draft structural frameworks based on research findings already synthesised by the authors, (ii) producing Mermaid diagram syntax for visual model representation, and (iii) iterative reformatting and restructuring of drafts through structured prompts. The AI tool did not contribute original analysis, identify source materials, interpret empirical data, or determine the conceptual logic of the models. All analytical content, theoretical frameworks, empirical interpretations, the selection and weighting of model pillars and phases, and final model validation were developed exclusively by the research authors. This disclosure approach aligns with emerging scholarly standards for transparent AI use in academic research (Nature, 2023; Science, 2024).

2. Literature Review on Energy Transition Management

2.1. Evolution of the Energy Transition Paradigm

Contemporary literature on energy transition has undergone significant evolution in recent years, shifting emphasis from investment deficit issues toward dynamic demand management and ensuring social equity (Wojtaszek, 2025). Meta-analysis of the latest editions of Energy Technology Perspectives 2024 (IEA) and New Energy Outlook 2025 (BloombergNEF, 2025) reveals a fundamental shift in global energy transition trajectory, challenging the established literature thesis regarding electricity demand plateauing (Wojtaszek, 2025). Exponential growth of data centers serving artificial intelligence, intensifying heat waves, and rapidly growing electric vehicle fleets generate new demand vectors that, according to IEA and BNEF forecasts, will increase electricity demand by 2035 by over 2200 TWh compared to 2024 scenarios.

The World Economic Forum report *Fostering Effective Energy Transition 2025* indicates that the Energy Transition Index increased by 1.1 percent year-over-year, more than twice as fast as the three-year average, with the key success factor proving to be simultaneous grid modernisation and administrative procedure streamlining (World Economic Forum, 2025). Only 28 percent of countries managed to balance energy security, affordability, and sustainable development (World Economic Forum, 2025). The UN Energy Transition Report 2025 emphasizes that despite significant progress in renewable technology cost reduction, global energy-related CO₂ emissions increased in 2024 by 0.8 percent, reaching a record level of 37.8 billion tons, although emission growth rate slowed compared to previous years (UN, 2025).

2.2. Renewable Energy Source Integration Challenges

Research on RES integration focuses on identifying and mitigating technical challenges related to variable renewable energy (VRE) source variability. A systematic literature review conducted by Nwagu et al. (2024) identifies four main categories of RES integration impacts on power systems: stability and grid control, infrastructure challenges, energy storage and management, and intermittent source integration. The authors emphasize that utilizing RES electricity reduces greenhouse gas emissions, ensures generation mix diversification, and reduces excessive fossil fuel dependence, however integration of these systems encounters numerous technical and economic barriers.

A comprehensive review conducted by an international team indicates that RES integration costs grow exponentially above 30 percent penetration, reaching 25-40 USD/MWh at 50 percent share in the mix, requiring investments in energy storage and grid modernisation valued at USD 2.4 trillion globally in 2024-2030 (Ghodbane et al., 2025). Wind forecasting accuracy improved from 72 percent in 2010 to 96 percent in 2023, while solar production

forecasting accuracy increased from 68 percent to 94 percent, significantly reducing reserve requirements and integration costs (Ghodbane et al., 2025).

2.3. Power System Stability in the VRE Era

The impact of high-VRE penetration on frequency and voltage stability has been the subject of intensive research. Studies demonstrate that high penetration of renewable energy sources interfaced through inverter-based resources (IBRs) significantly affects grid spinning reserve due to the intermittent nature of these sources (Mondal, Mishra, 2022). Consequently, low-inertia grid spinning reserve becomes intermittent, and generation loss can lead to frequency stability problems. The authors identify additional problems occurring in low-inertia grids, such as low short-circuit ratio and system strength, protection device setting changes, and reduced fault ride-through capability.

The CIGRE/IEEE Joint Working Group on voltage stability assessment has emphasized that controllers implemented on IBRs exert a significant influence on both short-term and long-term voltage stability (CIGRE, 2023). Classical power system stability theory highlights the fundamental role of reactive power balance, excitation control, and system strength in preventing voltage collapse phenomena (Kundur, 1994). The presence of IBRs at distribution voltage levels contributes to the dynamic behavior of the power grid, requiring voltage stability assessment methods to incorporate these facts to ensure accurate capture of voltage stability limits (IEEE PES, 2022). Technical challenges include the limitation on output current of IBRs, which is a crucial factor for voltage instability in systems with high VRE penetration (CIGRE, 2021).

Research on optimizing renewable energy integration in modern power grids indicates that with growing variable VRE penetration, grid operators face serious stability problems, including frequency fluctuations, voltage instability, and reduced system inertia (QIT Press, 2025). This work synthesises technical approaches and policy frameworks necessary to support resilient, decarbonised power systems, emphasizing the importance of advanced forecasting models, real-time grid control technologies, energy storage systems, and demand response mechanisms.

2.4. Energy Storage System Role

A comprehensive review published in 2025 analyzes the role of energy storage systems (ESS) in overcoming technical challenges related to large-scale intermittent RES integration (Al-Wahedi et al., 2025). The authors emphasize that although global ESS deployment reached 27 GW in 2023, further intensification is required, particularly regarding battery systems and pumped-storage hydropower. The study provides detailed analysis of various storage system types, including mechanical, electrochemical, electrical, thermal, and chemical, identifying their specific strengths and limitations for supporting grid flexibility and increasing RES adoption.

Chinese experience in energy transition provides empirical evidence of energy storage and grid infrastructure investment effectiveness. Battery storage investments in China increased by 69 percent from the first half of 2024 to the first half of 2025, while grid investments increased by 22 percent (Ember, 2025). Battery storage installed volume tripled over three years to 2024, with China adding more capacity in 2024 than the US and EU combined. Clean generation (wind, solar, other renewable, and nuclear) growth in China accounted for 84 percent of electricity demand growth in 2024, and in the first half of 2025 exceeded demand growth, resulting in a 2 percent decrease in fossil fuel generation (Ember, 2025).

2.5. Energy Transition in Developing Countries

Research on energy transition in developing countries reveals specific structural challenges differentiating these processes from transitions in developed countries. While in developed economies decarbonization objectives and technological progress constitute the main transition determinants (Markard, Rosenbloom, 2022; Li et al., 2022), in emerging economies energy transition represents a complex undertaking encompassing poverty alleviation, electrification, and institutional strengthening (Nasir et al., 2022; Li et al., 2021; Shittu et al., 2024). At the micro level, household energy stacking practices, weak financial systems, and ineffective regulatory frameworks constitute main constraints characteristic of developing country environments (Bajpain, Koul, 2025; Ferdoush et al., 2024).

2.6. Systematic Approach to Energy Transition

Turner et al. (2024) conducted a systematic review of the path to inclusive and sustainable energy transition, identifying strong policy frameworks, technological progress, economic incentives, and international cooperation as key success factors. Utilizing comprehensive literature search from 2001-2023 in the Scopus database, the study identifies energy literacy as a key element for social acceptance and participation, supporting informed decision-making and behaviors conducive to renewable energy initiatives. Energy justice ensures equitable access to energy transition benefits, while case studies of Nordic countries, Germany, and Poland reveal diverse approaches and significant progress, providing valuable lessons for global application.

2.7. Research Gap and Publication Contribution

The literature review reveals a significant research gap regarding application of lessons from specific power system destabilisation cases to national contexts undergoing intensive energy transition. While literature provides rich theory regarding RES integration challenges and a wide range of technological solutions, comprehensive analyses linking empirical failure experience with national energy transition plan specifics accounting for geographical source distribution and transmission system architecture are lacking. This study fills this gap through

a detailed analysis of the April 2025 Iberian blackout in the Polish power system context, formulating specific recommendations based on conceptual modeling integrating failure lessons with local technical and spatial conditions.

3. Iberian Peninsula Blackout Characteristics

The April 28, 2025 event represents one of the most significant large-scale voltage stability disturbances in recent European power system history (ENTSO-E, 2025). According to the technical assessment published by Red Eléctrica de España (2025), the incident evolved under stressed voltage control conditions in the transmission network. Contrary to early public speculation, the disturbance was not attributed to renewable overproduction or cyber interference, but rather to a progressive loss of effective voltage regulation capability under specific operating circumstances.

Cascading disconnection of conventional units (nuclear, gas, and coal) followed the activation of internal protection mechanisms designed to prevent equipment damage once operational thresholds were exceeded (Red Eléctrica de España, 2025). As voltage control conditions deteriorated, the progressive withdrawal of synchronous generation reduced system strength and reactive power support, accelerating destabilisation dynamics within a relatively short timeframe.

Independent expert reports and the official Spanish government position (Gobierno de España, 2025) identify three structural factors underlying the cascade. Energy isolation played a central role: limited interconnection capacity with the continental European grid prevented effective external assistance after an N-1 security criterion violation (ENTSO-E, 2025), and the peninsula's connections proved structurally inadequate relative to total system size. Operational coordination also proved challenging, as post-event analyses identified sequencing difficulties in activating available voltage and frequency control resources under stressed conditions. Finally, the absence of RES participation in ancillary services was critical: regulations in force before the incident excluded photovoltaic and wind installations from active grid voltage regulation, reserving those functions exclusively for conventional units (Red Eléctrica de España, 2025).

A structural element of particular relevance is the historically limited interconnection capacity of the Iberian Peninsula with the rest of continental Europe. For many years, the interconnection ratio remained below the European Union's 10% benchmark of installed capacity (European Commission, 2015). Although improvements have been implemented, the peninsula remains comparatively weakly coupled to the continental grid, reducing its ability to rely on external voltage and frequency support during stressed system conditions.

In parallel, the rapid expansion of inverter-based renewable generation has progressively reduced the share of synchronous inertia in the system. As documented in the literature (Ulbig et al., 2014; ENTSO-E, 2023), low-inertia systems are more sensitive to disturbances and exhibit faster dynamic responses, requiring enhanced coordination of voltage control and ancillary service provision. The April 2025 event therefore illustrates a broader integration challenge rather than a technology-specific failure.

The disturbance, which lasted up to eighteen hours in certain regions, caused significant disruptions to transport, telecommunications, and industrial activity, underlining the systemic importance of electricity infrastructure in advanced economies. Paralysis affected transport infrastructure, including complete suspension of AVE high-speed rail traffic and grounding of flight operations at major airports (Gobierno de España, 2025). Telecommunications network interruptions hampered emergency service coordination and crisis communication. The industrial and agricultural sectors sustained measurable financial losses resulting from sudden power disconnection of production processes sensitive to power supply interruptions.

4. Polish Context: RES Development and Transmission Infrastructure Status

According to Energy Market Agency data, at the end of August 2025, RES installed capacity in Poland reached 36.5 GW, representing a 14.5 percent increase compared to the same period of the previous year (Rynek Elektryczny, 2025a). In the RES installed capacity structure, photovoltaics currently dominates, with capacity exceeding 23.6 GW, constituting approximately 65 percent of all renewable energy source capacity (Rynek Elektryczny, 2025a). Wind energy ranks second with installed capacity of 10.4 GW, accounting for 28.5 percent of RES capacity (Rynek Elektryczny, 2025a).

Geographical distribution analysis of wind farms indicates their strong concentration in the northwestern part of the country (Atmossfera, 2024). The West Pomeranian and Pomeranian Voivodeships lead in terms of the number of wind installations, owing to favourable wind conditions in these areas (Atmossfera, 2024). According to Institute of Renewable Energy data, at the end of June 2025, total wind farm installed capacity reached 10,350 MW, with the largest new capacity increase recorded in the West Pomeranian Voivodeship (Rynek Elektryczny, 2025b; IEO, 2024).

Photovoltaic installation distribution is characterised by greater geographical diversification. The most photovoltaic farms operate in the Warmian-Masurian, Greater Poland, and Lubusz Voivodeships (Agro-Rydz, 2025; Gramwzielone, 2024). According to Institute of Renewable Energy data, at the end of the first quarter of 2024, 48 PV farms with total capacity

of 233.57 MW operated in the Warmian-Masurian Voivodeship, while 34 farms with capacity of 307.49 MW operated in the Greater Poland Voivodeship (IEO, 2024).

Prosumer microinstallation development dynamics constitute an important element of the Polish energy landscape. According to the Energy Regulatory Office report, at the end of 2024, 1,544,574 microinstallations with total capacity of 12,749.891 MW were connected to electricity grids (URE, 2025a). The vast majority of microinstallations – nearly 98.6 percent – belonged to prosumers, accounting for nearly 95 percent of installed capacity in this category (URE, 2025a).

The Polish transmission system, managed by PSE S.A. (Polskie Sieci Elektroenergetyczne, the Polish Transmission System Operator), comprised at the end of December 2024 a total of 311 lines with a combined length of 16,601 km, including 140 lines at 400 kV voltage (9416 km) and 171 lines at 220 kV voltage (7,183 km) (PSE, 2024). This infrastructure was largely built in the mid-twentieth century and requires modernisation and expansion to ensure the country's energy security (PSE, 2024).

The transmission grid development plan for 2025-2034, approved by the President of the Energy Regulatory Office (URE) in December 2024, calls for construction of 4700 km of new 400 kV transmission lines, construction of 28 new electrical substations, and modernisation of 110 existing stations (PSE, 2024). Total estimated expenditures for these investments amount to over PLN 64 billion (PSE, 2024). A key plan element is construction of an HVDC connection on the north-south axis, designed to enable power transmission from new generation sources located in the northern part of the country to consumers without excessive burden on the remaining transmission grid (PSE, 2024).

The Transmission Grid Development Plan is designed to facilitate grid integration of approximately 18 GW of offshore wind farms, 45 GW of photovoltaic sources, and over 19 GW of onshore wind farms (PSE, 2024). Simultaneously, global grid infrastructure expansion is not keeping pace with capacity growth in renewable energy sources. According to the International Energy Agency's Renewables 2024 report, as many as 1650 GW of wind, solar PV, and hydropower capacity in advanced development stages were awaiting grid connection by mid-2024, representing an increase of 150 GW from the previous year (IEA, 2024).

4.1. Spatial Distribution of RES in Poland: Critical Analysis

Analysis of issued grid connection permits reveals a significant disproportion between RES development potential and transmission system capabilities. According to PSE Vice President Tomasz Sikorski's testimony before the Parliamentary Subcommittee on Critical Infrastructure in June 2024, approximately 28 GW of renewable sources were operational, while grid connection permits had been issued for an additional 48 GW, indicating that the grid would need to accommodate nearly 76 GW of renewable capacity—effectively tripling the existing renewable energy system (Sikorski, 2024). Separately, industry analysis by Arthur D.

Little (2025) reports that in 2024 alone, connection requests for approximately 74 GW of theoretical capacity, including roughly 42 GW from renewable energy sources, were declined—exceeding Poland's total installed system capacity of 72 GW. These figures demonstrate that grid connection applications substantially exceed transmission system capabilities, creating significant queuing challenges for project developers.

Uneven geographical RES distribution in Poland generates additional challenges for the transmission system, revealing a critical spatial mismatch between generation concentration areas and consumption centres. Wind energy capacity demonstrates strong geographical clustering, with the West Pomeranian Voivodeship hosting approximately 3200 MW of installed wind capacity, representing the country's largest concentration (Atmosfera, 2024). The neighbouring Pomeranian Voivodeship accounts for an additional 2600 MW, while the Warmian-Masurian Voivodeship in northeastern Poland contributes approximately 1800 MW of wind capacity (Rynek Elektryczny, 2025b; IEO, 2024). This pronounced northern concentration of wind resources results from favourable meteorological conditions in coastal and near-coastal regions but creates significant transmission challenges.

Photovoltaic capacity exhibits greater geographical diversification than wind, though still demonstrates regional clustering patterns. The Warmian-Masurian Voivodeship, in addition to its wind capacity, hosts significant solar installations totalling approximately 350 MW (IEO, 2024). The Greater Poland Voivodeship in west-central Poland accounts for approximately 480 MW of photovoltaic capacity across 34 farms, while the Lubusz Voivodeship in western Poland contributes an additional 290 MW (IEO, 2024; Agro-Rydz, 2025). The combined RES capacity concentration in northern and northwestern regions creates an asymmetric generation distribution relative to national consumption patterns.

Poland's major consumption centres demonstrate an inverse geographical distribution relative to generation concentration. Warsaw, located in the Masovian Voivodeship in central-eastern Poland, represents the country's largest demand centre with peak consumption exceeding 4500 MW. Kraków in southern Poland (Lesser Poland Voivodeship) accounts for approximately 2200 MW of peak demand, while Wrocław in southwestern Poland (Lower Silesian Voivodeship) represents 1800 MW. Additional significant consumption centres include Poznań (Greater Poland Voivodeship, 1400 MW) and Gdańsk (Pomeranian coast, 1100 MW). The geographical distribution reveals that four of the five largest consumption centres (Warsaw, Kraków, Wrocław, Poznań) are located in central and southern Poland, while the bulk of wind generation capacity is concentrated in northern coastal regions.

This north-south spatial asymmetry creates fundamental challenges for transmission system planning. Concentration of offshore wind farms—planned to reach 18 GW by 2034—and a significant portion of onshore wind installations in the northern region requires construction of extensive transmission infrastructure enabling energy transport to main consumption centres located in central and southern Poland (PSE, 2024). The transmission grid development plan calls for offshore wind power plant connections to stations in Choczewo,

Słupsk, and Krzemienica, requiring coordinated investments in transmission and distribution infrastructure (OffshoreWindPoland, 2025). The planned HVDC north-south connection, with capacity of approximately 2000 MW, represents a critical infrastructure investment designed to address this spatial mismatch, though construction timelines and capital requirements (estimated at PLN 8 billion for the HVDC component alone) present significant implementation challenges.

5. Comparative Analysis: Spain and Poland

Both the Spanish and Polish systems are characterised by high-RES capacity growth dynamics while simultaneously facing challenges regarding transmission infrastructure modernisation. Both countries face the challenge of uneven geographical distribution of RES relative to energy consumption centres. In Spain, photovoltaic and wind farm concentration in regions with high solar and wind potential requires long-distance energy transmission, as does Poland, where wind source concentration in the northern part of the country necessitates reinforcement of connections with central and southern regions.

A key difference between Spanish and Polish systems is the degree of energy isolation. The Iberian Peninsula is characterised by limited interconnection capacity with the rest of Europe, which in the case of the blackout prevented effective external assistance (ENTSO-E, 2025). The Polish power system is better integrated with the European continental grid, in principle increasing resilience to disruptions through mutual support from neighbouring systems (PSE, 2024).

Another important differentiating factor is the structure of the generation mix. Spain was characterised at the time of the failure by a higher RES share in the generation mix compared to Poland, where coal units still maintain a significant share. The latter, despite negative environmental impact, provide important system regulation capabilities, particularly for voltage and frequency control.

The Iberian Peninsula blackout provides three fundamental lessons for energy transition management in Poland:

First, the failure proved that the contemporary threat to system stability stems not from generation capacity deficit but from loss of control over power quality parameters – voltage and frequency – in environments with high VRE saturation. The Spanish case proved that traditional conventional units may be insufficient to maintain grid parameters within operational norms if not supported by appropriate operational procedures and regulation technologies.

Second, the incident demonstrated the necessity of active RES installation participation in providing ancillary services. Exclusion of renewable sources from voltage and frequency regulation processes, practiced in Spain before April 2025, proved to be a structural error that was corrected in the June amendment to procedure P.O. 7.4 (Red Eléctrica de España, 2025).

Third, the event emphasized the importance of cross-border resilience of power systems. The energy isolation of the Iberian Peninsula accelerated system destabilisation and hindered the power restoration process. For Poland, this means the necessity of maintaining and developing interconnections with neighbouring countries.

6. Recommendations for Energy Transition Management in Poland

6.1. Regulatory Framework Modernization

In response to lessons from the Iberian blackout, the Polish regulatory framework requires comprehensive updating with regard to technical requirements for RES installations. An amendment to grid regulations, as part of the so-called anti-blackout legislative package, should introduce mandatory ancillary service provision, including voltage regulation, by wind and photovoltaic farms (Gobierno de España, 2025). The Spanish experience shows that excluding RES from active participation in system stabilisation represents a fundamental gap in the power security architecture.

PSE S.A. should develop detailed technical requirements for new and existing RES installations regarding capabilities for:

- rapid active and reactive power regulation,
- grid voltage support,
- frequency regulation participation,
- fault ride-through capability.

6.2. Stabilizing Unit Maintenance Strategy

Conclusions from the Spanish failure strengthen argumentation for maintaining in reserve a portion of coal blocks as voltage stabilizing units until full alternative solution implementation (Gobierno de España, 2025). Iberian experience proved that premature conventional unit phase-out can lead to loss of system regulatory capabilities, even with sufficient RES generation capacity.

The transitional strategy for Poland should identify the key conventional blocks of strategic significance for system stability, develop compensation mechanisms for maintaining these units in operational readiness, and establish the timeline and technical conditions that would allow their final shutdown once adequate alternative solutions have been deployed.

6.3. Energy Storage Infrastructure Development

Large-scale energy storage is a key element of the system's defence against sudden grid parameter fluctuations (Gobierno de España, 2025). Given the high share of weather-dependent sources in Poland's generation mix, storage is of particular significance for absorbing production surpluses during periods of high RES output, providing voltage and frequency support, and maintaining power reserves during periods of low RES generation. The transmission grid development plan should account for the strategic placement of storage at critical network nodes, with priority given to offshore wind farm connection areas in Pomerania and regions of high photovoltaic density in central Poland.

6.4. Cross-border Resilience Building

Accelerating the synchronisation and expansion of interconnection capacity with neighbouring countries is the cornerstone of avoiding the energy island effect, which in Spain's case accelerated system destabilisation (ENTSO-E, 2025). For Poland, the priority development directions are: strengthening interconnections with Germany to enable energy exchange with the western market; expanding interconnection capacity toward the Baltic states and Scandinavia; modernising interconnections with the Czech Republic and Slovakia; and developing new cross-border links, including prospective connections with Ukraine following its integration with the European power system.

6.5. RES Spatial Distribution Management

Uneven geographical RES distribution in Poland requires spatial planning mechanisms that account for transmission infrastructure constraints. Concentration of renewable sources in specific regions generates local grid bottlenecks that may necessitate curtailment even in the absence of a national capacity deficit. Recommended actions include developing grid connection potential maps for individual RES technologies across different regions, introducing preferential mechanisms for projects located in areas with adequate transmission capacity, coordinating RES development plans with grid infrastructure investment schedules, and supporting distributed generation near major consumption centres to reduce the burden on the transmission system.

7. Conceptual Models of Energy Transition Management

Both the ISSM and SETM models are designed for power systems where variable renewable energy (VRE) penetration exceeds approximately 30% of installed capacity, or is on a clear trajectory toward that threshold. Below this level, conventional synchronous

generation typically provides sufficient inertia and reactive power support to maintain stability without structured multi-pillar intervention. The Iberian Peninsula was operating at a VRE share of approximately 55-60% of instantaneous generation at the time of the April 2025 blackout (Red Eléctrica de España, 2025), illustrating the high-penetration context for which the models are intended. For Poland, RES installed capacity of 36.5 GW against a total system capacity of approximately 72 GW places it in the range where both models are already applicable. Their relevance increases as weather-dependent dispatch hours grow and VRE penetration rises further. The relative emphasis among ISSM pillars and the pace of SETM phase implementation should be calibrated to the current and projected VRE share, as summarised in Table 1.

7.1. Integrated System Stability Management Model (ISSM)

The Integrated System Stability Management Model (ISSM Model) is a comprehensive conceptual framework describing the key dimensions of power system stability management under conditions of high variable renewable energy (VRE) penetration. This model synthesizes lessons from the Iberian blackout with recommendations for the Polish energy system, identifying five key pillars of system stability.



Figure 1. Integrated System Stability Management Model (ISSM) structure.

Source: Authors' own elaboration using AI-based tools (Claude 4.5 Sonnet, Anthropic) and Mermaid software.

7.1.1. Characteristics of ISSM Pillars

Pillar 1: Technical Regulation – This dimension is derived directly from the Iberian blackout finding that pre-event exclusion of wind and photovoltaic installations from voltage regulation services was a structural root cause of the cascade (Red Eléctrica de España, 2025). It covers the revision of legal and technical frameworks to enable active RES participation in ancillary services. Key elements include mandatory voltage regulation by wind and PV farms, technical requirements for grid-forming inverters, and market mechanisms that incentivise the provision of system services by renewable sources.

- Pillar 2: Grid Infrastructure – This dimension reflects the blackout lesson that transmission constraints amplify instability once voltage control deteriorates. It focuses on the physical expansion and modernisation of the transmission network. Priority actions include construction of 400 kV lines on the north-south axis, HVDC connections to transmit power from offshore wind farms, and modernisation of substations to handle bidirectional power flows.
- Pillar 3: Energy Storage – The Iberian event exposed how the absence of fast-response reactive power reserves accelerates voltage collapse once synchronous units begin tripping. This pillar addresses the need to develop electrical energy storage at various temporal and power scales: large-scale battery storage at critical network nodes, pumped-storage hydropower, and distributed storage at the distribution level.
- Pillar 4: Cross-border Integration – This dimension is drawn directly from the structural isolation factor of the Iberian Peninsula: the peninsula's historically low interconnection ratio (below the EU's 10% benchmark for many years) prevented effective external support once the cascade began, prolonging the outage (ENTSO-E, 2025). Key actions include increasing interconnection capacity with neighbouring countries, strengthening ENTSO-E cooperation mechanisms, and harmonising operational procedures for rapid emergency response.
- Pillar 5: Spatial Management – This pillar addresses the north-south generation-consumption mismatch in Poland, which mirrors the Spanish pattern of renewable concentration far from load centres. It focuses on optimising the geographical placement of new RES installations relative to transmission capacity. Actions include connection potential maps, preferential mechanisms for projects in grid-accessible areas, and coordination of RES development plans with infrastructure investment schedules.

7.1.2. Interaction Mechanisms Between Pillars

The ISSM Model emphasizes synergistic relationships among individual pillars. Regulatory framework modernisation (Pillar 1) creates legal foundations for implementing technical solutions in other dimensions. Grid infrastructure development (Pillar 2) conditions the effective utilization of energy storage (Pillar 3) and determines cross-border connection capacity (Pillar 4). Spatial management (Pillar 5) influences requirements for all other pillars, optimizing the location of new sources relative to existing and planned infrastructure.

7.2. Strategic Energy Transition Management Model (SETM)

The SETM Model describes the energy transition management process as a sequence of integrated stages, considering implementation challenges and adaptive mechanisms necessary to achieve strategic objectives while maintaining energy supply security.

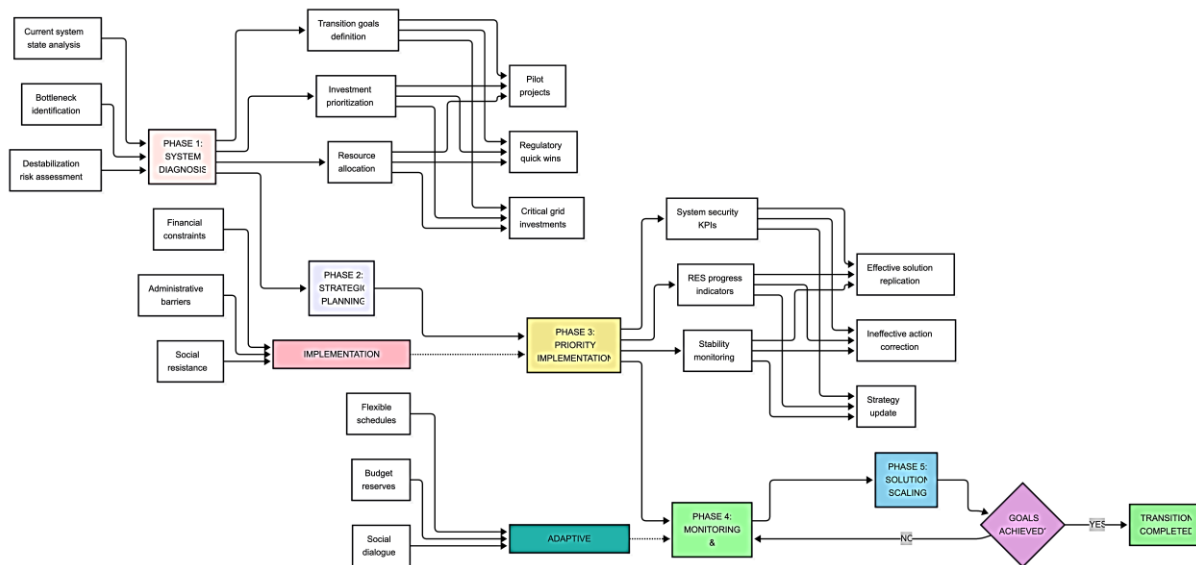


Figure 2. Strategic Energy Transition Management Model (SETM) structure.

Source: Authors' own elaboration using AI-based tools (Claude 4.5 Sonnet, Anthropic) and Mermaid software.

7.2.1. Characteristics of SETM Phases

Phase 1: System Diagnosis – Informed by the Iberian experience, which revealed that pre-event voltage control weaknesses went unaddressed, this phase requires comprehensive analysis of the current power system state. It covers identification of infrastructure bottlenecks and assessment of destabilisation risk under increasing VRE penetration. For Poland, this means mapping existing and planned RES installations relative to transmission capacity, identifying congestion-prone regions, and assessing regulatory capabilities.

Phase 2: Strategic Planning – Based on diagnostic results, energy transition goals are formulated within technical and financial constraints. Investment priorities are ranked by the criterion of maximising system security per unit of capital expenditure. For Poland, this directs attention toward grid integration of offshore wind farms (north-south HVDC line) and reinforcing critical nodes in high-RES concentration areas.

Phase 3: Priority Implementation – Action implementation focuses on pilot projects enabling verification of technical solutions, regulatory quick wins generating immediate system parameter improvements, and critical grid investments with highest priority for supply security. Spanish experience suggests starting with operational procedure amendments enabling RES participation in voltage regulation, which does not require significant capital expenditure but generates measurable stability improvement.

Phase 4: Monitoring and Adaptation – Continuous monitoring of key performance indicators (KPIs) enables early detection of deviations from assumed trajectories and introduction of corrections. Indicators cover technical parameters (frequency, voltage, line congestion), economic indicators (balancing costs, energy prices), and transition progress indicators (RES share in the generation mix, emissions reduction). The monitoring system

should contain early warning mechanisms for destabilisation risk, informed by lessons from the Iberian failure.

Phase 5: Solution Scaling – Solutions verified in pilot projects are replicated in other regions or system segments. Ineffective measures are corrected or removed. The transition strategy is updated based on accumulated experience through an iterative feedback loop to Phase 4, triggered whenever assumed goals are not met or significant deviations are detected.

7.2.2. Implementation Barriers and Adaptive Mechanisms

The SETM Model identifies three main categories of implementation barriers. Financial constraints arise because implementation of the Transmission Grid Development Plan requires expenditure exceeding PLN 64 billion, representing a significant challenge for the energy system; adaptive mechanisms include flexible investment schedules, technology optimisation, and diversification of financing sources (EU funds, public-private partnerships). Administrative barriers stem from the complexity of permitting procedures for transmission infrastructure, and can be addressed through streamlined decision-making processes, improved coordination across administrative levels, and dedicated procedural pathways for projects of strategic energy security significance. Social resistance to new transmission lines and large-scale RES installations can be mitigated through early-stage social dialogue, public education on the necessity of the energy transition, and mechanisms for local communities to share in the economic benefits of hosted infrastructure.

7.3. Model Application in Polish Energy Transition Context: Practical Implementation Scenarios

Both conceptual models – ISSM and SETM – constitute complementary frameworks for energy transition management. The ISSM Model defines structural dimensions of system stability, while the SETM Model describes the procedural dimension of change implementation. Their integrated application in the Polish context requires:

7.3.1. Temporal Synchronization Example

Scenario: Baltic Offshore Wind Integration (2025-2030)

Applying ISSM Pillar 2 (Grid Infrastructure) in conjunction with SETM Phases 1-3:

- **Years 2025-2026 (SETM Phase 1: System Diagnosis):** PSE conducts a detailed analysis of existing transmission capacity from the Pomeranian coast to central Poland consumption centres. The assessment reveals that the current 220 kV infrastructure can transmit a maximum of 4 GW from the planned 18 GW of offshore capacity, identifying a critical bottleneck.
- **Years 2026-2027 (SETM Phase 2: Strategic Planning + ISSM Pillar 2 activation):** Prioritization determines that north-south HVDC line (2000 MW capacity, estimated cost PLN 8 billion) takes precedence over less critical grid reinforcements. Simultaneously, ISSM Pillar 1 (Technical Regulation) is activated: URE mandates that

all new offshore wind farms ≥ 100 MW must provide voltage regulation services (grid-forming capability).

- **Years 2027-2030 (SETM Phase 3: Priority Implementation):** HVDC line construction proceeds in parallel with regulatory enforcement. Pilot offshore wind farm (400 MW) at Choczewo demonstrates grid-forming capability, validating technical requirements before full-scale deployment.

This sequencing ensures that regulatory framework (ISSM Pillar 1) and infrastructure development (ISSM Pillar 2) advance synchronously, preventing situations where either advanced infrastructure lacks compatible sources or vice versa.

7.3.2. Institutional Coordination Framework

Multi-stakeholder Implementation Structure

Implementation of both models requires coordinated action across multiple institutional levels:

- **Strategic Level:** Ministry of Climate and Environment sets policy direction aligned with SETM Phase 2 (goal definition: 30% VRE by 2030, 50% by 2035).
- **Regulatory Level:** URE translates policy into technical requirements (ISSM Pillar 1), establishing mandatory ancillary service provision for RES installations >5 MW effective January 2027.
- **Operational Level:** PSE implements ISSM Pillars 2-4 through transmission development plan execution, storage procurement, and interconnector enhancement. Monthly coordination meetings with URE ensure SETM Phase 4 (Monitoring) feedback informs ongoing ISSM Pillar implementation.
- **Market Level:** Distribution system operators (DSOs) coordinate with PSE on ISSM Pillar 5 (Spatial Management), rejecting connection applications in grid-constrained areas while incentivizing developments in zones with available capacity.
- **Stakeholder Level:** RES developers receive transparent connection potential maps (ISSM Pillar 5 output) updated quarterly, enabling informed investment decisions and reducing speculative applications that overwhelm system capacity.

7.3.3. Adaptive Flexibility: Response to Implementation Deviations

Example: Budget Constraint Scenario (Hypothetical)

Suppose in 2028, national fiscal constraints reduce available transmission investment budget by 30%. Adaptive flexibility mechanisms include:

- **SETM adaptation:** Extend Phase 3 (Priority Implementation) timeline from 3 years to 5 years, maintaining critical HVDC line but deferring less essential 400 kV reinforcements.
- **ISSM Pillar rebalancing:** Increase emphasis on Pillar 3 (Energy Storage) and Pillar 5 (Spatial Management) as partial substitutes for delayed Pillar 2 (Infrastructure). Procure 1 GW battery storage at strategic Pomeranian substations (lower capital cost than transmission construction) to buffer offshore wind variability. Simultaneously

strengthen Pillar 5 enforcement: temporarily suspend new RES connections in northern Poland, redirect development to central regions closer to consumption.

- **SETM Phase 4 (Monitoring) trigger:** KPI tracking detects growing north-south congestion. System activates adaptive mechanism: PSE negotiates accelerated HVDC completion with EU co-financing (Innovation Fund), restoring original timeline by 2029.

This example illustrates how SETM's iterative structure (Phase 4 feedback to Phase 2 planning) enables dynamic rebalancing of ISSM pillars in response to implementation realities.

7.3.4. Timeline-Based Integration Roadmap (2025-2034)

Table 1.
Phase-Pillar Integration Schedule

Period	SETM Phase	Active ISSM Pillars	Key Deliverables
2025-2026	Phase 1: Diagnosis	Pillar 5 (Spatial)	Connection potential maps, bottleneck identification
2026-2027	Phase 2: Planning	Pillars 1, 2 (Regulation, Infrastructure)	Updated grid code, HVDC line contract award
2027-2030	Phase 3: Implementation	Pillars 1, 2, 3 (+ Storage)	Regulatory enforcement, HVDC construction, 2 GW storage deployment
2030-2032	Phase 4: Monitoring	All Pillars	KPI dashboard operational, first deviation corrections
2032-2034	Phase 5: Scaling	Pillars 2, 3, 4 (Infrastructure, Storage, Cross-border)	Replicate successful models to other regions, enhance interconnections

Source: Own study.

This roadmap demonstrates that model application is not static but evolves across the transition timeline, with different ISSM pillars gaining prominence as corresponding SETM phases activate.

8. Implementation Challenges and Barriers

Implementation of the Transmission Grid Development Plan requires expenditure exceeding PLN 64 billion by 2034 (PSE, 2024), representing a significant burden for the energy system and ultimately for end consumers. These costs must be distributed over time and optimised through prioritisation of investments of greatest significance for system security.

The complexity of administrative procedures related to transmission infrastructure construction is a significant barrier to timely investment implementation. According to the European Union Agency for the Cooperation of Energy Regulators (ACER), in 2024 over 60 percent of major transmission infrastructure projects in Europe were delayed relative to their planned commissioning dates, perpetuating reliance on expensive interim congestion management measures (ACER, 2024). Poland is no exception to this trend, requiring

streamlining of decision-making processes and increased coordination among different administration levels.

Construction of new transmission lines and location of large-scale RES installations often encounters resistance from local communities. Energy transition management therefore requires parallel conduct of educational and consultative actions, ensuring understanding and acceptance of necessary infrastructure investments.

9. Summary and Conclusions

The April 28, 2025 Iberian Peninsula blackout marks a turning point in European power system history, revealing a new category of threats related to high renewable energy source share integration. This incident provides valuable lessons for Poland, a country implementing ambitious energy transition amid a growing VRE share in the generation mix.

Key conclusions from the analysis include:

Five conclusions emerge from the analysis. First, the Iberian blackout confirms a paradigm shift in energy security: the contemporary threat to system stability stems not from generation capacity deficit but from loss of control over power quality parameters in environments dominated by variable-output sources. Second, excluding renewable installations from voltage and frequency regulation processes represents a fundamental gap in the power security architecture that must be addressed immediately through appropriate regulations and technical requirements. Third, grid expansion must be synchronised with RES capacity growth, with particular attention to strengthening transmission corridors between regions of high renewable concentration and major consumption centres. Fourth, the Iberian case demonstrates that premature phase-out of conventional units can erode system regulation capabilities; a transitional strategy should therefore identify key blocks to be maintained in operational readiness until alternative solutions are fully deployed. Fifth, large-scale energy storage is a critical infrastructure element required to absorb VRE output fluctuations and support system stability.

Energy transition management in Poland requires a holistic approach accounting for not only technical and economic aspects but also social and regulatory dimensions. Spanish experience proves that transition success depends on the ability to anticipate and proactively address systemic challenges before they translate into crisis events threatening energy supply security.

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DEVELOPMENT POLICY DIRECTIONS ON CLIMATE CHALLENGES IN SELECTED CENTRAL AND EASTERN EUROPEAN COUNTRIES

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Purpose: The aim of this article is to identify and comparatively analyse the development policy directions of four Central and Eastern European countries - Poland, Latvia, Lithuania and Estonia - in the context of the climate requirements arising from the EU Fit for 55 package. Particular attention is paid to Poland, facing an unprecedented decarbonisation challenge in its coal-dependent energy sector, and to Latvia, which stands out as the regional leader in the energy transition owing to the dominance of renewables in its generation mix.

Design/methodology/approach: The article is based on a review of national energy and climate plans (NECPs), reports of the International Energy Agency (IEA), documents and legislation of the European Commission and the European Parliament, and peer-reviewed academic literature published up to 2024. A comparative analysis approach and strategic document analysis were applied.

Findings: The four countries studied, operating within the same EU legal framework, pursue their climate transitions along markedly different paths, reflecting their distinct structural starting points. Poland faces the most capital-intensive transformation; Latvia benefits from an established renewable base; the three Baltic states demonstrate high effectiveness of regional cooperation, confirmed by the synchronisation of their electricity grids with the Continental European Network in February 2025.

Research limitations/implications: The analysis is of a review character and relies on strategic documents that may be updated in the rapidly changing policy environment. Future research should include empirical studies measuring the actual effects of specific national policy instruments, with particular focus on emissions indicators and energy efficiency benchmarks.

Practical implications: The findings may be of use to policymakers and energy analysts seeking comparative models for national climate and energy policy design. Latvia's example of integrating energy security with climate goals, and the Baltic model of cross-border cooperation, offer reference points for strategy formulation across the CEE region.

Social implications: Just transition - the social dimension of climate policy - is of particular significance in Poland, given the hundreds of thousands of workers employed in the coal sector. Similar challenges, though on a smaller scale, affect Estonia's Ida-Virumaa region, which is dependent on oil-shale extraction.

Originality/value: The article combines an analysis of four distinct energy systems within a single comparative framework, highlighting both the common EU regulatory architecture and the structural differences that determine divergent transition pathways. The synthesis covers the literature up to 2024, including the key IEA Energy Policy Review of Latvia (2024).

Keywords: climate policy, energy transition, Fit for 55, Central and Eastern Europe, Poland, Latvia, Baltic states, renewable energy sources, decarbonisation.

Category of the paper: General review.

1. Introduction

Climate change has become one of the defining civilisational challenges of the twenty-first century, exerting ever-increasing pressure on the direction of public policy at both the global and the continental level. The European Union has consistently positioned itself as a global leader in this field. The adoption in 2021 of the Fit for 55 package - a comprehensive set of legislative instruments aimed at reducing greenhouse gas (GHG) emissions by at least 55% by 2030 relative to the 1990 baseline, with a perspective of full climate neutrality by mid-century - gave these ambitions a hard, legally binding form (European Commission, 2021). However, meeting such ambitious targets is far from equally straightforward for all member states; differences in financial capacity and inherited energy structures mean that EU climate commitments present a profoundly differentiated challenge in practice.

This article focuses on four Central and Eastern European countries: Poland, Latvia, Lithuania and Estonia. The selection is deliberate. Poland represents the extreme case in terms of the difficulty of decarbonisation, being the only EU member state that still derives more than half of its electricity from coal. Latvia offers a regional counterexample: a country whose generation mix has long been dominated by renewables and which exploits this advantage to bolster energy security as well. Lithuania and Estonia complete the picture, illustrating how the geopolitical ramifications of Russia's aggression against Ukraine can paradoxically accelerate decarbonisation decisions that had previously remained in the realm of long-term plans.

The article's principal objective is to identify and critically assess the key directions of national energy and climate strategies in the selected countries, with particular attention to: renewable energy targets and their share in national energy balances, support mechanisms for sectors undergoing structural change, institutional and financial barriers to transition, and regional cooperation initiatives. The evidence base comprises national energy and climate plans (NECPs), IEA reports, documents and acts of the European Commission and the European Parliament, and peer-reviewed academic literature published up to 2024.

2. Analytical framework: climate development policy in Central and Eastern Europe

The Fit for 55 package represents the most far-reaching legislative initiative ever launched by the European Union in the area of climate and energy. It encompasses the revision of the Renewable Energy Directive (RED III, setting a 42.5% RES target by 2030), the amended Energy Efficiency Directive, an expanded Emissions Trading System (ETS) - including its extension to maritime transport and a new mechanism for buildings and road transport (ETS2) - an Effort Sharing Regulation (ESR) distributing national GHG reduction obligations, and a Carbon Border Adjustment Mechanism (CBAM) (European Commission, 2021; Ringel, Knodt, 2018). Together, these instruments impose on the countries of the CEE region a set of legally binding obligations that must be translated into concrete sectoral actions.

European Commission estimates point to the need for annual investments equivalent to roughly 5% of EU-wide GDP - a figure unprecedented in the history of European structural policy (European Commission, 2021). For CEE economies, which combine lower GDP per capita with a stronger reliance on capital-intensive heat and power generation based on fossil fuels, the investment burden is proportionally greater than for the more prosperous Western member states. This is precisely why the Just Transition Fund (JTF) - a tool designed to cushion the consequences of restructuring for coal-dependent regions and communities - has become such a contested instrument in budget negotiations (World Bank, 2024; Stala-Szlugaj, Mirowski, 2021).

A distinct layer of complexity was added by Russia's military aggression against Ukraine, launched in February 2022. The invasion triggered a profound reordering of energy security priorities across the CEE region. The near-immediate consequence was a shift towards diversifying supply routes and accelerating investment in domestic renewable sources as substitutes for imported fossil fuels. The cascade of measures embedded in the REPowerEU framework strengthened this impulse, creating new obligations and funding streams specifically oriented towards reducing dependence on Russian energy carriers (IEA, 2024a). For the Baltic states, this translated into an urgent imperative to complete the desynchronisation of their electricity systems from the BRELL ring and their integration into the Continental European Network (CEN) (China-CEE Institute, 2023).

3. Poland: decarbonisation as a structural challenge

Poland occupies a singular position in the European energy landscape. It is the only EU member state in which hard coal and lignite together still account for more than 60% of national electricity generation. This structural dependence, deeply rooted historically in both the industrial and the social fabric, constitutes the most acute transformation challenge in the entire CEE region (Ember, 2023; Clean Energy Wire, 2024). Coal-fired electricity output has been declining year on year - from approximately 88 TWh in 2019 to around 76.6 TWh in 2023 (Brodny, Tutak, 2022; MDPI/Energies, 2024) - yet the pace of this decline still falls short of what EU climate policy requires.

There is an instructive paradox at the heart of Poland's situation: the renewable energy sector has been developing far faster than official planning documents foresaw. Installed solar capacity reached approximately 14 GW as early as mid-2023, whereas the Energy Policy of Poland until 2040 (PEP2040), adopted only two years earlier, projected 5-7 GW by the end of the decade (ECFR, 2024). Total installed RES capacity grew from 7.5 GW to 31.8 GW between 2019 and 2024 (MDPI/Energies, 2024). This gap between official planning and market dynamics reveals a fundamental weakness of Polish energy governance.

PEP2040, adopted in February 2021, set the following targets: a maximum 56% coal share in electricity generation and 23% RES in final energy consumption by 2030, commissioning of the first nuclear power plant by 2033, and a 30% reduction in GHG emissions relative to 1990 (IEA, 2021). Even at the time of adoption, these targets were widely regarded by analysts as inadequate in the light of Fit for 55 requirements (Ember, 2023). In response, Poland submitted in 2024 a draft updated National Energy and Climate Plan (NECP) presenting two scenarios: the baseline WEM - with a 43% GHG reduction by 2030 - and the more ambitious WAM, projecting a 53% reduction and a 53.2% RES share in electricity generation (CEE Energy News, 2024; European Parliament, 2024). The European Commission acknowledged the update while pointing out that the declared RES share in final energy consumption (29.8%) remains below the calculated national contribution of 32% needed to achieve the EU-wide target of 42.5% (European Parliament, 2024).

Four main investment axes of the Polish energy transition can be identified. The first is the accelerated expansion of renewable sources, with a strong emphasis on household and industrial photovoltaics and offshore wind on the Baltic Sea - current plans envisage up to 9.6 GW of offshore capacity by 2040. The second is nuclear energy: the planned construction of three large AP1000 reactors (Westinghouse) and the exploration of small modular reactor (SMR) concepts, with the first unit expected to enter service around 2033, aim to provide a stable, zero-emission backbone for the power system after 2035 (ECFR, 2024; CATF, 2024). The third axis is the decarbonisation of district heating - a priority explicitly flagged in the Council of the EU's 2024 country-specific recommendations - combined with large-scale building renovation. The fourth

is the electrification of transport and the build-out of charging infrastructure; transport remains the only sector that has registered an increase in emissions compared to 1990 (Clean Energy Wire, 2024).

Poland's challenge is not purely technological. Estimated investment requirements for the five-year period 2026-2030 alone amount to approximately EUR 185 billion (European Parliament, 2024). Furthermore, the Social Agreement concluded with mining trade unions in 2021 - which guarantees the continued operation of most collieries until 2049 and regulates the pace of their gradual closure - sets real political constraints on the speed of change. While criticised by environmental organisations for locking in coal far too long, the agreement does provide legal certainty for miners and creates a framework for an orderly rather than chaotic exit from coal (Stala-Szlugaj, Mirowski, 2021). The change of government following the October 2023 elections opened a more pro-European chapter in Polish climate policy, though inherited social commitments continue to define the realistic boundaries of transformation (Forum Energii, 2024).

4. Latvia: transition from a privileged starting position

The characteristics of Latvia's energy sector are fundamentally different from Poland's. Already in 2022, without any special adaptive measures, renewable sources accounted for approximately 76% of the country's total electricity generation - a dominance owed primarily to hydropower on the Daugava River (roughly 55% of generation) and supplemented by biomass and biogas capacity (IEA, 2024a). Such a high initial position means that Latvia has already largely achieved what Poland is still striving for on the 2030 horizon.

An important critical caveat must nonetheless be entered here. A large share of Latvia's historical GHG reductions - approximately 59% relative to 1990 levels by 2021 - was the product of the severe economic recession of the 1990s rather than deliberate climate action. The IEA explicitly notes that without additional effort the country may fail to maintain the trajectory required to achieve its 65% reduction target by 2030 (excluding LULUCF) (IEA, 2024a). In other words, a comfortable starting point does not excuse a country from continuing purposeful action.

Latvia's updated National Energy and Climate Plan for 2021-2030 sets as its headline indicator a 57% RES share in final energy consumption by 2030, with an updated ambition closer to 60% communicated to the European Commission (IEA, 2024a; IEA News, 2024). The establishment in January 2023 of a dedicated Ministry of Climate and Energy - consolidating competences previously dispersed across several ministries - was assessed by the IEA as a meaningful step towards greater policy coherence. One of the ministry's early visible results was the activation of the public debate on accelerated onshore wind development and

the streamlining of permitting procedures for wind farms. Latvia has simultaneously set a target of 1.5 GW of installed solar capacity by 2030; in 2024 solar capacity more than tripled and photovoltaics advanced to the third position among domestic electricity sources (IEA, 2024a).

Battery energy storage systems (BESS) constitute a critical element of the new infrastructure. Latvenergo - the dominant state-owned energy group - has planned 250 MW/500 MWh of cumulative battery storage capacity by 2030. Co-financing is drawn from Latvia's Recovery and Resilience Plan (NRRP), which allocates 38.1% of total funds to green transition objectives (European Parliament, 2022). The IEA (2024a) simultaneously flags areas requiring reinforcement: the absence of detailed sectoral roadmaps for the pathway to 2050, delays in simplifying administrative procedures for RES investment, and the energy-intensive building stock and ageing vehicle fleet that necessitate intensive renovation and electrification programmes.

5. Lithuania and Estonia: geopolitical catalyst for energy transition

Among the Baltic states, Lithuania has adopted the most resolute stance on severing energy dependence on Russia. In April 2023 it became the first of the three to conduct a full island-mode test of its electricity system - for ten uninterrupted hours the Lithuanian grid operated in complete isolation from the BRELL network, demonstrating technical readiness for desynchronisation (China-CEE Institute, 2023). Lithuania initially lobbied for completing the entire project as early as the first half of 2024; ultimately, following negotiations with Latvia and Estonia, a date of February 2025 was agreed upon.

In terms of its target energy mix, Lithuania aims to generate at least 70% of its electricity from domestic sources by 2030, effectively reversing a long-standing net import balance. The long-term goal - 100% renewable electricity by 2050 - will require intensive offshore wind development in the Baltic Sea along with adequate system flexibility through energy storage and demand-side management (IEA, Lithuania review). Lithuania is also the principal advocate of the Baltic Energy Hub concept - a shared integration point for regional renewable generation with transmission capacity sized to export clean power to Central Europe, estimated to be capable of producing up to seven times the Baltic region's combined electricity consumption (Baltic Wind, 2024).

Estonia grapples with a challenge that is unique among the four countries studied: the need to phase out oil shale, the fuel that formed the backbone of the country's energy security for decades and sustained the livelihoods of thousands of workers in the north-eastern Ida-Virumaa region. Analysts project that, from around 2027 onwards, Estonian oil-shale power plants may lose market viability under high ETS allowance prices, creating a natural economic incentive for transition even without direct regulatory mandates (European Commission/Estonia NECP,

2023). Estonia's emerging generation mix is to be built around onshore wind and biomass, complemented by a growing photovoltaics share and energy storage. As a country with a strong digital tradition, Estonia sees smart grid technologies and artificial intelligence in grid management as a distinguishing feature of its own decarbonisation pathway (ScienceDirect, 2024; European Commission/Estonia NECP, 2023).

6. Regional energy cooperation as a driver of climate transition

The synchronisation of the electricity systems of Lithuania, Latvia and Estonia with the Continental European Network (CEN) - completed over the weekend of 8-9 February 2025 - is arguably the most momentous infrastructure achievement in the history of Baltic Sea energy cooperation. The project, formalised by agreement in 2018 and dramatically accelerated following Russia's invasion of Ukraine, attracted total financing of over EUR 2 billion, of which more than EUR 1.2 billion was provided by the European Union through the Connecting Europe Facility (CEF) (European Commission/BEMIP, 2024). The technical transition - disconnecting from the BRELL ring and synchronising via the LitPol Link interconnector with the Polish PSE grid - lasted approximately 24 hours. The legal and market consequence is the full integration of the Baltic states as equal participants in the common European electricity market, with access to its pricing mechanisms, trading rules and emergency solidarity arrangements.

The Baltic Energy Market Interconnection Plan (BEMIP) has been coordinating multilateral energy cooperation in the Baltic Sea region since 2009, encompassing transmission infrastructure, gas and hydrogen markets, and offshore wind. Three hydrogen project corridors under BEMIP, including the Nordic-Baltic Hydrogen Corridor linking production sites in Finland with demand centres in Germany via Estonia, Latvia, Lithuania and Poland, were included on the first EU list of Projects of Common Interest (PCIs) that entered into force in April 2024 (European Commission/BEMIP, 2024). The Baltic Energy Hub initiative - announced in October 2024 by the energy ministers of the three Baltic states - envisages the creation of an integrated renewable energy centre capable of exporting clean electricity to Central Europe at volumes far exceeding regional domestic consumption (Baltic Wind, 2024)).

Table 1 below provides a comparative overview of the key indicators and climate policy priorities of the four countries analysed.

Table 1.*Key climate policy indicators and priorities for Poland, Latvia, Lithuania and Estonia*

Criterion	Poland	Latvia	Lithuania	Estonia
Dominant energy source	Coal ~60-65% of electricity generation (2023)	RES ~76%; mainly hydropower and biomass	Growing RES share; net electricity importer	Oil shale; rapid phase-out underway
RES target 2030	29.8% of final energy consumption (NECP)	57-60% of final energy consumption	70% of electricity from domestic sources	Full renewable electricity by 2050
GHG reduction by 2030 (vs. 1990)	43-53% (WEM/WAM scenarios)	65% (excl. LULUCF)	In line with EU ESR	In line with EU ESR
Nuclear energy	3 AP1000 units + SMR (from ~2033)	No plans	Visaginas project (regional discussions)	Under consideration (SMR technologies)
CEN grid integration	LitPol Link interconnector (since 2015)	Synchronisation completed February 2025	Synchronisation completed February 2025	Synchronisation completed February 2025
Just transition	Social Agreement: mines operational until 2049	Regional support under NRRP	Regional RES support programmes	Restructuring of Ida-Virumaa oil-shale region

Source: Own compilation based on national NECP documents, IEA reports (2024a, 2024b) and European Commission documentation.

7. Discussion: shared framework, divergent transition pathways

Setting the analysed strategies side by side, one is compelled to conclude that the divergence in the routes taken towards a commonly declared goal is not a faulty anomaly but an inevitable consequence of heterogeneous starting points. Poland's climate transformation is, in equal measure, a political and social transformation - it requires dismantling an industrial fabric that has defined the economic identity of entire regions for generations. The Latvian pathway is an effort to extend existing advantages to sectors that still resist decarbonisation. The Lithuanian and Estonian approaches combine geopolitical necessity with technological ambition, manifesting in projects ranging from grid synchronisation to offshore wind farms and grid-scale energy storage.

It is worth noting that the Central and Eastern European institutional context may in certain respects slow the transition. Ringel and Knodt's (2018) research on the governance of the Energy Union identifies persistent difficulties in ensuring coherence between national and EU-level objectives when member states perceive climate requirements as encroachments on their energy sovereignty. In Poland, this tension was especially pronounced under the previous

government; in the Baltic states, security imperatives caused the decarbonisation narrative and the energy sovereignty narrative to merge into a single, mutually reinforcing discourse.

Financing the transition remains the paramount shared challenge across the region. Estimated investment requirements for Poland alone in the five-year period 2026-2030 run to approximately EUR 185 billion (European Parliament, 2024). Mobilising such sums demands the effective channelling of EU mechanisms - the Recovery and Resilience Facility, cohesion funds, ETS revenues, JTF and CEF - into private-sector investment flows, which in turn requires stable and predictable regulatory frameworks. The repeated revision of wind farm planning rules in Poland serves as a cautionary tale about the costs of regulatory unpredictability for investors (Forum Energii, 2024).

A separate but equally important issue is society's capacity to absorb the consequences of the transition. Rising energy costs in the short run, energy poverty, and the need to retrain coal and oil-shale workers are challenges that climate policies must treat as co-equal with emissions reduction targets. The experience of Poland's Clean Air programme - suspended in 2024 following the discovery of widespread irregularities and administrative mismanagement - carries a sobering lesson for the architects of similar schemes across the region (Clean Energy Wire, 2024; World Bank, 2024).

8. Conclusions

The comparative analysis carried out in this article supports several overarching conclusions.

First, the EU's common legal framework embodied in the Fit for 55 package is necessary but not sufficient to ensure a fair and effective climate transition across Central and Eastern Europe. It must be complemented by instruments tailored to the specific structural circumstances of individual economies - which is precisely the rationale behind the differentiated national contribution mechanism embedded in the ESR.

Second, Poland - facing the most demanding decarbonisation challenge among the four countries studied - confronts a task without precedent: the simultaneous transformation of its power generation sector, modernisation of district heating, electrification of transport, and delivery of a just social transition in coal-dependent regions. The success or failure of this process will have consequences extending well beyond national borders, bearing directly on the credibility of EU climate policy as a whole.

Third, Latvia's energy model - with its durably high RES base, a new dedicated ministry for climate and energy, and a clear ambition to lead the region on energy prices - can serve as a case study for shaping transition strategies across the CEE area. The country demonstrates

that energy security and decarbonisation are not competing objectives but mutually reinforcing ones.

Fourth, Baltic regional cooperation in delivering the CEN synchronisation project is a textbook example of effective multilateral energy governance in practice. The capacity to act in a coordinated manner - overcoming individual TSO interests and differing national timetables - is a competence the Baltic states have demonstrably developed, and one that can serve as a reference model for future joint initiatives in offshore wind auctions, hydrogen corridors and the Baltic Energy Hub.

Fifth, the credibility of long-term climate strategies - measured by the coherence between declared targets and implementing instruments, budget allocations and intermediate milestones - remains a shared weakness of the countries studied, to varying degrees. Bridging this gap calls for political will, strengthened administrative capacity, investment in monitoring and evaluation, and the building of a durable societal coalition in favour of the energy transition: one robust enough to survive the inevitable shifts in public mood and government composition.

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