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Dear "e-mentor" readers,

I am delighted to present you with the latest collection of papers exploring current trends in management and education. The contributions gathered in this issue reflect a shared concern with how organisations and educational institutions navigate transformation in an increasingly complex and technology-driven environment. Across both sections, a common thread emerges around adaptation – whether in the context of innovation ecosystems, digital transformation, artificial intelligence, or evolving competencies of new generations.

In the management domain, the articles collectively address the challenges of navigating innovation and institutional complexity. They explore how national intellectual property ecosystems shape innovation dynamics, how digitising administrative processes unfolds within siloed organisational structures, and how artificial intelligence is becoming increasingly integrated into HR processes across different national contexts. At the same time, attention is given to the human dimension of these transformations, particularly through the lens of Generation Z and their evolving competency profiles.

Similarly, the contributions focusing on education highlight the ongoing reconfiguration of learning environments and educational practices. The papers engage with themes such as rethinking information system success in the era of generative AI, the growing relevance of hybrid models of business education, and the role of early financial socialisation in shaping students' behaviours and decision-making. Together, these contributions illustrate how technology, changing expectations, and new forms of engagement are reshaping higher education.

Summarising the developments of 2025, the internationalisation strategy supported by the Ministry of Science and Higher Education (Poland) with granted funds (RCN/SP/0361/2021/1) has enabled the development of strong collaborations between "*e-mentor*" and international partners, including organisers of scientific conferences. We have continued and further strengthened this cooperation throughout 2025, while also establishing new international connections. At the same time, we have focused on enhancing the quality of published articles, increasing the journal's international visibility, improving the transparency of the editorial process, and modernising our website. By narrowing the scope of the journal to higher education in management and economics, we have adopted a more selective approach to submissions, while simultaneously strengthening cooperation with international reviewers to provide authors with high-quality, expert feedback. Please visit www.e-mentor.edu.pl/eng to explore the outcomes of these efforts.

Our goal remains to position "*e-mentor*" as a peer-reviewed journal that serves as a platform for the exchange of research and ideas related to teaching and learning in management and economics higher education. We aim to support the dissemination of knowledge on the use of technology in education, including e-learning, innovative teaching methods, the assessment of learning outcomes, and the integration of emerging management trends into academic practice.

I would also like to warmly invite you to collaborate with us in shaping "*e-mentor*" – either by contributing your research or by joining our community of reviewers. The journal is open access and free of charge for both readers and authors. All submissions undergo a rigorous peer-review process, accepted articles receive complimentary proofreading, and each publication is assigned a DOI and indexed in international databases such as Web of Science ESCI and EBSCO. Further information is available at http://www.e-mentor.edu.pl/eng/page/8/Info_for_Authors. Should you have any questions, please feel free to contact the editorial team at redakcja@e-mentor.edu.pl.

Małgorzata Marchewka
Editor

Appreciating the invaluable role of reviewers in the process of delivering the best quality papers, we wish to acknowledge the contributions of all 82 Reviewers who cooperated with „e-mentor" throughout 2025:

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International Reviewers constitute 63% of the total, confirming the effectiveness of internationalisation efforts. Our Reviewers represent 69 different institutions from 29 countries: Poland (37%), Australia, Canada, China, Croatia (7%), Estonia, France, Germany, Hong Kong, Hungary, India, Indonesia, Italy, Lithuania, Malaysia, Moldova, Nigeria, North Macedonia, Portugal, Romania, Saudi Arabia, Slovenia, South Africa, Switzerland, The Netherlands, The United States of America (5%), Türkiye, Ukraine, and The United Kingdom (6%), and 69 different institutions: Academy of Economic Studies of Moldova (Moldova), Babes-Bolyai University (Romania), Bayero University Kano (Nigeria), City University of New York (USA), CNR-IRCrES (Italy), Czestochowa University of Technology (Poland), Dalian University of Technology (China), Erasmus University Rotterdam (The Netherlands), Gdańsk University of Technology (Poland), HHL Leipzig Graduate School of Management (Germany), Instituto Politécnico de Lisboa (Portugal), International Balkan University (North Macedonia), Jan Kochanowski University in Kielce (Poland), King Abdulaziz University (Saudi Arabia), Kozminski University (Poland), Krakow University of Economics (Poland), Lodz University of Technology (Poland), Nicolaus Copernicus University in Toruń (Poland), Open Data and Intellectual Property Institute ODIPI (Slovenia), Queen's University Belfast (United Kingdom), Royal College of Art (United Kingdom), Rzeszow University of Technology (Poland), SGH Warsaw School of Economics (Poland), SKEMA Business School (France), Sumy State University (Ukraine), Tallinn University (Estonia), Taras Shevchenko National University of Kyiv (Ukraine), TH Köln (Germany), The Hong Kong Polytechnic University (Hong Kong), The Maria Grzegorzewska University (Poland), Transylvania University (Romania), Universitas Hayam Wuruk Perbanas (Indonesia), Universitas Muhammadiyah Yogyakarta (Indonesia), Université du Québec (Canada), Université Paris Cité (France), Universiti Malaysia Sabah (Malaysia), University of Applied Sciences of the Grisons (Switzerland), University of Bialystok (Poland), University of Bologna (Italy), University of Economics in Katowice (Poland), University of Gdańsk (Poland), University of Glasgow (United Kingdom), University of Iowa (USA), University of Lodz (Poland), University of London (United Kingdom), University of Miskolc (Hungary), University of Osijek (Croatia), University of Primorska (Slovenia), University of Siedlce (Poland), University of Silesia in Katowice (Poland), University of South Africa (Republic of South Africa), University of Split (Croatia), University of Tartu (Estonia), University of Tasmania (Australia), University of the National Education Commission in Krakow (Poland), University of Trieste (Italy), University of Warmia and Mazury in Olsztyn (Poland), University of Wrocław (Poland), University of Zadar (Croatia), University of Zagreb (Croatia), University of Zielona Góra (Poland), Uşak University (Türkiye), Utenos Kolegija (Lithuania), Vinod Gupta School of Management (India), Warsaw University of Technology (Poland), West University of Timisoara (Romania), Worcester Polytechnic Institute (USA), Wroclaw University of Economics and Business (Poland).

Ana Hafner

Marijana Ribičić

Navigating Innovation: A Comparative Analysis of National Intellectual Property Ecosystems in Croatia and Slovenia

Abstract

This study provides a comparative analysis of the national intellectual property ecosystems in Croatia and Slovenia. In contrast to national innovation systems, national intellectual property ecosystems are rarely studied. The starting point for the research was the institutions within the national innovation system. The authors examined which institutions – such as research and business agencies, technology transfer offices, incubators, intellectual property offices, and inventors' associations – provide intellectual property-related services. In addition, they analysed industrial property data (patents, industrial designs, trademarks) and innovation indexes. Findings indicate that while Slovenia has outperformed Croatia in several industrial property and innovation indicators, a decline over the last ten years in some key areas, such as national patent applications and innovation indexes, may suggest emerging vulnerabilities. Croatia, on the other hand, is showing signs of strengthening its intellectual property ecosystem and engagement with digital tools, which may position it more favourably in the future. By identifying gaps and challenges within each ecosystem, this study highlights opportunities for mutual learning, where Croatia and Slovenia can adopt best practices from one another to enhance their intellectual property strategies.

Keywords: intellectual property (IP), national innovation systems (NIS), support institutions, industrial property, technology transfer, innovation indexes

Introduction

Intellectual property (IP) ecosystems are crucial for fostering national innovation and economic growth, yet their effectiveness depends on the broader institutional, policy, and support mechanisms. This study presents a comparative analysis of the national intellectual property ecosystems in Croatia and Slovenia, focusing on the availability and role of institutions that provide IP support, the structure of national IP support mechanisms, and the overall IP and innovation performance of both countries. By examining these factors, the authors of this study try to understand how each country facilitates IP management, commercialisation, and knowledge transfer within its innovation system.

For the theoretical framework, the authors used the national innovation system (NIS) concept, which has provided a valuable framework for organising and fostering innovation efforts across individuals, groups, and organisations within a country (Weerasinghe et al., 2024). NIS approach was introduced in the late 1980s by Freeman and Dosi et al. and further elaborated in the years thereafter by Lundvall (2016), Nelson (1993) and Edquist and can be perceived as a historically grown subsystem of the national economy in which various organizations and institutions (companies, supportive institutions, agents, a political government setting…) interact and influence each other in the carrying out of innovative activity (Balzat & Hanusch, 2004). However, national IP systems were not often researched in this way as NIS, and they

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are frequently mentioned only in the context of international IP systems (e.g. Nguyen, 2024; Shabani, 2024). For this reason, not to understand the term "IP system" narrowly as a set of laws, regulations, and formal procedures, authors will instead use the term "ecosystem" to emphasise the broader constellation of actors, relationships, and practices through which IP is created, managed, enforced, and exploited.

Both systems, NIS and the national IP ecosystem (NIPE), are closely connected. While NIS focuses on the broader environment for fostering innovation, NIPE explicitly governs the protection and commercialisation of intellectual assets. A well-functioning NIS requires a well-balanced NIPE, ensuring that IP rights encourage the dissemination of knowledge and technological progress. In the next chapter, the authors will explain that NIPE can be seen as a subset of NIS, but the opposite view is also possible.

However, this study focuses only on the first understanding of the NIPE – namely, its role within the NIS – and compares two neighbouring countries, Croatia and Slovenia, which share a long historical and institutional legacy. The study examines the availability and functionality of institutions that provide IP-related support, the structure and coherence of national innovation and IP support mechanisms, and the broader IP and innovation performance of both countries. This study specifically focuses on industrial property, not because the authors disregard the importance of copyright, but because industrial property rights are registered and can therefore be clearly identified and measured for comparative analysis. By examining these dimensions, authors aim to identify similarities and differences in how each country integrates IP within its innovation system, and how this integration affects the commercialisation of research and broader innovation outcomes.

National Innovation System and National IP Ecosystem

The term 'IP ecosystem' is not frequently defined in the scientific literature. Reis et al. (2021) very narrowly define it as "a network of relationships between government, business and institutional actors that interact dynamically to provide protection for the intellectual assets generated by entrepreneurs who wish to innovate" (p. 110). They, of course, seek to explain the relationships among entrepreneurship, IP, and innovation ecosystems; thus, their definition prioritises the protection of intellectual assets generated by entrepreneurs. They put a simple formula: ***entrepreneurship ecosystem + IP ecosystem = innovation ecosystem***.

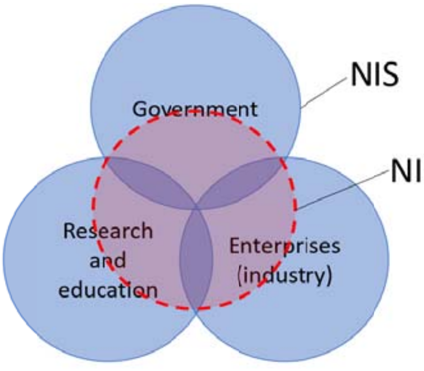
However, the exploitation of intellectual property is not limited to entrepreneurs; it is also essential for artists, scientists, and other key social actors. Such a definition ignores the broader set of actors, institutions, and practices involved in the creation, governance, enforcement, diffusion, and strategic use of IP across different sectors and stages of innovation (or creation). The IP ecosystem could therefore be defined as a network of all participants and processes involved in the creation, protection, and utilisation of intellectual property. This includes creators (artists), inventors, designers, businesses, legal professionals, government agencies, higher educational institutions, and other relevant entities, as well as the rules, measures, technologies, and market mechanisms that govern their interactions.

If the IP ecosystem is defined in this way, what is the relationship between the national innovation system (NIS) and the national IP ecosystem (NIPE)? As noted in the introduction, NIS focuses on the networks of institutions and policies that support the innovation process in a country, with particular emphasis on the roles of government, research institutions, and industry. It is constituted by elements and relationships that interact in the production, dissemination and use of new, and economically advantageous knowledge (Lundvall, 1992). On the conceptual level, NIS appears to be more than the spatial agglomeration of a given activity or cluster but relies on the economic rationale of benefits from agglomeration, specialisation, politics, and complementariness among the elements – it provides a broad approach to assessing a country's economic performance (Acs et al., 2017).

If the focus of research is on NIS, NIPE can be regarded as a subset of NIS (as shown in Figure 1 below), as it provides the legal and institutional framework governing the protection, management, and commercialisation of knowledge and inventions. Intellectual property rights (IPRs) constitute a foundational legal framework that safeguards the creations of the mind, encompassing patents, copyrights, trademarks, and trade secrets which are granting creators exclusive rights to their intellectual endeavours (Kumar, 2024) and therefore promote innovation and market competition (Gupta, 2024), and encourage investment in research and development (Wang, 2025). As such, the NIPE also supports the functioning of NIS by attracting private-sector participation and facilitating technology transfer between public and private actors (Holgersson & Aaboen, 2019; Meissner, 2019).

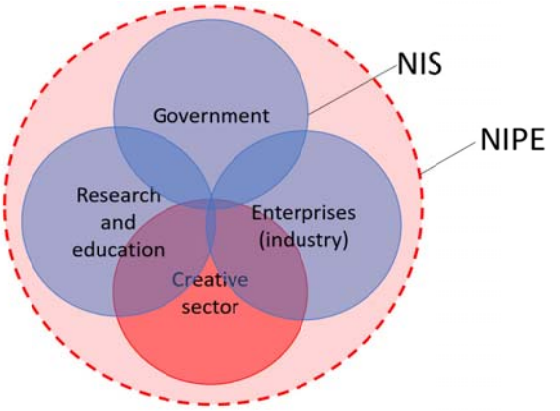
On the other hand, NIPE can be seen as larger than the NIS (see Figure 2 below), since the NIS typically excludes the creative sector (such as writers, artists, musicians, and performers), which also relies heavily on intellectual property protection. While the NIS primarily focuses on technological innovation and the roles of science, industry, and government in fostering economic growth, the NIPE encompasses a broader range of creative outputs beyond science and technology. This includes copyright and related rights that govern the production of cultural and artistic works. As a result, the NIPE spans both the innovation-driven knowledge economy and the broader cultural and creative industries.

Figure 1
National IP Ecosystem as a Subset of a National Innovation System



Source: authors' own work.

Figure 2
National IP Ecosystem as Being Wider than the National Innovation System



Source: authors' own work.

Method

This research employs a cross-country comparative approach, combining analyses of IP data (patents, industrial designs, trademarks) and innovation indexes (Global Innovation Index and European Innovation Scoreboard) with analyses of IP-related institutional support structures. Through comparative institutional analysis, the study explores similarities and differences in the role and availability of IP-related support mechanisms across the two countries. The starting point for the institutional analysis were those institutions which are included in the NIS, e.g. national research agencies and business agencies, knowledge and technology transfer offices, technology parks, incubators, intellectual property offices, development agencies, chambers of commerce, IP attorneys, associations of inventors … Authors tried to get information – mostly on institutional websites – which of these institutions offer services connected to IP such as advisory services, training programs, (financial) incentives for IP registration or support for IP commercialisation.

For the IP data collection, the study relies on international IP databases. Authors used the following IP databases: PATENTSCOPE (n.d.), Search International and National Patent Collections; PATSTAT (n.d.), Global Patent Index (n.d.), Madrid Monitor (n.d.), and eSearch Plus (n.d.).

For retrieving data from IP databases, the authors used the following queries:

For PATENTSCOPE: Applicant address country = HR (or SI) and office = PCT

For Patstat, a SQL query was used:

```
SELECT distinct tls201_appln.appln_id
FROM tls201_appln
JOIN tls207_pers_appln ON tls201_appln.appln_id
= tls207_pers_appln.appln_id
JOIN [tls206_person] on tls207_pers_appln.person_
id = tls206_person.person_id
WHERE person_ctry_code = 'HR' // or 'SI'
AND receiving_office = 'HR' // or 'SI'
AND applt_seq_nr > 0
```

For Global Patent Inex: APPC = HR (or SI) and PUC = HR (or SI) and APD [2000, 2023]

For Madrid Monitor and eSearch plus: Holder country = HR (or SI) AND registration date = [specific year]

Data queries were done from June to August 2025. For designing the charts, MS Excel was used.

Results

A comparison of the two countries' IP systems is presented in Table 1. It reveals a high degree of alignment between Croatia and Slovenia in terms of IP governance. Both countries have centralised national IP offices, DZIV (State Intellectual Property Office) in Croatia and URSIL (Slovenian Intellectual Property Office) in Slovenia, which serve as the primary administrative bodies responsible for managing intellectual property rights. The shared foundation in civil law, derived from the continental European legal tradition, ensures a harmonised legal approach to IP protection. This common basis facilitates regional cooperation, legal predictability, and cross-border IP enforcement. Both countries are parties to the same key international treaties (e.g., WIPO, TRIPS, PCT, EPC, Madrid Protocol), signalling their commitment to global IP standards and ensuring the international recognition and protection of IP rights. This also enables local innovators to access international markets through streamlined mechanisms. The scope of industrial property protection is almost identical, encompassing patents, utility models, industrial designs, trademarks, and geographical indications. This reflects adherence to EU norms and ensures comparable levels of legal coverage for innovators and businesses in both countries. Both countries also provide automatic copyright protection without requiring formal registration, thereby simplifying the protection of creative works.

Table 1
IP Systems in Croatia and Slovenia

Aspect	Croatia	Slovenia
National IP office	State Intellectual Property Office of the Republic of Croatia (DZIV)	Slovenian Intellectual Property Office (URSIL)
Legal system basis	Civil law (based on continental European legal tradition)	Same
International treaties	Member of WIPO, EUIPO, TRIPS, PCT, EPC, Hague Agreement, Madrid Protocol	Same set of memberships
Industrial property protection	Patents, utility models, industrial designs, trademarks, geographical indications…	Same
Copyright office	No separate copyright registration system (automatic protection)	Same

Source: authors' own work.

As noted in the introduction, this research focuses on institutions that support science and industry, including national IP offices, technology transfer offices, innovation agencies, and research and development support organisations. The list of institutions is presented in the Appendix. The list is not exhaustive and may change over time. However, the authors have sought to include the most important entities that play a crucial role in assisting researchers, entrepreneurs, and companies in securing and utilising IP rights effectively. While the creative sector, including musicians, painters, and other artists, also heavily depends on IP, this segment was excluded from this study, as it would require a separate, in-depth analysis. This distinction allows this study to provide a more focused evaluation of how national IP ecosystems function in the context of scientific and industrial innovation (NIS).

However, the tables in the Appendix indicate that most NIS institutions do not offer any IP-related services (or do not provide information about such services on their websites), which makes NIPE significantly smaller than NIS.

The most important institutions that provide IP assistance are the national IP offices (DZIV and URSIL). For IP support, knowledge and technology transfer offices (KTOs) at universities and public research organisations (PROs) are also very important. They are more developed in Slovenia, where more PROs have a KTO. In Croatia, there are only a few of them, but some have very attractive programmes, such as the Fund for IP protection from the University of Split (University of Split, 2024). Slovenia also has four patent information centres (PATLIBs), whereas Croatia has only one (Directory, n.d.). PATLIB centres provide local access to patent information and related issues, are familiar with the local industrial, economic, and business landscape, and offer valuable services to inventors, entrepreneurs, and SMEs (PATLIB, n.d.). Another important source of information for entrepreneurs and inventors is inventors' associations. While some exist in Croatia, none are currently active in Slovenia.

An important part of NIS in both countries is entities such as business incubators and accelerators, science and technology parks, and regional development agencies and centres. While such institutions are undoubtedly important for business development, according to the authors' research, there is a lack of evidence that they employ staff with sufficient IP rights knowledge. The same situation is with chambers of commerce and business clubs. Private business consultants typically focus on services such as accounting, tax advisory services, and assistance with EU funding applications. However, they generally lack expertise in IP rights and rarely provide support in this area. However, both countries have several IP attorneys, private consultants, and legal professionals who are officially authorised to represent individuals or organisations in IP matters before their respective national IP offices (DZIV and URSIL). For example, they draft and file patent, trademark, and design applications (Rockman, 2004).

The authors also investigated the number of faculties in Croatia and Slovenia that offer courses on intellectual property. The analysis focused on whether intellectual property is taught as a standalone course or is sufficiently important to be included in the course title. Only higher education institutions that offer such courses were included in the Appendix table. The results show that these courses are primarily offered by law and business schools (economics, management), whereas they are rarely included in faculties of the technical and natural sciences. The authors believe it is important to integrate intellectual property education more systematically into technical and natural science curricula, as students in these fields are directly involved in research, innovation, and knowledge production and therefore require a solid understanding of IP rights and related commercialisation processes.

Slovenia has more public calls (regular tenders) to support IP protection, particularly targeting SMEs and research organisations. Currently active calls are Voucher for patents, designs, trademarks, which is managed by Slovenian Enterprise Fund (Slovenski Podjetniski Sklad, n.d) and Public Call for Supporting the Activities of Knowledge Transfer Offices (JR KTO) co-financed by the Republic of Slovenia, the Ministry of Higher Education, Science and Innovation, and the European Union through the European Regional Development Fund (ERDF) (European Commission, n.d.). For SMEs and PROs, these calls provide co-financing for IP application costs for national or international IP protection. This proactive public support reflects a broader institutional effort to integrate IP into innovation policy and to encourage the commercialisation of research outputs. In contrast, Croatia offers fewer such instruments, which may limit local innovators' ability to effectively protect and leverage their intellectual assets.

This situation is clearly reflected in registered industrial property. Slovenian residents and organisations have more patent applications, industrial designs, and trademarks compared to Croatian residents and organisations. Considering that Croatia has a significantly larger population (Croatia: 3,9 million; Slovenia: 2,1 million in 2024), these differences are even more pronounced.

Figure 3 presents PCT patent applications by the applicant's country of address. Between 1998 and 2004, the number of applications in both countries was approximately the same; thereafter, Slovenia recorded significantly more applications. In recent years, however, the number of applications has declined in both countries, indicating that they have had better times in the past and suggesting that measures are needed to return to that level.

Among the top applicants in Croatia are the pharmaceutical company Pliva, the GlaxoSmithKline Istraživa ki centar Zagreb, and the Rudjer Bošković Institute; in Slovenia, the pharmaceutical companies Krka and Lek and the University of Ljubljana. This shows the central role of the pharmaceutical industry and key public research institutions in the patenting landscape of both Croatia and Slovenia.

A similar pattern is observed in the Patstat database, where PCT applications from national applicants who selected DZIV or URSIL as the receiving office can be identified. The decline in applications is visible in both countries, but it is even more pronounced in Slovenia than in Croatia.

The downward trend is even more pronounced in national patent applications (Figure 4), which refers to applications by Croatian and Slovenian residents filed with the national IP offices (DZIV or URSIL). In both countries, a downward trend is evident, but it is more pronounced in Slovenia. In 2023, Croatia surpassed Slovenia for the first time in the number of national applications.

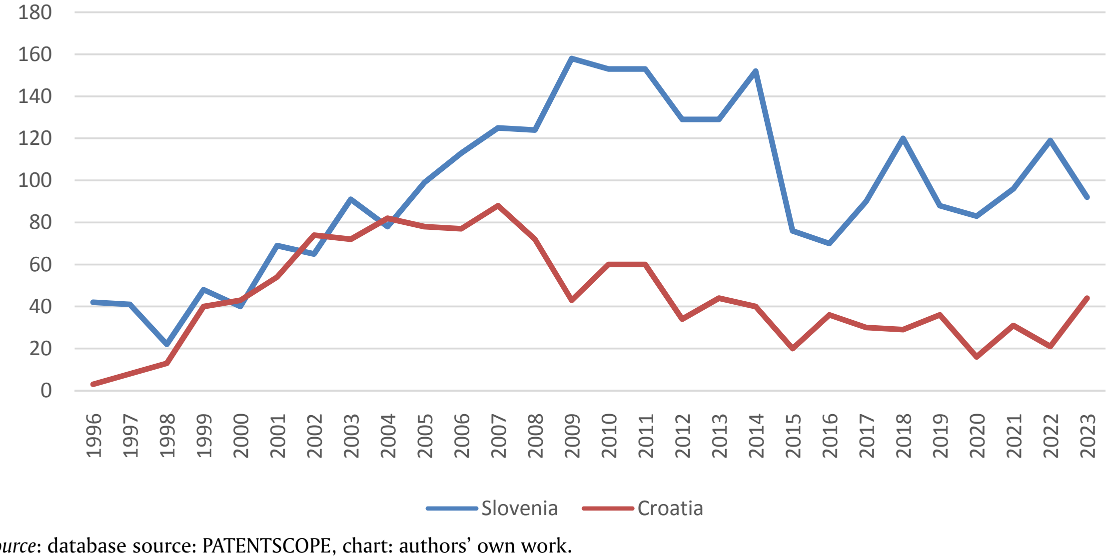
However, unlike national and PCT applications, European patent applications are increasing slowly in both countries (see Figure 5). This reflects a growing awareness among applicants of the strategic importance of securing protection in the EU market. The increase could be linked to policy initiatives, EU-funded projects, and institutional support programs that encourage companies and research organisations to pursue European-level protection. In Slovenia, such an institutional support programme is the above-mentioned "Public Call for Supporting the Activities of Knowledge Transfer Offices (JR KTO)" (KTS, n.d.).

Figure 6 below shows the number of trademarks (or service marks) registered through the Madrid System. Slovenian trademark holders hold more registered trademarks, but this trend appears to be stagnating, whereas registrations in Croatia have increased in recent years and are approaching Slovenia's level.

Figure 7 below shows the number of industrial designs registered at the EU Intellectual Property Office (EUIPO). Again, Slovenia has more industrial designs, but its trend is stagnating, while the number of registrations in Croatia has been increasing. In 2024,

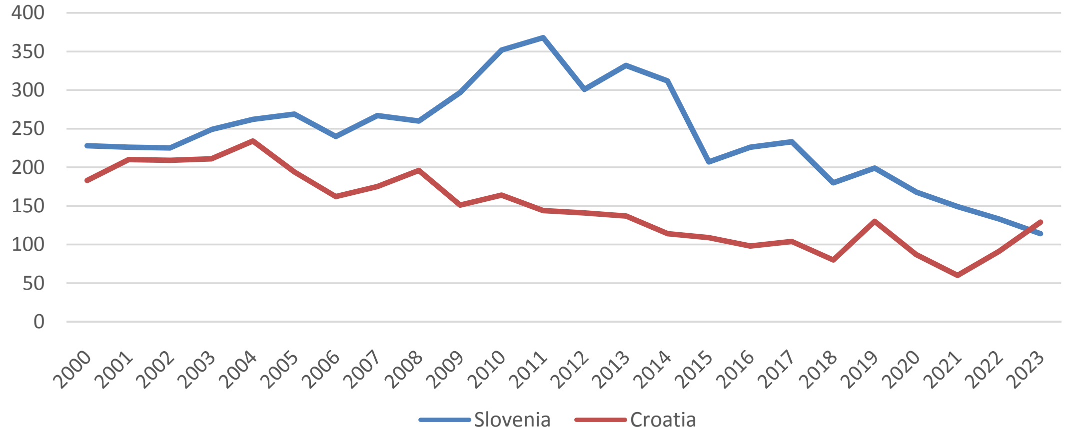
Figure 3

PCT Patent Applications by Applicant's Address Country



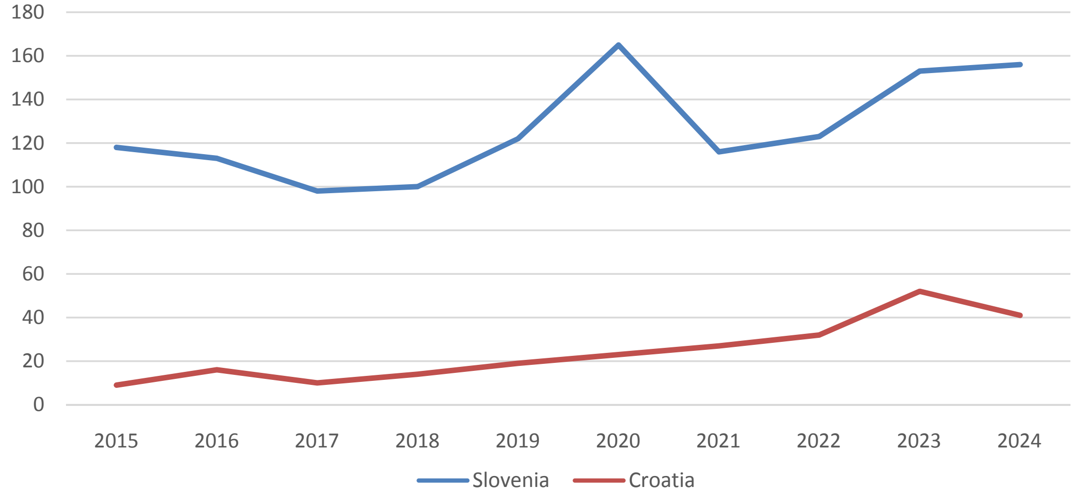
Source: database source: PATENTSCOPE, chart: authors' own work.

Figure 4
Croatian and Slovenian National Patent Applications



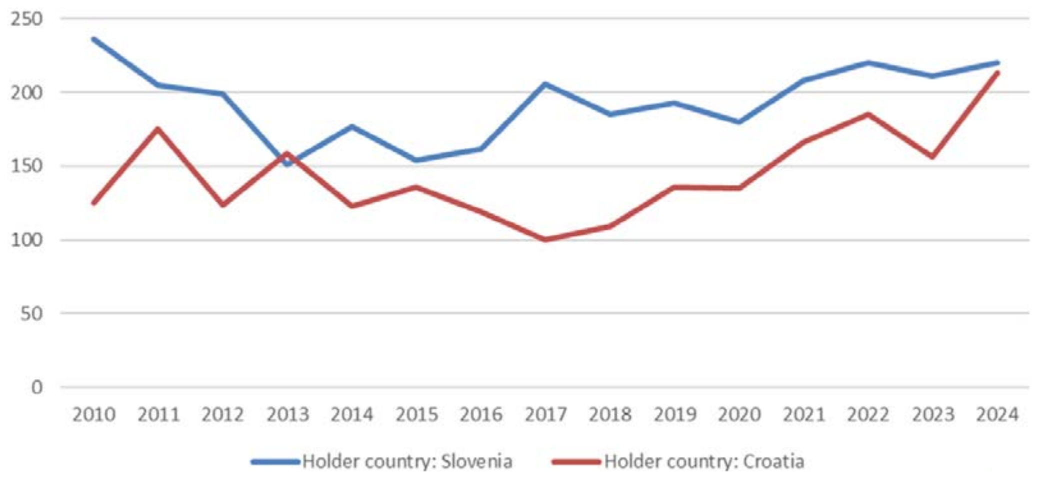
Source: database source: Global Patent Index, chart: authors' own work.

Figure 5
European Patent Applications



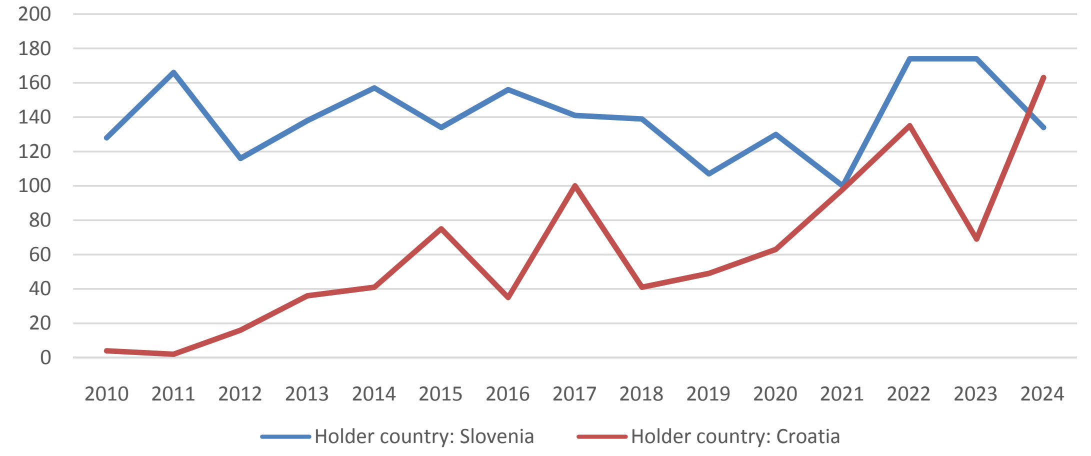
Source: data source: Statistics & Trends Centre, chart: authors' own work.

Figure 6
Number of Trademarks Registered Through the Madrid System



Source: database source: Madrid System, chart: authors' own work.

Figure 7
Number of Industrial Designs Registered at EUIPO



Source: database source: EUIPO eSearch plus, chart: authors' own work.

Croatian design holders registered more industrial designs than Slovenian design holders.

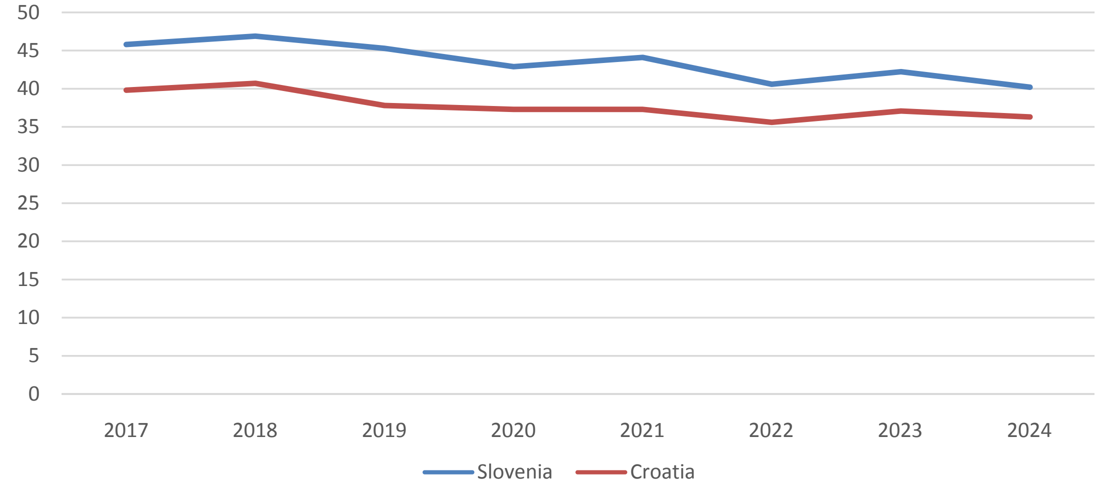
Using data from the Global Innovation Index (GII) and the European Innovation Scoreboard (EIS), the authors assess the innovation capacity and IP effectiveness of Croatia and Slovenia. These rankings provide insights into each country's strengths and weaknesses in fostering a knowledge-driven economy. At EIS, Slovenia is currently ranked 17th, while Croatia is 26th (European Commission, 2025). GII scores for the last few years are presented in the chart below (Figure 8).

Although Slovenia ranks higher, both countries have experienced declines in their GII rankings since 2018. Several possible reasons include increasing competition from other emerging, innovation-driven economies, such as China.

Discussion

Balzat and Hanusch (2004) identified three development lines of the NIS concept: 1) policy-oriented studies, 2) contributions to formalise the concept of NIS through descriptive or analytical models, and 3) NIS studies of countries beyond the group of highly industrialised economies. This study can also address points 1 and 3. Among European countries, Švarc (2011) identifies three broad groups of countries: "first movers," such as the Nordic countries, which adopted NIS early; "latecomers," including countries with highly centralized and relatively inert public administrations – such as France, Italy, and Austria – where the adoption of NIS was slower; and "discursive reformers," primarily former socialist countries like Slovenia, Hungary, and Poland, where innovation

Figure 8
GII Scores for Croatia and Slovenia



Source: *Global Economy.* (n.d.). Retrieved August 10, 2025, from https://www.theglobaleconomy.com/rankings/gii_index/, chart: authors' own work.

systems were introduced only partially and primarily through broader political and discursive processes, particularly those associated with integration into the European Union. In this third group of countries, according to Švarc (2011), Croatia also belongs.

The dissolution of Yugoslavia in the early 1990s was accompanied by a series of conflicts that had profound and long-term consequences for Slovenia, Croatia, Bosnia and Herzegovina, and Serbia. Among these, Slovenia's Ten-Day War in 1991 was the briefest and least damaging. This relatively limited exposure to armed conflict may partly explain why Slovenia was more successful than other former Yugoslav countries in establishing a national innovation system. Since gaining independence from Yugoslavia in 1991, Slovenia has made significant achievements in economic and social development (Martin et al., 2015). It joined the European Union in 2004 and the OECD in 2010. Slovenia was recognised as an economic leader among the states of the former Yugoslavia and ranks favourably among its EU colleagues in many measures of economic performance and innovation (Martin et al., 2015). Croatia became an EU member in 2013, nearly ten years after Slovenia.

A comparative analysis of Croatia and Slovenia presented in this article still reveals differences in the structure and performance of their national IP ecosystems. Although both countries share a similar legal framework and international IP commitments, their IP performance and institutional arrangements diverge in some respects.

Slovenia leads in the number of registered IP rights; however, it has experienced a notable decline in PCT and national patent applications over the last ten years, which has been steeper than that observed in Croatia. In addition, Croatia has shown a positive trend in trademark and industrial design registrations, whereas Slovenia's performance in these categories has mainly remained stagnant. This suggests that while Slovenia may have initially benefited from a more mature innovation environment, its momentum has weakened, potentially indicating a need for renewed strategic focus on fostering innovation protected with industrial property. This situation reflects several years of neglect in the field, which the current government is attempting to address through initiatives such as the adoption of a national IP strategy (GOV.SI, 2024; Urad Republike Slovenije, 2024). This strategy does not address industrial property (or NIS) alone; it also emphasises the importance of open science and encompasses copyrights (including open-source software) and the creative sector more broadly, aiming to strengthen the entire intellectual property ecosystem. While the measures are appropriate, their effects will only become visible in the coming years.

When examining support structures, Croatia has more institutions within its NIS. However, a greater proportion of Slovenian institutions provide IP-specific support services, which could enhance the quality and coherence of assistance available to innovators, inventors and entrepreneurs. This structural efficiency may explain Slovenia's historical strength in IP metrics despite its smaller innovation ecosystem.

However, Croatia has some other positive sides: its innovation landscape is characterised by the presence of inventors' associations – an element completely absent in Slovenia. These associations can play a critical role in grassroots innovation, peer learning, and policy advocacy. Additionally, Croatia has implemented a more advanced e-filing system for patents, which streamlines the application process and may reduce administrative barriers for inventors seeking protection (State Intellectual Property Office, n.d.).

Despite Croatia's broader institutional base and technical improvements, Slovenia appears to benefit from stronger state support mechanisms. Public funding measures that consistently support public research organisations and SMEs may help to explain Slovenia's comparatively better IP performance. This suggests that Croatian policy could benefit from introducing more stable, long-term funding instruments to strengthen the capacity of research organisations and SMEs to generate and protect intellectual property. Among these, support for KTOs is critical, as the success of commercialisation models at European universities is primarily shaped by the availability of funding sources and the activity and capacity of technology transfer offices (Skala-Gosk, 2025). In particular, targeted programs that combine financial incentives with advisory services, training, and technology transfer support may be effective in enhancing Croatia's innovation and IP outcomes. Here, it is not necessary to take another state, such as Germany, France or Slovenia, as the ultimate role model. As research on EU Member States has shown, highly innovative states are those with *their own policy designs* to stimulate support for innovation by providing a predictable, stable, and transparent democratic and legal environment (Kustec & Zalokar, 2024).

Conclusion

By identifying gaps and challenges within each ecosystem, this study highlights opportunities for mutual learning, where Croatia and Slovenia can adopt best practices from one another to enhance their IP strategies. While Slovenia has historically outperformed Croatia in several IP and innovation indicators, the decline or stagnation in industrial property applications over the last ten years suggests emerging vulnerabilities. Current Slovenian policymakers are aware of this situation and have already taken important steps, such as the recent adoption of a national IP strategy (Urad Republike Slovenije, 2024).

Croatia, on the other hand, is showing signs of gradual institutional strengthening and engagement with digital tools, which may position it more favourably in the future – if more targeted and consistent policy efforts support these trends. Croatia should introduce stable, long-term funding instruments that strengthen research organisations (KTOs) and SMEs, thereby creating a predictable and supportive environment for generating and commercialising intellectual property.

A key limitation of this study is its reliance on website-based data to identify and analyse NIS institutions. While institutional websites provide accessible and comparable information, they may not fully capture the scope, quality, or effectiveness of IP-related support activities, as some practices are not systematically documented or regularly updated online. However, findings of this study still provide valuable insights for policymakers, industry leaders, and academia, offering recommendations to strengthen national intellectual property frameworks and enhance the global competitiveness of both countries. This research aligns with the broader discourse on sustainable innovation and digital transformation, emphasising the role of resilient IP systems in fostering long-term economic and technological advancement.

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Ida Knapik

Digitising Administrative Processes in Siloed Structures – Lessons Learned from the University

Abstract

The digitalisation of administrative processes in higher education institutions offers significant potential for improving efficiency, yet it remains challenging in organisations characterised by siloed structures and low process maturity. This article presents a qualitative case study of a digitalisation initiative implemented at a large public university, focusing on the digital support of a selected administrative process. The results show measurable benefits, including reduced paper usage, improved transparency, and shorter processing times. However, the study also demonstrates that digitalisation alone does not increase overall process maturity when formal process governance and standardised management practices are absent. The initiative succeeded mainly due to the practical application of BPM lifecycle principles by experienced staff, despite the lack of a formally adopted BPM framework. The findings highlight the importance of governance, people, and organisational culture as key enablers of an early-stage digital transformation and show how small-scale initiatives can serve as a starting point for broader process-oriented change in higher education.

Keywords: Business Process Management (BPM), digital transformation, higher education administration, process maturity, process digitalisation

Introduction

Universities are a distinct type of organisation characterised by a long-standing institutional tradition, substantial professional autonomy, and governance structures rooted in collegiality rather than hierarchical managerial control. The classical Humboldtian model of the university emphasises academic freedom, the unity of teaching and research, and a high degree of institutional autonomy – values that continue to shape the functioning of contemporary public universities (Dziedziczak-Foltyn, 2018).

Universities often combine elements of bureaucratic administration with decentralised decision-making structures, in which authority is distributed across faculties, departments, and collegial bodies rather than concentrated in a single managerial hierarchy (Clark, 1986; Paradeise et al., 2009). In many European higher education systems, including Poland, the Rector holds a central formal position as the institution's head and issues internal regulations, ordinances, and administrative decisions. The practical implementation of these decisions relies on numerous semi-autonomous organisational units. This dispersion of authority reinforces organisational fragmentation and limits direct managerial control over administrative processes.

While institutional autonomy and collegial governance are fundamental to academic values, they also contribute to organisational inertia and complicate the implementation of large-scale administrative and technological change (Kezar, 2014). These structural characteristics have direct consequences for the management of administrative processes within universities. Fragmented authority, firm disciplinary boundaries, and the coexistence of academic and administrative logics frequently result in siloed organisational structures, limited cross-unit coordination, and slow decision-making. In such an environment, processes are often poorly documented, informally executed, and highly dependent on individual knowledge and personal relationships, which hampers transparency and organisational learning (Rosemann & de Bruin, 2005).

In response to these structural and governance-related challenges, digitalisation has emerged as a key approach to improving the efficiency and coordination of administrative processes in universities. Business Process Management (BPM) is a systematic approach to

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designing, executing, monitoring, and continuously improving organisational processes to achieve strategic objectives and enhance operational efficiency (Davenport, 1993; Harmon, 2019). Closely related, Business Process Orientation (BPO) denotes the adoption of a process-focused mindset across the organisation, emphasising clear process ownership, alignment of processes with organisational goals, and the integration of process governance into managerial practices (Rosemann & de Bruin, 2005). These concepts provide a foundation for understanding how digitalisation initiatives can be effectively implemented in higher education institutions.

Digitalisation entails the end-to-end redesign of workflows by adopting digital systems to automate processes and enable platform integration. Rather than merely converting information into digital form, this approach aims to improve operational efficiency and foster collaboration through technology (Parviainen et al., 2017). The digitalisation of administrative processes in higher education, including the implementation of Enterprise Resource Planning (ERP) systems, Business Process Management (BPM), workflow automation, and document management solutions, is well established.

Prior research consistently reports measurable efficiency gains from such initiatives and increasingly highlights frameworks and technologies specifically tailored to higher education contexts (Chaushi et al., 2017; Galimberti et al., 2022; Zenak et al., 2025). However, universities often struggle to implement digitalisation in a coherent, organisation-wide manner. While some administrative areas, such as dean's offices, are frequently partially digitised, for example, through student information systems such as USOS (Afeltowicz, 2011), these solutions tend to remain isolated and insufficiently coordinated within a broader institutional framework.

Studies on process maturity in educational institutions further indicate that many universities remain at the initial levels of process maturity, as described in models such as the Business Process Maturity Model (BPMM) (Duarte & Martins, 2014; Hrabala et al., 2017). At this stage, organisations typically prioritise the digitalisation of existing processes, often suboptimal and poorly structured, over their systematic organisation and improvement (Rosemann & de Bruin, 2005). This limited process maturity is closely linked to structural and governance-related barriers. The absence of clearly defined process owners, overlapping authority structures, and the widespread presence of ad-hoc or shadow processes are repeatedly identified as significant obstacles to effective BPM implementation in higher education institutions (Abdelnabi et al., 2023; Hrabala et al., 2017). In addition, universities frequently encounter resistance to change stemming from dispersed responsibility, legal constraints, and a deeply embedded organisational culture that prioritises academic autonomy over managerial efficiency (Kezar, 2014).

Consequently, digitalisation initiatives are often reduced to the introduction of new technological tools, with insufficient attention paid to the structure and governance of the underlying processes. The literature nevertheless acknowledges that even partial digitalisation can yield short-term benefits, such as reduced paperwork, increased transparency, and shorter document processing times (Davenport & Short, 1990; Vom Brocke & Mendling, 2018). Without comprehensive process governance and the development of a process-oriented organisational culture, these benefits are difficult to sustain in the long term. As emphasised by Gabryelczyk (2020), digitising poorly governed processes rarely leads to lasting improvements in organisational efficiency.

The article contributes to the literature by presenting an in-depth case study of the digitalisation of a selected administrative process in a large public university characterised by low process maturity and siloed organisational structures. Unlike many studies that focus on process optimisation prior to digitalisation, the case deliberately examines the digital support of an existing process without prior redesign, reflecting common practice in higher education organisations. By analysing the implementation steps, encountered challenges, and achieved outcomes, the study highlights the critical role of Business Process Orientation (BPO) and formal process governance as prerequisites for lasting process-oriented digital change in universities.

Methodology

This study adopts a qualitative descriptive case study approach (Yin, 2003), which describes the university's digitalisation efforts from an insider perspective, following the logic of a BPM lifecycle that has not been formally institutionalised. The process lifecycle serves as a schematic representation of how processes are implemented and managed within an organisation, providing a map for the core steps of process management (Szelągowski, 2018). According to this lifecycle, effective process transformation involves identification, modelling, analysis, design, implementation, and monitoring of processes (Dumas et al., 2013). Digitalisation projects often expose shortcomings in existing process governance and can, by necessity, accelerate the adoption of BPM principles (Cruz et al., 2021). The subject matter is one of ten Polish higher education institutions designated as research universities. As of 31st December 2024, the university serves nearly 20,000 students and employs over 2,000 academic staff as well as more than 2,000 non-academic employees, including administrative and engineering-technical personnel across 18 faculties (AGH, 2024). From a technological perspective, the university is characterised by a well-developed IT infrastructure. Core administrative and academic functions are supported by integrated information systems (e.g., human resources system). The institution has established formal data management policies governing data quality, access, security, and compliance with legal and regulatory requirements (https://www.agh.edu.pl/o-agh/dokumenty).

Case Characteristics

In the case analysed, the university undertook digitalisation efforts to streamline administrative processes and transition from paper-based workflows to digital environments. These initiatives were conducted as pilot projects in selected areas. Prior to digitalisation, processes were carefully mapped, analysed, and documented, providing a foundation for subsequent technological implementation. The initiative aligns with the university's strategic goals of becoming an efficiently managed institution and implementing the digital university concept (6th strategic goal and 3rd operational goal) (AGH, 2022). The organisation exhibited characteristics of level 1 (Initial) in the Business Process Maturity Model (BPMM), where processes are informal, poorly documented, and highly dependent on individual knowledge (Object Management Group, 2008). To empirically justify this, criteria such as process documentation, standardisation, repeatability, and governance mechanisms were assessed.

Well-known, established project management frameworks, such as PRINCE2 or PMBOK, cannot be directly operationalised in higher education without adaptation, due to unique governance structures, professional autonomy, and collegial decision-making (Coghlan & Brannick, 2014). Their principles served as reference points for evaluating the organisation's maturity. Despite intuitive adherence to some good practices and an agile approach to implementation, processes remained largely siloed and dependent on individual actors. This low maturity reflects both the Humboldtian structure of the university and entrenched discipline-specific administrative traditions. Consequently, many activities were performed on an ad hoc basis, relying heavily on tacit knowledge, which increases vulnerability to personnel changes (Rosemann & de Bruin, 2005). The implemented changes primarily focused on digitising existing processes through pilot projects. This approach enabled structured digitalisation aligned with BPM principles while also providing insights necessary for future optimisation and standardisation.

Digitalisation Steps in the Context of BPM

The project followed the subsequent stages:

1. The management of job vacancy leaflets was selected as one of the first processes for optimisation within the faculty. Prioritisation was jointly decided by the Dean of the Faculty and the Project Manager. During this stage, all stakeholders involved in the process were identified, ensuring that responsibilities, inputs, and outputs were clearly mapped. This phase corresponds to the *process identification* stage of the BPM lifecycle.
2. The second phase involved *AS IS process modelling* for the management of job vacancy leaflets. The case was intentionally selected to represent a typical faculty within the university, enabling an in-depth understanding of current practices in a real-world operational context. The study included administrative staff from both the faculty (four recruiters and three HR employees) and the central HR department (four staff members), all of whom were directly involved in the preparation, verification, or publication of job vacancy leaflets as a part of their daily responsibilities. Data were collected over approximately six months, with the researcher participating as an internal observer, gaining hands-on insight into the process. Empirical material was documented in the form of systematic handwritten notes, digitally recorded by the researcher throughout the observation and interview phases.

The modelling consisted of two main parts:

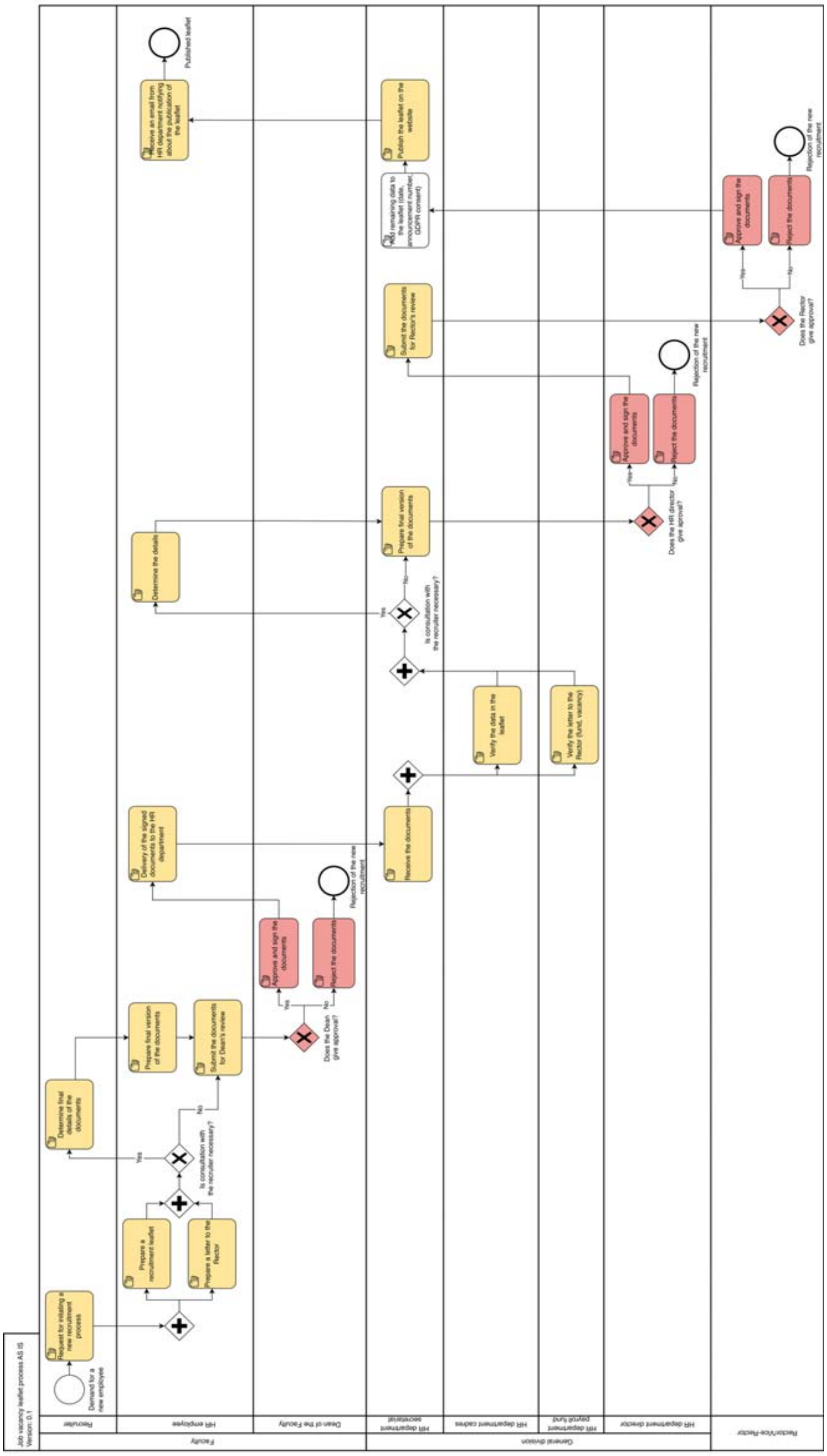
1. Documentation analysis – archival documents containing job vacancy leaflets were gathered, organised, and indexed by faculty and date. A thorough content analysis was performed to identify key elements, document structure, recurring patterns, and commonly used terminology. Each leaflet typically included mandatory elements, such as announcement number, faculty, position type, number of vacancies, requirements, and necessary documents (e.g., CV, consent for data processing, or cover letter). Optional elements included detailed job descriptions, personal qualities, and scope of duties. Conclusions and discussion questions for stakeholders were prepared based on this analysis.
2. Interviews with stakeholders – semi-structured, face-to-face interviews were conducted with faculty and central staff. An initial set of questions was prepared as a *kick-off* guide. Examples of the prepared questions included:
   - What is the process flow from submitting a demand for a new employee to publishing the leaflet on the website?
   - Who is authorised to submit a demand for a new employee?
   - Which information is provided by the faculty, and which is completed by the HR department?
   - On average, how many leaflets are published each month?

   Further questions arose dynamically during the conversations, often in an ad hoc manner depending on respondents' flow and real-time reactions. Limited participant availability extended the interview phase over several weeks. The analysis of the AS IS process revealed several bottlenecks (marked in red) and weaknesses (marked in yellow), as shown in Figure 1. In particular:
   - Approval stages at the faculty, HR department and Rector levels constitute major bottlenecks, as decisions depend on individual availability and are not supported by standardised timeframes.
   - Verification and correction actions between faculty and HR units introduce delays due

to non-standardised content and repeated manual checks.
- Strong dependence on tacit knowledge is visible in several steps, where task execution relies on individual experience rather than formalised procedures (e.g., leaflet preparation or document verification).
- Manual data handling and document transfers increase the risk of errors and prolong the overall process duration.

The identified bottlenecks correspond to activities characterised by low formalisation and high reliance on individual expertise, consistent with level 1 (Initial) of process maturity.

Figure 1
AS IS Flow for the Analysed Process (Job Vacancy Leaflet Management)



Source: author's own work.

3. In the next step, the documented process was subjected to qualitative analysis using an inductive approach. Given the limited scope of the case and the exploratory nature of the study, the analysis focused on understanding process logic, recurring issues, and opportunities for improvement rather than on theory-building or large-scale qualitative generalisation. The analysis proceeded in four stages. First, a descriptive phase was conducted, involving repeated readings of the collected empirical material, including interview notes and internal documents. This stage aimed to familiarise the researcher with the process logic, terminology used by participants, and recurring problem areas. Second, the material was segmented into smaller analytical units, such as sentences and short thematic fragments. During this stage, frequently recurring expressions and topics were identified. The most common references concerned:
   - Submission and circulation of the job vacancy leaflet, e.g., “the leaflet and letter are sent to the HR department” (Interview 1, 2024).
   - Verification of documents by the HR department, e.g., “the HR department verifies the documents” (Interview 3, 2024).
   - Roles and responsibilities of process participants, e.g., “roles and permissions must be clearly defined” (Interview 1, 2024).
   - Approval by Dean and Rector, e.g., “documents must be signed by the Dean, then they go to the Rector” (Interview 1, 2024).
   - Document requirements and formal correctness, e.g., “the leaflet must contain all mandatory elements, otherwise it is returned for correction” (Interview 2, 2024).

   The purpose of this step was not to quantify word frequency but to identify recurrent process-related issues and decision points, which served as indicators of structurally significant elements within the process. Third, an open coding procedure was applied. Codes were assigned to recurring themes and grouped into broader analytical categories:
   - Requirement process (demand for a new employee, prepare the leaflet and letter, approvals, publish the leaflet, inform the unit).
   - Documents and content (leaflet description, necessary documents, document templates, with mandatory and optional sections).
   - Roles and actors (recruiter, HR employee, Dean, Rector, HR department staff).
   - Issues and needs (roles and access rights, duplicate actions, alerts and reminders).
   - Proposed system functionalities (colour-coded forms, notifications, automated publishing).

   Given the study's limited scale and the narrowly defined process scope, coding was conducted by a single researcher. The empirical material was relatively small and homogeneous, and the objective of the analysis was to understand processes rather than to generate theory. For this reason, formal inter-coder reliability procedures were not applied, as they would not have added analytical value in this context. Instead, consistency was ensured through repeated iterations of coding and continuous comparison between data segments and emerging categories. In the final step, the codes were consolidated into higher-level thematic categories (primary, secondary, expected and unexpected). Table 1 presents the results of this analytical process, along with illustrative quotations from the empirical material.

   The analysis revealed several major issues (*narrative summary*), including:

Table 1

Summary of Closed Coding Results with Categorised Themes and Illustrative Quotations

Theme category	Codes	Illustrative quotations
Primary	Recruitment process, documents, roles and actors	“Step 1 is a demand for a new employee” (Interview 3, 2024). “The application should include a CV” (Interview 2, 2024).
Secondary	Process issues	“There are many duplicative actions and substantial paper use” (Interview 2, 2024).
Expected	Automated workflow, document management, role clarity and permissions	“HR department employees must be able to edit the leaflet” (Interview 1, 2024). “Note that person XYZ is responsible for this document to prevent duplicates” (Interview 3, 2024).
Unexpected	Duplicated actions, lack of centralised communication	“The HR department communicates by phone/email with the relevant HR employee” (Interview 1, 2024).

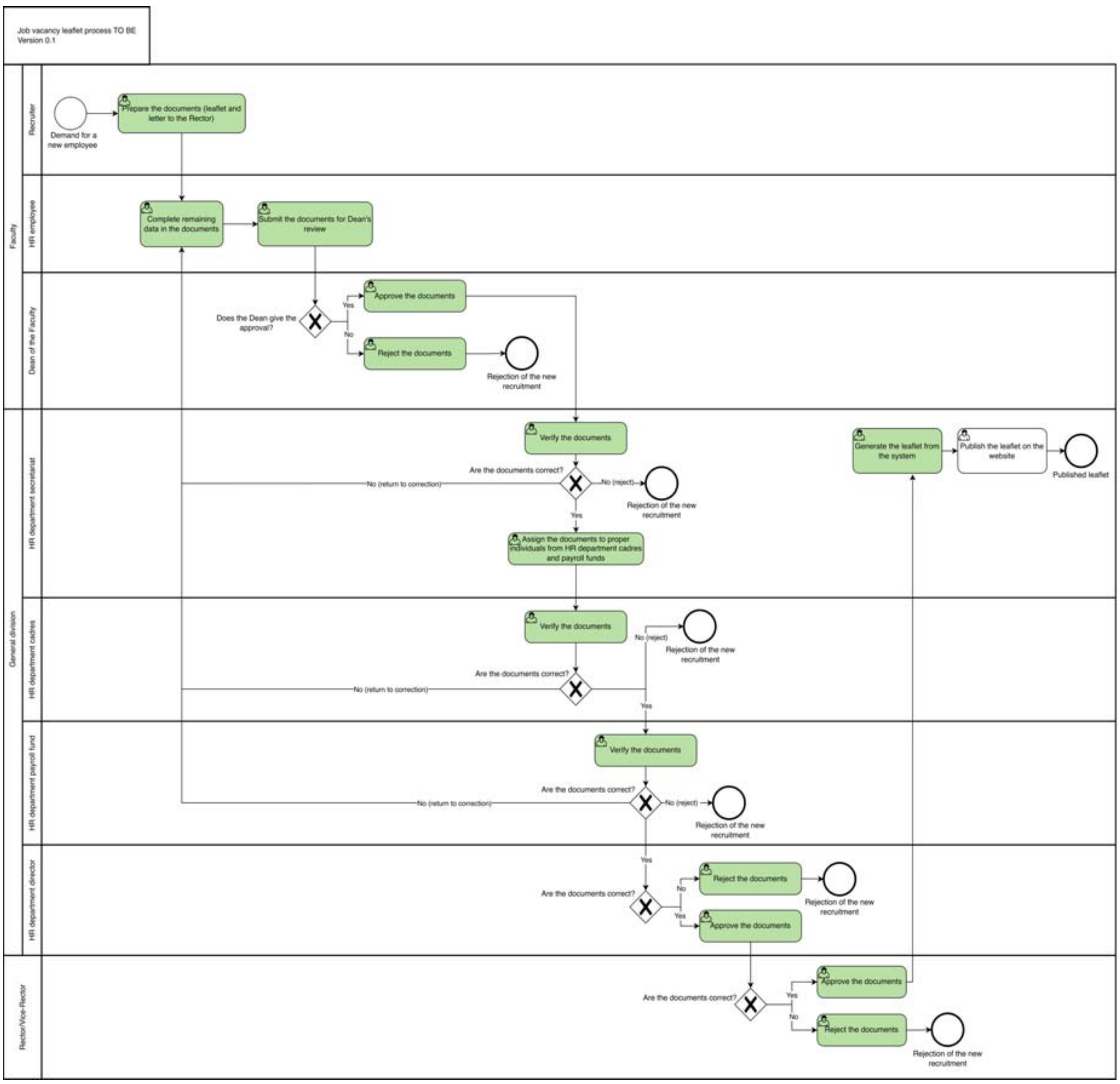
Source: author’s own work.

- extensive manual handling of information,
- frequent corrections and delays,
- limited process transparency,
- lack of status tracking mechanisms,
- strong dependence on informal communication,
- and growing frustration among process participants.

4. Based on the identified requirements, observed process weaknesses, and stakeholder input, a TO BE process model was developed using BPMN notation. The design phase focused on translating analytical findings into feasible process improvements while considering the technical capabilities of the target system. BPMN modelling was supported by draw.io and Figma tools, which were used to prepare both process diagrams and interface mock-ups. The outcome of this phase was a pre-implementation analysis document, including AS IS and TO BE process models, detailed descriptions of redesigned process steps, and visual mock-ups of the planned system interface. The TO BE model (Figure 2) introduces several key improvements compared to the existing process (marked in green):

- Automation of requests, enabling automatic forwarding of tasks to the next responsible actor without manual intervention.
- Built-in data validation, ensuring completeness and correctness of submitted forms before further processing.
- Full digital handling of documents, eliminating paper-based steps and reducing the risk of errors.

Figure 2
TO BE Flow for the Analysed Process (Job Vacancy Leaflet Management)



Source: author's own work.

- Real-time process tracking, allowing participants to monitor the status of requests.
- Centralised data and document management, ensuring consistent access to up-to-date information.
- Improved communication between stakeholders, supported by system-based notifications and clearly defined responsibilities.

These changes directly address the bottlenecks and inefficiencies identified in the AS IS analysis. The TO BE process represents a structured approach to process improvement, aimed at increasing efficiency, traceability, and reliability while laying the foundation for further process standardisation and digital maturity.

5. As a part of the implementation phase, the redesigned process was digitalised using the nAxiom low-code platform (https://naxiom.com/en/platform/about-platform). The tool was selected through a formal public procurement procedure, in accordance with regulations applicable to public higher education institutions. It was made available for process automation at the organisational level. nAxiom is a low-code platform supporting process modelling, electronic forms, rule-based validation, automated task routing, and role-based access control. These functionalities enabled the implementation of the redesigned process while maintaining compliance with institutional and legal requirements. The platform was particularly well-suited to supporting structured workflows and enhancing process transparency without requiring extensive custom development. The implementation was constrained by the system's technical capabilities and the need to preserve the existing business logic. Consistent with observations by Scheithauer and Wirtz (2008), the digitalisation focused on improving execution and control rather than on radically redesigning the process. The final phase of the project corresponded to the process monitoring and control stage and was conducted using an agile-oriented User Acceptance Testing (UAT) approach. In agile methodologies, UAT constitutes a critical validation phase in which end users assess whether the implemented solution adequately supports business processes and operational requirements prior to production deployment (https://scrumguides.org/index.html).
6. In the case analysed, UAT was conducted iteratively, with key stakeholders directly involved in the job-vacancy process. The testing phase combined hands-on system use with structured feedback collection and was conducted over 2 cycles. This approach enabled the identification of functional issues, usability problems, and inconsistencies between the designed process and actual work practices. The results of UAT led to several refinements to the implemented solution, including adjustments to form structure, validation mechanisms, and system improvements. Following the incorporation of these changes, the system was approved for initial deployment. The pilot implementation was launched at the Faculty of Computer Science and subsequently extended to three additional organisational units cooperating at the executive level. The solution is currently in operational use and is supported through ongoing maintenance and incremental improvements based on user feedback.

Empirical Outcomes of Digitalisation

The effects of this digitalisation became visible shortly after deployment and could be directly linked to previously identified bottlenecks in the AS IS process. The effects of digitalisation were assessed using a set of process-oriented Key Performance Indicators (KPIs), which are summarised in Table 2. The most significant improvement concerned the elimination of paper-based documentation. Prior to implementation, each case required printing and manual circulation of multiple documents, typically up to 10 pages per 1 leaflet. Following digitalisation, the process became fully electronic, resulting in a 100% reduction in paper use for the analysed workflow. A second significant improvement concerns process throughput time, particularly at the approval stages. In the AS IS process, document circulation depended

Table 2
KPIs before and after Digitalisation

KPI	AS IS	TO BE	Observed effects
Process duration	10–14 days	3–5 days	Approx. 60–70% reduction
Paper usage	Up to 10 pages per 1 leaflet	0 pages	100% elimination
Approval dependency	Physical presence required	Electronic approval	Bottleneck removed
Level of automation	Fully manual process	Partially automated, system-supported	Significant reduction of manual work
Process transparency	Low	High (real-time tracking)	Fewer status inquiries

Source: author's own work.

on the physical availability of decision-makers, which frequently caused delays. After implementation, approvals were processed electronically and asynchronously with proper reminders, reducing the average processing time from approximately 10–14 days to 3–5 days, depending on case complexity. The digital solution also improved process transparency and control. Users gained real-time access to request status, which significantly reduced informal inquiries and repeated follow-ups. User feedback collected during and after UAT confirmed these effects. One participant noted that "The status of each request is now immediately visible, which eliminates uncertainty and unnecessary communication." At the same time, another emphasised that "The system enforces a clear structure and reduces the risk of errors." Concurrently, the implementation revealed challenges in adapting established work practices. Some users required additional time to adapt to the new workflow, underscoring that digital transformation in academic organisations must be accompanied by gradual learning and support mechanisms. The system remains under continuous evaluation, with performance indicators monitored to guide further optimisation.

Challenges and Recommendations

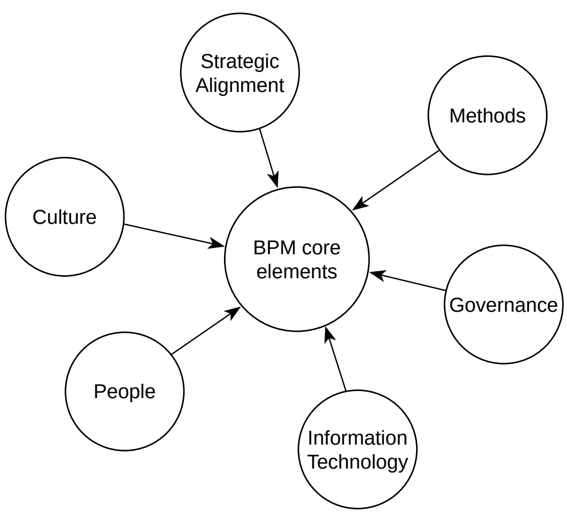
Although the digitalisation initiative delivered measurable operational improvements, it is important to emphasise that the presented results stem from the implementation of a single administrative process; therefore, they should be interpreted within the limitations of a qualitative case study. The findings do not permit direct generalisation to the entire organisation. They provide empirically grounded insights into the typical challenges associated with process digitalisation in large, decentralised universities.

The case demonstrates that digitalisation, when implemented without a broader organisational framework for process management, tends to focus on the technical layer rather than on structural or governance-related transformation. In the analysed project, the primary effort was directed toward mapping and digitising an existing process. In contrast, issues such as process ownership, cross-unit coordination, and long-term process governance remained only partially addressed. This confirms earlier observations that digital tools alone do not guarantee process maturity and may even reinforce existing inefficiencies if organisational conditions are not adequately addressed.

The findings of this study should not be interpreted as exceptional or isolated. On the contrary, they reflect challenges widely reported in the literature on Business Process Management in Central and Eastern European (CEE) countries. As noted by researchers analysing BPM adoption in this region, there is often an apparent discrepancy between the theoretical maturity of BPM concepts and their practical implementation. While process-oriented management is well described in academic literature, its application in public organisations remains fragmented, incremental, and frequently limited to local initiatives rather than organisation-wide transformation (Gabryelczyk et al., 2022).

From this perspective, the value of the presented case lies precisely in its practical realism. The study illustrates how digitalisation efforts unfold under real organisational constraints, including limited formal process governance, siloed structures, and a strong dependence on individual engagement. Rather than representing an idealised BPM implementation, the case highlights the everyday conditions under which digitalisation initiatives are typically carried out in public universities.

Figure 3
BPM Core Elements



Source: own work based on M. Rosemann & J. vom Brocke, "The six core elements of business process management". In J. vom Brocke, & M. Rosemann (Eds.), *Handbook on business process management 1: introduction, methods, and information systems* (p. 111). Springer (https://doi.org/10.1007/978-3-642-45100-3_5).

The analysis also indicates that while the strongest emphasis was placed on information technology, methods, and strategic alignment, the project simultaneously initiated gradual development in the remaining BPM core elements – governance, people, and culture (Rosemann & vom Brocke, 2014) (Figure 3). Although no formal process governance framework was introduced, the agile, iterative implementation approach led to the gradual emergence of responsibility and decision-making structures within the digitised process.

Similarly, while BPM was not formally adopted, the project fostered increased process awareness among participants and encouraged more structured thinking about workflows and responsibilities. The observed user adaptation challenges underline that digital transformation is not merely a technical change but a social and organizational one. Resistance to new tools, reliance on established work habits, and the need for learning time are common in organisations characterised by low process maturity. These findings support earlier research indicating that successful wide digital transformation requires not only technological investment but also sustained efforts in training, communication, and cultural change (Sánchez, 2020).

Based on the case analysis, several recommendations can be formulated, not as universal prescriptions, but as practice-oriented indicators for similar organisations:

- Digital initiatives should be accompanied by the gradual development of process governance structures, even if implemented initially on a limited scale.
- Process ownership and accountability should be explicitly defined to avoid fragmentation and local optimisation.
- Employee competencies in the process lifecycle and digital tools should be systematically developed.
- Cultural change toward process orientation should be supported through incremental, well-communicated initiatives rather than top-down enforcement.

The presented case does not claim to provide a comprehensive model for digital transformation in higher education. Instead, it offers empirical evidence that even a single well-executed digitalisation initiative can reveal structural weaknesses, stimulate organisational learning, and catalyse broader process-oriented thinking. Addressing such issues openly, rather than assuming that digital tools alone will resolve them, remains a critical challenge for universities pursuing digital transformation.

Conclusions

The presented case demonstrates that even in highly siloed higher education institutions, digitalisation can yield tangible operational improvements when supported by process-oriented thinking. The implementation confirmed that BPM principles, although not formally adopted, enabled the identification of bottlenecks, improved transparency, and increased efficiency of the analysed process. The study clearly shows that digitalization alone does not increase overall process maturity. While the project improved the execution of a single administrative process, it did not produce systemic change at the organisational level. This is why technological solutions must be accompanied by the development of process governance, clearly defined responsibilities, and organisational capabilities related to process management. The study contributes to the BPM literature by empirically demonstrating how low process maturity and the absence of governance mechanisms shape the trajectory of digitalisation. Under such conditions, efficiency gains remain confined to local process improvements, while organisation-wide process transformation is systematically constrained. The presented case concerns a single, relatively small administrative process implemented as a pilot initiative; therefore, its results cannot be generalised directly to the entire university. However, the study provides valuable empirical insight into how digitalisation unfolds in practice and highlights the typical challenges faced by higher education institutions at the early stages of process maturity. Future research and implementation efforts should extend this approach to a broader set of processes to assess scalability and long-term organisational impact. Meaningful digital transformation in higher education does not begin with technology itself, but with the willingness to rethink processes, responsibilities, and collaboration, making process awareness the actual driver of change.

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Artificial Intelligence in the Functioning of HR Processes: Experience of Poland and Ukraine

Abstract

The article examines the role of artificial intelligence (AI) and generative artificial intelligence (GenAI) in Human Resource Management, with a focus on the comparative experiences of Poland and Ukraine. While traditional AI in HRM focuses on predictive analytics and automation, GenAI introduces novel capabilities for content creation and personalised communication. Theoretically grounded in the Technology Acceptance Model (TAM), the study investigates adoption levels, perceived advantages, and systemic risks. The research employs an exploratory methodology based on a quantitative survey of HR specialists ($n = 90$). The findings indicate that while the total sample comprises 90 professionals, specific adoption patterns were analysed among those already implementing AI tools ($n = 32$ in Poland; $n = 19$ in Ukraine). The study reviews key literature sources and presents the results of a quantitative survey of human resource management specialists. According to the results, Poland has advantages in terms of stronger institutional capacity, clarity of the regulatory framework, and economic stability. However, its approach to implementing AI in HRM remains cautious. Despite infrastructure and regulatory constraints, Ukraine has demonstrated a higher level of experimental implementation, primarily in automating operational activities and creating recruitment-related content. Both Ukrainian and Polish HR professionals share a similar view on the benefits of applying AI, including improved HR management efficiency, more accurate recruitment processes, better onboarding results for new employees, and the ability to make data-driven decisions that lead to better strategic outcomes. The most significant risks identified included personal data privacy concerns, management bias, over-reliance on technology, and organisational resistance to change. The study concludes by emphasising the necessity of ethical frameworks and targeted digital literacy programs to support sustainable AI-driven HRM solutions.

Keywords: artificial intelligence, generative artificial intelligence, HR department, HR functions, HR processes, AI-driven solutions, AI tools

Introduction

In the era of rapid digitalisation and automation, disruptive technologies, namely artificial intelligence (AI) and generative artificial intelligence (GenAI), are recognised as playing an increasingly important role in many business processes, in particular in Human Resource Management (HRM) (Eubanks, 2022). AI represents itself as a complex revolutionary technology, a computer system designed to perform tasks typically performed by humans and is seen as a driving force in the world of work (Huang & Rust, 2018). AI is defined as a broad branch of computer science aimed at building systems capable of performing tasks that typically require human intelligence, such as reasoning, learning, and decision-making (Barret & Miller, 2024). Its impact on management in general and human resource management in particular has been a constant focus of attention in the spotlight of scientists and researchers since the very first successful implementation (Berente et al., 2021; Iyer et al., 2025; Williams, 2025). This attention is driven by the potential opportunity to optimise recruitment processes, improve

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onboarding smoothness, increase employee training quality and flexibility, and facilitate data-driven decision-making (Dennis & Aizanberg, 2023; Reilly, 2018; Tambe et al., 2019; Vrontis et al., 2022).

GenAI is a specific subset of AI technologies that uses models to generate new content, such as text, images, code, or audio, based on the patterns it learned from existing data and has its own potential to be applied in HRM (Bučková & Przyłuska-Schmitt, 2025; Dasborough, 2023; Feuerriegel et al., 2024). When general AI technologies are commonly used in HR for Predictive Analytics purposes and for automation, GenAI is mostly considered for content creation (Garcia & Kwok, 2025; Gowri et al, 2025; Semujanga & Mikalef, 2024). Even though general AI is already described as a catalyst for economic growth in Central and Eastern Europe. For example, recent studies show that generative AI could boost GDP by 90–100 billion per year (5%) and up to 8% of GDP per year in an accelerated scenario (Bernardelli et al., 2025). Overall, the applicability of AI and GenAI tools in the practice of human resource management professionals is of wide interest, with the first successful application cases. However, this experience remains fragmented, as different countries and industries demonstrate varying rates of disruptive technology adoption, legal requirements, and the speed and flexibility of integration.

Thus, the article examines the role of artificial and generative intelligence in HR management processes by comparing experiences of both Poland and Ukraine. The study identifies challenges and prospects for the further development of AI in HR and suggests possible steps to optimise its application in HR specialists' functions and processes. The relevance of such a comparative analysis is determined by the fact that both countries are actively developing their technology sectors and adapting to global automation trends. Poland demonstrates a structured approach to integrating advanced AI-based HR management practices, supported by EU procedures and frameworks, while Ukraine, with its dynamic IT sector, is prone to experimenting with AI in HR to address operational issues and workforce limitations amid wartime difficulties.

In the field of management science, the implementation of artificial intelligence remains innovative, and there is a lack of in-depth research. This creates a research gap that this article seeks to address. Thus, the following research questions were formulated:

1. To what extent have AI technologies been integrated into HR management functions within Polish and Ukrainian organisations?
2. How do HR practitioners in Poland and Ukraine perceive the balance between the operational efficiencies and the ethical or systemic risks associated with the implementation of Artificial and Generative AI?
3. What is the current state of AI-related digital literacy and professional orientation among HR specialists in both countries, and how does this influence their readiness for AI adoption?

To answer these questions, the study employed a two-stage research design: (1) a review of relevant literature and (2) an empirical quantitative survey conducted with HR professionals in both countries.

Literature Review

The growing interest in the implementation of artificial intelligence and other revolutionary technologies in HR management is explained by several interrelated factors (Charlwood & Guenole, 2022; Fenech et al., 2019; Guenole & Feinzig, 2018; Nar et al., 2024). First, general AI has the potential to improve the efficiency and accuracy of key HR functions, primarily recruitment, routine process optimisation, workforce analysis, training, and technical tasks. Initial attempts to utilise AI in HR have already demonstrated tangible benefits, including speeding up processes, reducing task overload, and improving decision-making efficiency. Updating onboarding programs for new employees, staff training and development, and talent management issues related to AI applications are also recognised in various studies as promising and relevant (Manoharan, 2024; Nyathani, 2023; Votto et al., 2021; Williams, 2025).

HR leaders and professionals demonstrate a strategic view of AI, not only as a tool for improving operational performance, but also as a means of optimising decision-making for a long-term perspective (Berente et al., 2021; Iyer et al., 2025). The ability of AI technologies to analyse large datasets quickly and reliably, identify hidden patterns, and generate practical insights enables the development of more informed HR strategies and greater flexibility compared to competitors (Aydin et al., 2024; Vrontis et al., 2022).

GenAI usage examples include drafting personalised job descriptions, generating interview questions based on a specific role, or creating employee training materials from scratch (Bučková & Przyłuska-Schmitt, 2025; Dashborough, 2023).

Nevertheless, the level of artificial intelligence implementation varies across different industries and countries due to different economic conditions, degree of organisational readiness, and technological infrastructure development, which play a decisive role in accelerating the pace and determining the scale of AI integration. In addition, corporate culture characterised by strict professional standards, aversion to risky decisions, or strict control over employee autonomy, in most cases, slows down the adoption of AI technologies. This is especially true when there are simultaneous concerns about cybersecurity and corporate data protection when using digital technologies (Michailidis, 2018). Under such conditions, the transformational potential of AI is limited by the need to strike a balance between innovation and management control (Qamar et al., 2021; Spossato, 2025).

At the first stage of the research, the main scientific approaches to AI and GenAI in HR implementation were summarised. This approach made it possible to identify the main advantages and risks of AI integration into HR processes, as well as to conduct a comparative analysis of conditions in Poland and Ukraine to assess their influence on AI technology adoption.

The main advantages of AI in HR, according to global best practices (Eubanks, 2022; Guenole & Feinzig, 2018), include:

- efficiency in automation of streamlining repetitive tasks such as CV screening, interview scheduling, perks and benefits management, and other routine processes;
- enhanced recruitment accuracy according to improved candidate matching based on automated skills review, experience, and cultural fit, reduced hiring bias and subjectivity of human decisions;
- enabling evidence-based HR strategies with data-driven decision-making achieved by advanced HR analytics, able to provide brief and deep insights into workforce trends on the labour market, talent gaps, and employee performance results;
- efficiency of a continuous learning and development system supported by personalised training recommendations and adaptive AI-based learning platforms for skill-building;
- improved employee experience in onboarding processes with the help of AI chatbots and virtual assistants that provide round-the-clock HR support and facilitate smoother service.

At the same time, significant risks and disadvantages have been identified (Charlwood & Guenole, 2022; Dennis & Aizenberg, 2023), such as:

- potentially discriminatory outcomes of AI systems risk reproducing or amplifying biases embedded in training data;
- data security and privacy protection during the collection and processing of large-scale employee datasets by AI tools (cybersecurity issue);
- over-reliance on technology caused by AI solutions may undermine human judgement and empathy in HR decision-making;
- expected high implementation costs of developing, integrating, and maintaining AI solutions and resistance to change by employees fearing job displacement or reduced autonomy in decision-making;
- more regulatory challenges with legal and ethical debates over transparency, accountability, and trust in AI-generated decisions.

Comparative Conditions for AI Adoption in HR: Ukraine vs. Poland

Both Ukraine and Poland are demonstrating a growing interest in integrating AI into their HR practices. However, differences have been primarily identified in the conditions under which AI is being implemented. These differences are evident in economic development, technological capabilities, and institutional frameworks.

In Poland, AI implementation in HR is receiving a significant boost thanks to a relatively well-developed digital infrastructure, stable macroeconomic conditions, and integration with the European Union's regulatory framework. Access to EU innovation funding and legal support provides companies with the financial resources and governance structures needed to responsibly implement AI in HR processes. Previous studies (Tabor-Błażewicz, 2023) show that HR professionals in Poland are supportive of the idea of implementing AI. They report many advantages and challenges associated with this process, but are also hesitant about the level of their own knowledge of the subject.

The actual pace of implementation remains slow, as only 5.9% of Polish companies have confirmed the implementation of AI in their activities, compared to the EU average (13.5%) (Bernardelli et al., 2025). Moreover, the level of digital maturity remains below the EU indicators: only 44.3% of Poles have shown an appropriate level of basic digital skills, compared to 55.6% in the EU. This cautious approach is most likely achieved due to risk aversion, resource constraints, or the prevalence of other strategic priorities for organisational development, which may slow down wider adoption of AI in Poland.

Analysing conditions in Ukraine, the growing interest in AI for HR management is likely driven by the need to achieve short-term operational efficiency. Ukrainians tend to speed up decision-making under remote working conditions and to retain talent in extremely challenging socio-economic conditions. Here, the widespread adoption of AI is limited by several factors: territorial gaps in the development of digital infrastructure (in both urban and rural areas), limited access to investment capital, and institutional and legal reform issues. Ukraine is characterised by a lack of a unified national regulatory framework for AI implementation and the ongoing process of harmonising personal data protection legislation with EU standards, which creates additional constraints for employers in terms of cybersecurity and ethical compliance (Tsymbaliuk et al., 2022). At the same time, this issue acts as a catalyst for innovation, giving Ukrainian companies more flexibility and encouraging them to experiment with AI tools. Technology-oriented companies and start-ups have made significant progress in implementing AI to automate HR routine tasks, optimise recruitment algorithms, develop training platforms for better reskilling, and protect human capital (Bei & Didyk, 2024).

In the long term, the described conditions and trends will benefit both countries: Poland to achieve a more structured implementation and a balanced approach to the use of AI technologies, and Ukraine to develop a flexible set of AI-based HR management solutions suitable for a constantly changing environment.

Methods

The second stage of the research was based on a quantitative survey conducted in March-April 2025 using an original questionnaire developed by the authors. To ensure clarity and avoid misinterpretation across languages, the retranslation method was applied: the questionnaire was first translated from the original language into another, and then independently translated back by a different translator. This process confirmed the accuracy and consistency of the questions and concepts presented to respondents in both Poland and Ukraine.

The authors' questionnaire was distributed online via direct contacts on professional social media platforms (LinkedIn, Facebook) and reached 90 HR professionals across both countries. Respondents were specifically selected to represent various business sectors and professional levels. Prior to distribution, the potential target group profile was analysed to ensure study relevance. Respondents received an invitation message with a link to the survey.

Of the total 66 responses in Poland and 24 in Ukraine, positive answers regarding the use of AI in HR processes were received from 32 participants in Poland (48.5%) and 19 in Ukraine (79.1%). These responses were subjected to a more in-depth analysis.

The sample composition reflects notable differences between the two countries. In Ukraine, respondents were primarily senior HR professionals, concentrated in the IT sector. In Poland, the sample included a more diverse range of sectors, with HR managers and senior specialists dominating. Ukrainian respondents were more likely to work in medium-sized companies (10–249 employees), while Polish participants were more likely to work in large companies (more than 500 employees). In terms of ownership, most respondents worked in domestic firms (70% in Poland and 76.2% in Ukraine), with the remainder employed by multinational companies (30% and 23.8% respectively). Details of the research sample were presented in Table 1.

Table 1
Characteristics of the Research Sample

Respondents profile details	Poland	Ukraine
Position in the structure		
director/manager in Human Resources department	24.3%	47.6%
director/manager in other department	21.2%	9.5%
HR senior specialist	22.7%	38.1%
HR junior specialist	12.1%	4.8%
Other	19.7%	–
Experience in HR industry		
less than 1 year of experience	19.7%	4.8%
1–5 years of experience	50.0%	42.9%
6–10 years of experience	16.7%	33.3%
11–15 years of experience	6.0%	9.5%
over 16 years of experience	7.6%	9.5%
Industry sector of the company		–
Banking	3%	–
Construction	4.5%	–
Finance and Insurance	4.5%	4.7%
Industry	12.1%	9.5%
Public Administration	13.7%	4.7%
Commerce	3%	14.3%
Services	22.7%	4.7%
IT	13.7%	47.7%
Other	22.8%	14.4%
Size of the company		
up to 10 employees	9%	–
10–49 employees	17%	28.6%
50–249 employees	24%	38.1%
250–499 employees	15%	9.5%
over 500 employees	35%	23.8%
Company's headquarters	–	–
In Poland / In Ukraine	70%	76.2%
Internationally, with a branch in Poland / Ukraine	30%	23.8%

Source: authors' own work.

Findings

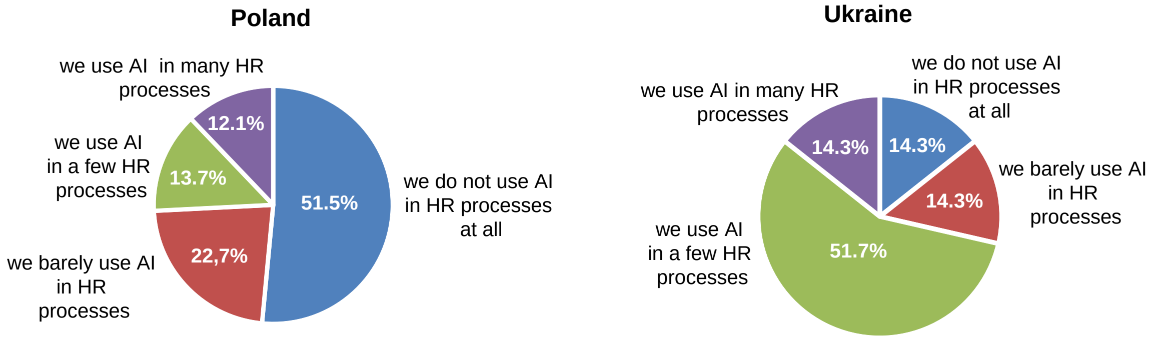
The survey results reveal clear differences between Poland and Ukraine in the AI adoption in HR processes. In Poland, most companies (51.5%) reported not using AI at all, while in Ukraine, 71.4% indicated that they had already integrated AI into at least some HR functions. This points to a more progressive adoption trend in Ukrainian organisations, particularly in areas of partial automation (Figure 1).

Among companies that have not used AI in HR processes, half of the Polish respondents (50%) stated they have no plans to do so. Equal proportions (33.3%) of Ukrainian participants either plan near-term (1–2 years) implementation or are undecided. In Poland, for comparison, around 20% of companies (both those planning to implement AI in their HR processes within the next 1–2 years and those planning to do so within the next 3–5 years) plan to implement AI in their HR processes. This suggests greater openness to future integration in Ukraine, although uncertainty persists in both countries, as AI and GenAI technologies are described as new and not well understood in their further implementation.

When asked about functions in which AI is already used or planned, automation of routine tasks was the universal priority (85.7% in Ukraine, 50% in Poland) (Figure 2). Recruitment-related applications – such as resume analysis and automated candidate selection – were particularly common in Poland (59.3%). Polish companies were also more likely to use AI in talent and career development (28.1%), while Ukrainian respondents emphasised operational efficiency, including market research, preparing reports, and multilingual content verification.

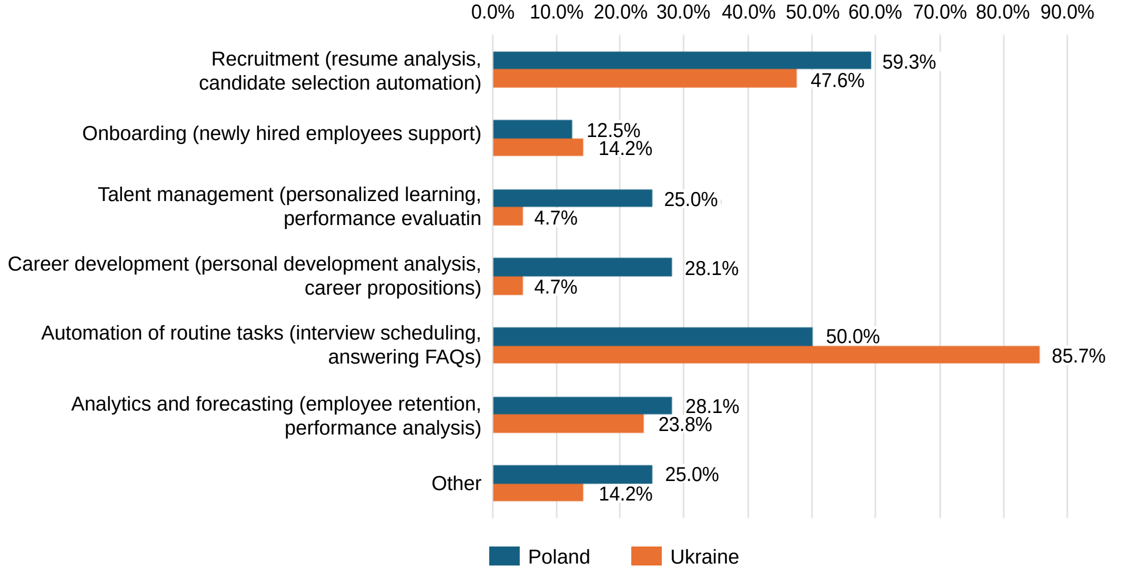
Generative AI ranked highest in perceived potential, especially in Ukraine (77.8%). Other promising applications included HR analytics and natural language

Figure 1
Current Use of AI in HR Processes in Poland and Ukraine



Source: authors' own work.

Figure 2
HR Functions Using or Planning to Use AI in Polish and Ukrainian Companies



Source: authors' own work.

processing (e.g., automated text analysis, resume screening). Polish respondents expressed comparable interest across most categories but showed greater attention to VR and AR technologies (46.8%), likely reflecting differences in innovation priorities and available resources (Figure 3).

Almost all respondents in both countries reported familiarity with GenAI models (94% in Poland, 100% in Ukraine), with widespread use for generating job descriptions, emails, and reports. Ukrainian companies reported more diverse adoption, using such tools as ChatGPT, BambooHR, and SAP, while Polish companies tended to rely primarily on ChatGPT. Text generation, virtual assistant support, and automation are dominant use cases, particularly in Ukraine. Less common in both countries is the use of productivity analysis tools and learning and development, such as Coursera for Business, Degreed, or EdCast. The list of additional platforms also cited by respondents includes Gemini, Notion, and Miro AI tools, Midjourney, Leonardo, Fellow, and Clever Staff.

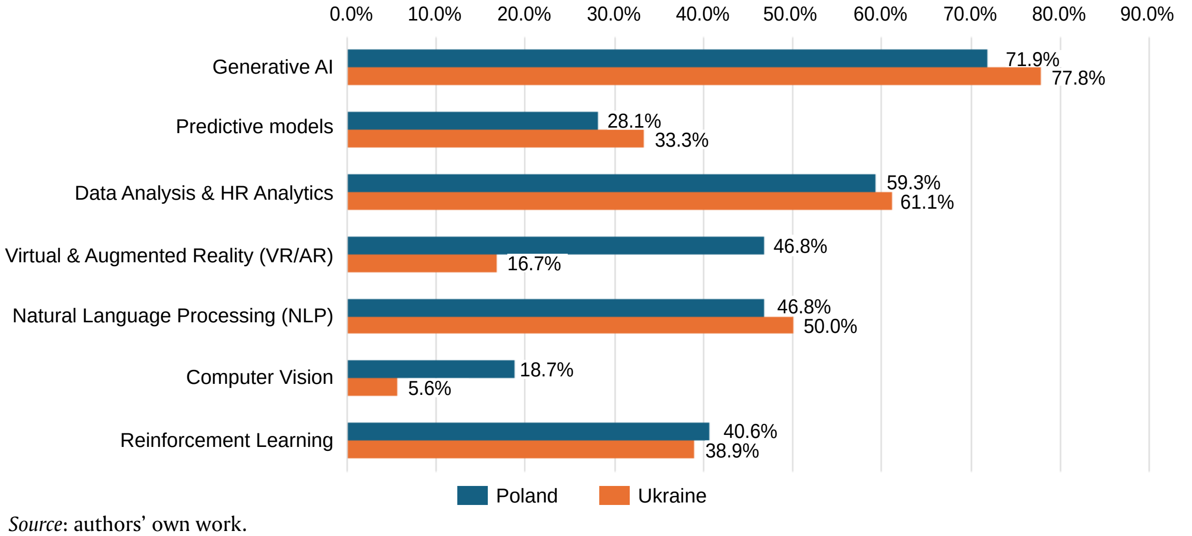
Collaboration with external AI providers was much more common in Poland (31.3%) than in Ukraine (11.1%). In Ukraine, the majority (72.2%) reported no external collaboration, which may reflect resource limitations, legal uncertainties, or a preference for in-house experimentation (Figure 4).

The main benefits of AI adoption cited in both countries included time savings (PL 93.7% / UA 85.7%), speed of operation (PL 75% / UA 61.9%), resource efficiency (PL 53.1% / UA 71.4%), and advanced data analysis capabilities (PL 65.6% / UA 71.4%). Polish respondents additionally highlighted error reduction (59.3%) and enhanced employee experience. Ukrainian respondents more often emphasised the advantage of 24/7 availability (52.3%), reflecting staffing and service challenges.

Concerns also varied. Polish respondents were more likely to cite lack of empathy (75%), data privacy risks (62.5%), and resistance to innovation (40.6%).

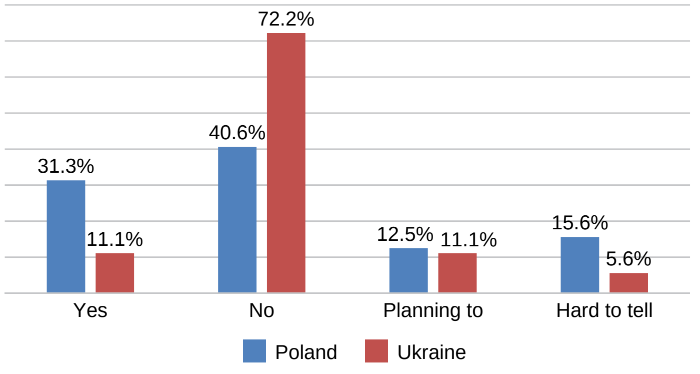
In contrast, Ukrainians were more concerned about over-reliance on templated AI responses (66.6%) and

Figure 3
Technological Trends Considered the Most Promising in HR



Source: authors' own work.

Figure 4
External Collaboration (AI Solutions in HR Providers)



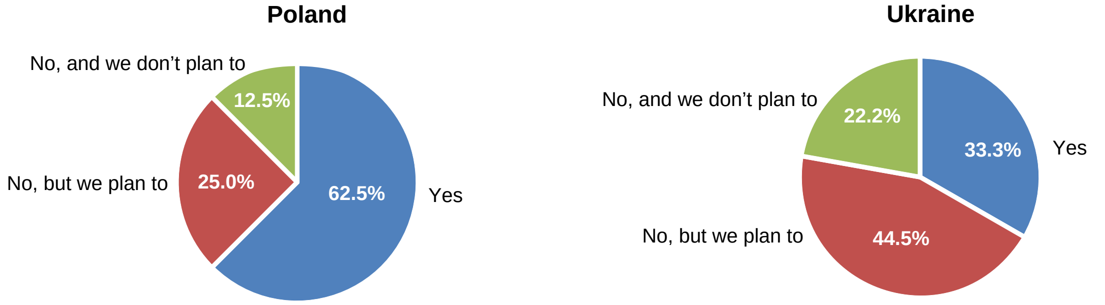
Source: authors' own work.

Table 2
Benefits and Potential Risks / Challenges in Using AI in HR in Poland and Ukraine

Benefits	Potential Risks / Challenges
reduction of time spent on routine tasks – PL 93.7% / UA 85.7%	dependence on technology – PL 43.7% / UA 23.8%
improvement of decision-making accuracy – PL 16.7% / UA 0%	ethical concerns (bias. decision transparency) – PL 53.1% / UA 23.8%
enhancement of the candidate/employee experience – PL 28.1% / UA 14.2%	data privacy threats – PL 62.5% / UA 42.8%
saving resources – PL 53.1% / UA 71.4%	resistance to innovations (from employees. management level) – PL 40.6% / UA 4.7%
elimination of so-called 'human' errors – PL 59.3% / UA 33.3%	lack of empathy and 'human' approach – PL 75.0% / UA 52.3%
work 24/h a day – PL 15.6% / UA 52.3%	lack of understanding of complicated issues. template responses by virtual assistants – PL 59.3% / UA 66.6%
speed of operation – PL 75.0% / UA 61.9%	lack of creativity – PL 31.2% / UA 33.3%
lack of emotion in decision-making – PL 15.6% / UA 0%	machines taking people's jobs – PL 28.1% / UA 19.0%
ability to analyse big data – PL 65.6% / UA 71.4%	difficulty in understanding and implementing software or algorithm – PL 32.3% / UA 14.2%

Source: authors' own work.

Figure 5
Plans to Provide AI Training to Employees in Poland and Ukraine



Source: authors' own work.

less likely to see resistance to change as a barrier (4.7%). Both groups expressed moderate concerns about creativity loss and potential job displacement (Table 2).

Training patterns also differed. More Polish companies (62.5%) had already provided AI-related training, compared to 33.3% in Ukraine, which led in planned training (44.5%). This shows rising awareness among HR staff of the need to upskill to work effectively with AI tools and growing concerns about its potential (Figure 5).

According to the research results, AI's overall impact on HR processes is described as generally positive. In Ukraine, the dominant view was that AI has a moderately positive effect (72.2%), while in Poland, 40.6% described its impact as very positive. No respondents in both countries considered the impact entirely negative.

When asked to assess their country's overall level of AI implementation in HR, both groups tended to classify it as medium (62.5% in Poland, 72.2% in Ukraine). Polish respondents, however, were more likely to describe it as low (37.5%), whereas a small share of Ukrainians (5.6%) rated it as high.

Respondents also commented on the impact of legislation on the effectiveness of AI implementation in HR management processes. Most Ukrainians (55.6%) believe that national legislation does not affect the use of AI in human resource management (possibly due to the lack of a clear regulatory framework). In Poland, most respondents (65.6%) are unsure about the nature of this impact, while 12.5% believe it is rather negative.

Across both countries, respondents highlighted the need to:
1) expand AI-related training, especially for individual use;
2) prioritise automation of routine (repetitive) tasks to free HR staff for strategic initiatives;
3) closely monitor evolving legislation and ensure ethical compliance;
4) strengthen collaboration with technology providers to accelerate responsible adoption.

The observed discrepancy in AI adoption, with more than half of Polish respondents reporting no AI usage compared to only one-third in Ukraine, is striking, given that the Polish sample contained a higher proportion of large enterprises (50% vs. 33% in Ukraine). Theoretically, larger firms have greater economies of scale to offset the high costs of implementing AI. However, our findings suggest that in Poland, adoption is moderated by a 'compliance-first' approach. The stringent regulatory environment of the EU (notably GDPR) and internal corporate risk-mitigation policies often slow the integration of AI in HR processes.

In contrast, Ukraine's higher experimental adoption (71.4%) reflects a 'digital-first' resilience strategy. Supported by national digital transformation initiatives like Diia City, which lower regulatory friction, Ukrainian HR practitioners appear more willing to leverage accessible AI tools to maintain operational efficiency amidst socio-economic instability. This aligns with the Technology Acceptance Model (TAM), where the 'perceived usefulness' of AI for organisational survival in Ukraine outweighs the 'perceived ease of use' or regulatory risks that dominate the Polish context.

Discussion

The results of the study highlight the complex interplay among technological readiness, organisational culture, and the quality of the regulatory environment in implementing AI in human resource management. Clear contrasts have been identified between the current implementation process and plans regarding the *first research question*. Poland, for example, has advantages and can be identified as a country more conducive to the development and implementation of AI solutions, thanks to its well-developed digital infrastructure and management systems aligned with EU standards. It was found that, in general, the pace of implementation remains moderate, likely due to risk aversion, resource allocation issues, or, more importantly, strategic priorities for organisational development in Polish companies. Ukrainian companies are characterised by a higher frequency of AI application, particularly for automating and optimising routine HR tasks. GenAI is widely used in recruitment, employee onboarding processes, HR analytics, and data-driven decision-making, both in the short and long term, reflecting a flexible approach. Greater flexibility has been shaped by the challenges posed by the economic and political situation, operational pressure, workforce mobility, an unbalanced labour market, and resource limitations.

Regarding the *second question of the study* – balancing operational efficiencies and the ethical or systemic risks associated with the implementation of AI and GenAI – the study confirms that while both Polish and Ukrainian HR practitioners recognise universal benefits (such as enhanced processing speed and data-driven decision-making), their perception of risk is heavily mediated by national context. In both countries, respondents identified general risks, including the problem of overcoming subjective bias, ethical risks (replacing human labour and experience with automated results), data security issues, and excessive dependence on technology in the future; however, the significance of these risks is assessed differently in the two countries. Polish respondents expressed greater concern about data privacy, loss of empathy, and resistance to innovation, while Ukrainians are more concerned about excessive dependence on technology and the generic nature of AI-generated responses. Consequently, the research underscores that achieving an effective balance requires not only unified regulatory standards but also locally adapted ethical guidelines that account for these distinct professional orientations.

Answering the *third research question*, clear patterns can also be observed. Polish HR specialists tend to prioritise AI-based professional solutions aimed at improving recruitment, talent management, and career development. This approach can be described as characteristic of strategic improvement in a relatively stable environment. Ukrainian specialists focus on operational efficiency, rapid process automation, and multilingual content creation for various purposes and tasks when working with specialists outside the country, reflecting an adaptive approach amid high instability and limited resources. Thus, specific factors in the implementation of disruptive technologies and the specifics of their support in both countries were identified.

Our empirical findings regarding the high prioritisation of AI in recruitment and operational automation (over 70% in the Ukrainian sample) align with the global trends identified by Barret & Miller (2024), who argue that HR functions with high data volume are the primary entry points for AI adoption. However, the notable caution among Polish HR professionals, despite their stronger institutional backing, suggests that 'perceived risk' (particularly concerning data privacy and GDPR compliance) acts as a significant moderator in the technology acceptance framework, as previously theorised by Vrontis et al. (2022). Furthermore, the striking difference in adoption rates between the two countries, regardless of company size, supports the view of Charlwood & Guenole (2022) that idiosyncratic organisational needs and regional digital readiness are often more decisive than traditional structural factors like enterprise scale.

Despite the insights gained, this study has certain limitations that should be acknowledged. First, the sample size of HR professionals actively using AI is relatively small, which limits the ability to generalise the findings to the entire HR sector in both countries. The second limitation is the predominance of big companies in the research sample. Third relates to the rapid changes observed in AI implementations, which may mean that, because of constant change, the results of the research will be valid only for a certain period. However, given the rapid and uneven adoption of AI technologies, this research was designed as an exploratory study. Its primary goal was not to provide exhaustive statistical proof, but to identify emerging trends, practical challenges, and comparative patterns in two distinct socio-economic environments. Future research with larger, more diverse samples is needed to validate these preliminary findings and to track the longitudinal impact of Generative AI on HR performance.

Conclusions

The study proves that the implementation of AI technologies in Human Resource Management is not purely a technological process and does not occur in the same way in all countries. In Poland, institutional capacity, developed digital infrastructure, and a clear regulatory framework, which are favourable conditions for scaling up the use of AI, are combined with a cautious and gradual approach to implementation. Ukraine, on the other hand, demonstrates a more experimental and operationally driven approach to implementation, despite its weak institutional framework and limited resources.

Both countries recognise the potential of AI to transform the overall efficiency of HR processes, the quality of recruitment, data analysis, and informed decision-making, and improve the employee experience during onboarding and subsequent service by HR professionals. However, the extent of these benefits depends on how effectively organisations address ongoing risks, including data privacy concerns, algorithmic bias, over-reliance on technology, and resistance to change.

Our targeted recommendations for HR practitioners could be:

- *Polish organisations:* focus on developing clear internal ethical frameworks and data governance policies to bridge the gap between regulatory caution and technological potential, develop partnerships with technology providers to access scalable, reliable solutions;
- *Ukrainian organisations:* foster transition from fragmented, experimental AI usage toward systemic, strategy-aligned implementation through dedicated digital literacy programs for HR staff, expanding AI-related training to build workforce competence and confidence in AI use;
- *policy makers in both countries:* foster cross-border knowledge exchange to harmonise ethical standards while maintaining the agility observed in emerging digital markets.

Future research on this topic could focus on analysing long-term trends in the implementation of AI technologies in HR, measuring the economic and social impact of their use, and determining the role of EU and national legislation in ensuring ethical and sustainable practices.

Despite the limitations of the study, its results reduce gaps in research on the implementation of AI in human resource management, thanks to the comparative perspective of Poland and Ukraine.

From a practical point of view, the results of the study can help businesses better understand their positioning regarding the use of AI technologies, understand the national and regional context, and identify opportunities for gaining competitive advantages.

From a social perspective, the study confirmed a high level of concern about the risks of AI implementation, even if its intensity varies across countries. General concerns about ethics, data privacy, and the human dimension of HR management remain central issues in the debate on the integration of AI technologies into HR management and other areas.

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Employee Competencies from the Perspective of Generation Z Representatives

Abstract

This article aims to identify key competencies for employees from the perspective of Generation Z. The study sought to answer the following questions: which competencies will be crucial for employees in organisations in the coming years, how they are perceived by representatives of Generation Z, and what forms of developing these competencies are preferred. The article discusses the concept and role of employee competencies in the changing labour market, from the perspective of Generation Z. The development of employee competencies increases the likelihood that organisations gain a competitive advantage in a dynamic, complex environment.
The article presents the results of a literature review and a survey in which respondents identified key competencies that determine professional success amid rapid technological development. Based on the findings, the following competencies were highlighted: technological curiosity and openness to innovation, flexibility and adaptability to change, technological skills, and foreign language proficiency. Representatives of Generation Z prefer the following forms of competency development: online training, mentoring, internships, and study visits. The results contribute to the design of work environments that foster employee competencies and enable organisations to adapt effectively to the modern demands of the labour market.

Keywords: employee competencies, Generation Z, competency development methods, labour market transformation, future skills

Introduction

Modern organisations operate in an environment dominated by volatility and complexity. In such conditions, employee competencies have become a key determinant of organisational success, serving not only as a source of value but also as the foundation of competitive advantage (Moczydłowska, 2021, p. 3; Sony & Naik, 2020). With the development of technology and ongoing digitalisation, employees are expected to possess not only advanced technical and technological competencies, but also the ability to work effectively in virtual environments (Albano et al., 2020, pp. 20–22; Grześ, 2022, p. 157).

Generation Z, currently entering the labour market, has new opportunities but also new expectations. Growing up in the digital era has shaped their approach to technology (Dewicka, 2013, pp. 19–20). They perceive competencies as an element linking employees' individual abilities with the needs of the business environment (Chomątowska & Żarczyńska-Dobiesz, 2016).

Despite growing interest in employee competencies, a research gap persists in the literature regarding the developmental needs of Generation Z. Existing analyses primarily focus on general trends such as digitalisation, automation, and the development of soft skills, while relatively few studies consider the perspectives of Generation Z representatives themselves. There is also a lack of empirical studies that combine a literature review with an examination of young employees' opinions on key competencies and preferred forms of developing them. Filling this gap enables a better understanding of Generation Z's needs and supports the design of work environments and development programs that align with their expectations and labour market requirements.

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This article aims to identify the competencies that are crucial for employees from the perspective of Generation Z. The study seeks to answer the following research questions: Which competencies are essential for employees in organisations in the context of rapid technological change, and how are they perceived by representatives of Generation Z? It is also important to determine the preferred forms of developing these competencies.

The achievement of this aim and the answers to the research questions are made possible through a literature review, a questionnaire survey, and the interpretation of the obtained results.

Modern Technologies and Competencies in the Era of the Digital Economy

Competencies are among the key factors determining employees' effectiveness and professional success, forming the foundation for achieving organisational goals and completing professional tasks. Competence is a broad concept that has been defined in multiple ways in the literature, depending on the context in which it is used. Initially, it was associated with the formal scope of an employee's authority and responsibility. Today, however, it is defined as a combination of knowledge, experience, abilities, and attitudes that determine the effective performance of professional tasks (Bombiak, 2014, pp. 174–175). Competencies include knowledge, diverse skills, behaviours, and attitudes that enable tasks to be carried out at an appropriate level (Filipowicz, 2016, pp. 186–187).

In this article, the term 'competence' is understood as a combination of knowledge, skills, attitudes, and personal traits that condition work effectiveness and adaptability to changing organisational and technological conditions. This understanding draws from the behavioural approach, which focuses on individual traits and behaviours, as well as the functional approach, which refers to work outcomes and job requirements (van der Klink & Boon, 2002; Vazirani, 2010). In contrast, the concept of skills is defined as a learned ability to achieve specific results with a high level of effectiveness and efficiency (Knapp, 1963). Skills include both practical and professional competencies developed through experience and training, as well as the ability to perform tasks in an automated way, without excessive engagement of cognitive processes (Dreyfus & Dreyfus, 1986). Thus, skills result from combining knowledge, practice, and experience, enabling individuals to act effectively in diverse and often demanding conditions (Breivik, 2016).

A breakthrough in global research on competencies came with McClelland's 1973 publication, which demonstrated that traditional intelligence tests or academic assessments are not reliable predictors of professional success. Instead, competencies – understood as enduring behaviour patterns – better predict work effectiveness (McClelland, 1998). Boyatzis further developed this concept, pointing out that competencies are fundamental characteristics of an individual, causally related to high job performance, and can be developed throughout life (Boyatzis, 2008). Similarly, Spencer and Spencer emphasised that competencies include motivations, personality traits, values, knowledge, and measurable skills that distinguish top performers from average ones (Spencer & Spencer, 1993).

Parry highlighted that competencies are a set of interrelated knowledge, skills, and attitudes that can be assessed against clearly defined standards and subsequently developed through training and practice (Parry, 1996). From another perspective, Athey and Orth (1999) argued that competencies take the form of observable dimensions of individual and organisational behaviours linked to high performance and competitive advantage (Athey & Orth, 1999). Draganidis and Mentzas (2006) likewise stressed that competencies encompass both direct skills and indirect behaviours that enable effective task performance (Draganidis & Mentzas, 2006). Page, Wilson and Kolb (1994) added that competencies include both explicit aspects (knowledge, skills) and implicit ones (attitudes, personality traits) (Page et al., 1994).

In practice, competencies can be divided into core competencies, comprising the knowledge and skills necessary for the proper execution of a given job, and distinguishing competencies, which separate the most effective employees from the rest (Pocztowski, 2005, p. 245; Sojda & Lepiarska, 2019, p. 124). Competencies cover all employee attributes used in the work process to achieve specific results aligned with organisational goals (Łukasiński et al., 2021, pp. 57–58; Rostkowski, 2004, pp. 69–71). These are not only knowledge and skills, but also attitudes, motivations, and personality traits that influence the way tasks are performed (Oleksyn, 2006, pp. 43–44; Strzelczyk-Łucka, 2019, p. 64). They represent fundamental human characteristics that are causally related to work effectiveness, measured by defined criteria and reflected in above-average results achieved during task execution (Wiśniewska, 2021, p. 16).

Competencies are therefore perceived as dynamic attributes integrating knowledge, skills, attitudes, and abilities, enabling effective performance in a given professional context. They combine the knowledge necessary for proper job execution with soft skills that determine how tasks are carried out (Armstrong, 2007; Łukasiński et al., 2021, p. 52). Competencies shape both cognitive and emotional development, making them a key element in self-development and adaptation to the evolving work environment (Łukasiński et al., 2021, p. 52; Rieckman, 2018).

Competencies can also be considered in behavioural terms, where they represent the ability to perform specific patterns of behaviour that integrate knowledge, skills, and responsibilities, adjusted to the requirements of a given position (Podgórska, 2018, p. 69). This approach highlights the dynamic nature of competencies, which are developed and modified in response to changing organisational and technological demands.

In today's rapidly changing world, employees are expected to develop both technical and interpersonal competencies that enable effective collaboration and adaptation to the evolving work environment. The modern labour market requires far more than theoretical knowledge or industry-specific skills. Increasingly, what matters is how employees approach their work, deal with challenges, communicate within teams, and navigate dynamic environments (Karbownik, 2017; Moczydłowska, 2023, pp. 97–98). Key attributes include adaptability, continuous learning, and the evolution of competencies (Jastrzębowska, 2020, p. 14).

In the context of today's socio-economic transformations, green competencies are also gaining importance. They combine knowledge, skills, and attitudes to minimise the negative environmental impact of professional activities and support sustainable development principles (Gadomska-Lila et al., 2024; Kozar & Sulich, 2023). These include both hard green skills, such as installing and operating renewable energy technologies or implementing resource-saving processes, and soft ones, such as ecological awareness, responsible attitudes, and pro-environmental communication (ILO, 2019). Green competencies are gaining importance as Generation Z, which, upon entering the labour market, expects organisations to act in accordance with the principles of sustainable development. In response to these needs, the GreenComp document was developed as the European sustainability competence framework. This framework defines a set of knowledge, skills, and attitudes necessary to act responsibly and empathetically toward the environment, regardless of age or level of education, and it can be applied in formal, non-formal, and informal learning. GreenComp comprises 12 competencies organised into four areas: embodying sustainability values, embracing complexity in sustainability issues, envisioning sustainable futures, and acting for sustainability (European Commission, 2022). For Generation Z, these competencies represent an essential element of preparation for work in modern organisations, as they integrate values, systems thinking, critical and futures thinking, as well as the ability to initiate pro-environmental actions.

The modern labour market, with its demands for flexibility, mobility, and digitalisation, poses new challenges for employees. It is a dynamic space characterised by rapid technological development, globalisation, and evolving organisational expectations of employees. A key feature of this market is the need for a multidimensional approach to employment, where traditional, stable career models are being replaced by flexible forms of work, such as project-based work, remote work, or freelancing (Vadie & Lipták, 2023). Today's labour market is also marked by increasing process automation and the intensive use of artificial intelligence and digital tools. This creates a need for not only specialised technical competencies but also soft skills such as the ability to collaborate in interdisciplinary teams, creative thinking, and effective communication (Cichy et al., 2024, pp. 3–4).

In this context, it is worth referring to the European Commission's Digital Competence Framework for Citizens (DigComp). This framework serves as a tool to support the development of digital skills, enabling the assessment of the level of knowledge, skills, and attitudes necessary for the effective, safe, and critical use of digital technologies. DigComp encompasses five main areas of competence: information and data literacy, communication and collaboration, digital content creation, digital safety, and problem-solving in digital environments. This tool allows individuals, educational institutions, and employers to assess and develop digital competencies, supporting lifelong learning and preparation for work in a digital economy (Vuorikari et al., 2022). Including DigComp in the analysis of contemporary labour market requirements underscores that Generation Z needs digital competencies not only in a technical sense but also in critical thinking, collaboration within digital networks, and adaptation to rapidly changing technologies.

In parallel with green and digital competencies, it is useful to refer to the OECD publication The Future of Education and Skills: Education 2030. This framework presents a vision of future education that focuses on preparing learners for life in a dynamic, uncertain, and complex world. The OECD emphasises that modern education should develop not only knowledge and skills but also attitudes, values, and the capacity to make responsible decisions (learner agency). The document identifies three main transformative competencies: creating new value, reconciling tensions and dilemmas, and taking responsibility. These competencies require the mobilisation of knowledge, skills, attitudes, and values in action, supported by reflection, anticipating consequences, and taking informed action. The framework also highlights the importance of systems thinking, intercultural collaboration, creativity, critical thinking, digital development, and ecological awareness, forming a coherent model of competencies necessary for active and responsible functioning in a complex world (OECD, 2018). Incorporating the OECD framework into the analysis of the labour market and education allows consideration of a broader perspective on future competencies, encompassing not only professional qualifications but also adaptive, social, and ethical skills that are crucial for Generation Z.

Another important feature of today's labour market is generational diversity. In one work environment, employees from different generations coexist – from Baby Boomers to Generation Z – which requires flexible management approaches, as well as adjustments in communication styles and expectations (Ławińska & Korombel, 2023, p. 14). As a result, employees can no longer rely on one-time qualification acquisition. Career development depends on lifelong learning, experimenting with new technologies, and quickly adapting to changing conditions. Particularly valuable are the competencies acquired directly through performing work tasks (Taradejna, 2014, p. 23).

Generation Z in the Labour Market

Generation Z, defined as individuals born after 1995 (Czerwińska & Bojar, 2021; Grabiwoda, 2019, p. 51; Messyasz, 2021; Tomaszuk & Wasiluk, 2023, p. 84) or 1998 (Tapscot, 2008, p. 16), is a generation that differs significantly from previous ones in its approach to work, communication style, and perception of professional success. As the first generation to grow up fully integrated with modern technologies, its representatives do not need to learn how to use digital tools, as they have been exposed to them since early childhood. They demonstrate a high level of digital competency, encompassing not only effective online navigation and the use of digital work tools but also advanced skills in data analysis, programming, and operating various communication platforms. From the labour market perspective, technological competencies have become indispensable in many industries, particularly in IT, digital marketing, e-commerce, and project management, where remote work tools and virtual workspaces have become the standard (Stankiewicz-Mróz, 2020, pp. 53–54).

Generation Z representatives prefer remote work, flexible working hours, and integration with cloud systems, introducing a modern approach to organising daily tasks. They are capable of working effectively from different locations, self-organising their tasks, and adjusting their work both to organisational requirements and to their own needs, which allows them to maintain a balance between professional and personal life (Muster, 2020, pp. 133–134). They are adept at adopting new technologies, and using the latest digital tools is not only an obligation but also a source of satisfaction. They also understand the importance of critical thinking, information management, problem-solving using digital tools, and effective team communication, especially in remote environments (Żarczyńska-Dobiesz & Chomątowska, 2016, pp. 198–199).

As the first generation raised in full integration with technology, Generation Z must adjust its skills to the realities of a rapidly changing labour market marked by the constant emergence of new tools and methods of work. To meet these challenges, employees must not only maintain baseline competencies but also continually update their skills to keep pace with evolving trends (Świerkosz-Hołysz, 2016, pp. 442–443). In this context, digital skills represent only one part of the broad skillset required for professional success. Personal and social competencies (e.g., interpersonal and emotional skills) are equally important. While online communication is natural for Generation Z, this can result in difficulties with face-to-face interactions, where more advanced interpersonal skills are needed (Ławińska & Korombel, 2023, pp. 17–18).

Adapting to traditional, physical workspaces may also pose a challenge. Thus, developing skills in emotional management, assertiveness, teamwork, and conflict resolution is essential. Furthermore, adjusting work styles to different organisational roles requires a high degree of flexibility and openness to change (Kukla & Nowacka, 2019, pp. 125–126). For Generation Z, this often means working in flexible conditions that encourage self-organisation, creativity, and the use of individual predispositions. They expect their work environment to allow experimentation, testing new solutions, and the rapid implementation of innovations (Całek, 2021, pp. 106–107).

Generation Z particularly values autonomy at work, the ability to achieve goals independently, but under the guidance of leaders who provide support and motivation. Therefore, organisations seeking to effectively develop employee competencies must create environments that foster independent development, provide opportunities for experimentation, and allow flexible working hours. Flexibility and openness to modern work approaches are key to maintaining the engagement and motivation of Generation Z. Organisations that understand these needs gain loyal employees who not only contribute their skills but also become ambassadors of organisational values in their wider environment (Muster, 2020, pp. 143–144). Generation Z appreciates individualism and flexibility, requiring leaders who can manage projects while supporting personal growth. Leaders should act as guides, inspiring development, offering constructive feedback, and assisting in problem-solving. This approach fosters teamwork skills, enhances communication efficiency, and improves adaptability to changing work conditions. The modern leader is not only a supervisor but also a mentor, providing both emotional and substantive support (Moczydłowska, 2023, pp. 155–157).

Generation Z is aware that competency development requires continuous adaptation to changing professional and technological realities. They place great importance on self-improvement, actively seeking new methods of learning and self-development. This generation uses a wide range of tools, including online educational platforms and interactive workshops, to acquire new skills in ways that suit their preferences. Time and project management skills are also crucial, enabling them to effectively organise their work despite increasingly complex and demanding tasks (Żarczyńska-Dobiesz & Chomątowska, 2016, pp. 203–204). Competencies are the foundation of professional success and the key to efficiency and job satisfaction. Success depends not only on the ability to apply existing competencies in practice but also on their continuous development and adaptation to evolving work conditions. Generation Z is fully aware of the ever-changing labour market, which requires readiness for lifelong learning, adaptation, and shifting approaches to work (Kukla, Nowacka, 2019, pp. 128–129).

In this context, competency development is achieved through a variety of methods that enable the acquisition of new skills and the improvement of existing qualifications. These include participation in training and courses (both onsite and online), mentoring programs, and involvement in international projects that facilitate experience-sharing, as well as practical learning during internships or project-based work. Technological progress has also enabled new forms of learning, such as webinars, e-learning platforms, and microlearning, which align with the digital habits of Generation Z and allow flexible adaptation of learning to their lifestyle. Access to diverse online knowledge resources (e.g., podcasts, expert blogs) further supports self-directed learning (Bendkowski, 2018).

Having grown up in an era of rapid technological change, Generation Z is particularly aware of the role of digital skills in fostering innovation and adapting to new work conditions. However, social and emotional competencies are equally important, as they enable not only integration within organisations but also effective management of professional relationships and the building of trust-based, collaborative teams (Moczydłowska, 2023, pp. 105–106).

Research Method

To better understand the developmental needs of Generation Z and how they perceive labour market-relevant competencies, a survey was conducted. For the study, Generation Z was defined as individuals born after 1995. The survey was carried out online between October and December 2024, using the CAWI (Computer-Assisted Web Interview) technique. The questionnaire was distributed through internal communication channels of Polish higher education institutions (e.g., mailing systems, student platforms). The questionnaire used in the study was an original instrument developed by the authors, tailored to the topic's specificity and the research objectives.

The sampling was non-random and purposive – respondents had to meet two criteria: be members of Generation Z and hold student status in economics-related fields of study at Polish universities. Although the non-stratified selection limits the ability to generalise the findings to the entire Polish Generation Z population, the sample represents a group of young people who are educated or actively engaged in both education and work.

The study included 315 individuals meeting the age criteria: 185 men (58.7%), 128 women (40.6%), and 2 respondents (0.6%) who chose not to disclose their gender. In terms of educational and professional activity, 134 respondents (42.5%) were students, 177 (56.2%) combined study with work, and 4 (1.3%) focused exclusively on professional activity.

The questionnaire included single- and multiple-choice questions developed based on a literature review of employee professional competencies. The design of the survey questions was grounded in a theoretical model of professional competencies derived from the review, which encompassed both hard and soft skills considered essential in the context of a dynamically changing labour market and the digital economy era (Industry 4.0). The literature review identified competencies critical from both technological and social perspectives, including digital skills, programming, adaptability, creativity, communication, and language skills. These competencies were then selected for inclusion in the survey instrument.

To ensure data quality, a filtering mechanism was applied – only fully completed questionnaires were included in the analysis, with incomplete responses excluded. The data analysis was conducted in Microsoft Excel (version 2016), using statistical functions and tools to visualise the results (tables and figures). While the data were not deposited in a public repository, they may be made available for further scientific research upon request.

Results

In the study, respondents were asked to select, from a given set, the 10 key employee competencies considered important for the development of their professional careers (Figure 1).

The study results indicate that the most frequently selected competency (70.2%) was technological curiosity and openness to innovation. This finding highlights a strong interest in technological advancements and a readiness to implement innovations among Generation Z representatives. The result reflects the growing significance of technology and digitalisation in all professional domains. The second most frequently indicated competency was flexibility and adaptability to change (68.9%), emphasising the importance of adjusting to rapidly evolving work environments and technologies. These skills have become particularly crucial in the face of challenges such as the pandemic and the swift transition of organisations to remote work.

Technological skills (62.9%) and foreign language proficiency (62.2%) were also highly valued, indicating a demand for professionals prepared to work in a global, digital environment. Equally important were competencies related to continuous learning and personal development (60.3%) and teamwork (57.5%), which are indispensable for collaboration in dispersed teams and amid increasing automation.

Among the less frequently chosen competencies, empathy and emotional intelligence (35.9%), as well as negotiation skills and conflict resolution (26.3%), stood out as crucial for building relationships and effective communication in organisations. Competencies such as practical knowledge of sustainable development (20.3%) and cultural diversity awareness (21.9%) were considered important but ranked lower, likely due to respondents prioritising technological and practical aspects.

As part of the study, respondents were also asked to assess the impact of identified employee competencies on their career development. They rated the influence of each competency on a scale from 1 to 5, where 1 meant 'minimal' and 5 signified 'crucial.' The average ratings and variability coefficients for each competency provide valuable insights into the professional priorities of Generation Z representatives.

Figure 1
Key Competencies for Future Employees According to Respondents

Source: authors' own work based on survey research conducted in October–December 2024.

Table 1
Assessment of the Impact of Employee Competencies on Career Development from Respondents' Perspectives

Competency	Mean Score	Variability Coefficient
Communication skills	4.30	18.15%
Foreign language proficiency	4.25	23.31%
Flexibility and adaptability to change	4.23	18.36%
Continuous learning and personal development	4.20	20.26%
Technological curiosity and openness to innovation	4.17	20.17%
Time management and work organisation	4.08	21.51%
Technological skills (e.g., programming)	4.03	22.46%
Digital skills	4.00	22.83%
Teamwork	3.98	21.55%
Creative and critical thinking skills	3.92	22.35%
Analytical skills and data utilisation	3.90	23.41%
Remote work and virtual collaboration	3.86	25.66%
Building valuable relationships with stakeholders	3.85	22.76%
Independence in problem-solving	3.77	24.34%
Negotiation skills and conflict resolution	3.73	24.12%
Work ethics and responsibility	3.71	24.98%
Practical knowledge of sustainable development	3.54	26.43%
Empathy and emotional intelligence	3.50	28.97%
Cultural diversity awareness	3.28	34.27%

Source: authors' own work based on survey research conducted in October–December 2024.

Based on the study results, several competencies emerge as particularly important for career development, as perceived by the respondents. The highest-rated competencies are communication skills, foreign language proficiency, and flexibility and adaptability to change, which respondents perceive as fundamental for effective functioning in a dynamic and globalised work environment. The relatively low variability coefficients for these competencies indicate a high level of consensus regarding their importance.

High importance was also attributed to competencies related to continuous learning, technological curiosity, and openness to innovation, reflecting the growing significance of adaptability and lifelong learning in the context of rapid technological change. Similarly, time management, work organisation, and digital and technological skills were assessed as important, confirming the increasing role of digitalisation and automation across professions.

Moderately rated competencies include teamwork, creative and critical thinking, analytical skills, and remote work capabilities, which support collaboration and problem-solving in modern organisational settings. Competencies related to relationship-building, negotiation, responsibility, and independent problem-solving, although valued, were perceived as less critical compared to technology-oriented skills.

The lowest ratings were assigned to empathy and emotional intelligence, sustainable development knowledge, and cultural diversity awareness. Higher variability coefficients in these areas suggest greater diversity of opinions among respondents regarding their relevance to future career development.

Analysing the survey results also makes it possible to group competencies into thematic clusters, which helps to better understand Generation Z's professional priorities as well as the relationships between specific skills. Based on functional similarity and significance for career development, four main groups of competencies can be distinguished.

The first cluster consists of technological and digital competencies, including technological curiosity and openness to innovation, technological skills such as programming, and digital skills. These competencies highlight young employees' strong orientation toward growth in the area of modern technologies and the digitalisation of professional processes.

The second cluster comprises adaptive and developmental competencies, which include flexibility and adaptability to change, the ability to engage in continuous learning and personal development, and independence in problem-solving. These emphasise the importance of adjusting to a dynamic work environment and taking initiative in self-development.

The third cluster covers social and communication competencies, including communication skills, teamwork, negotiation and conflict-resolution abilities, empathy, and emotional intelligence. These reflect the need for effective interpersonal interaction and relationship-building in the workplace.

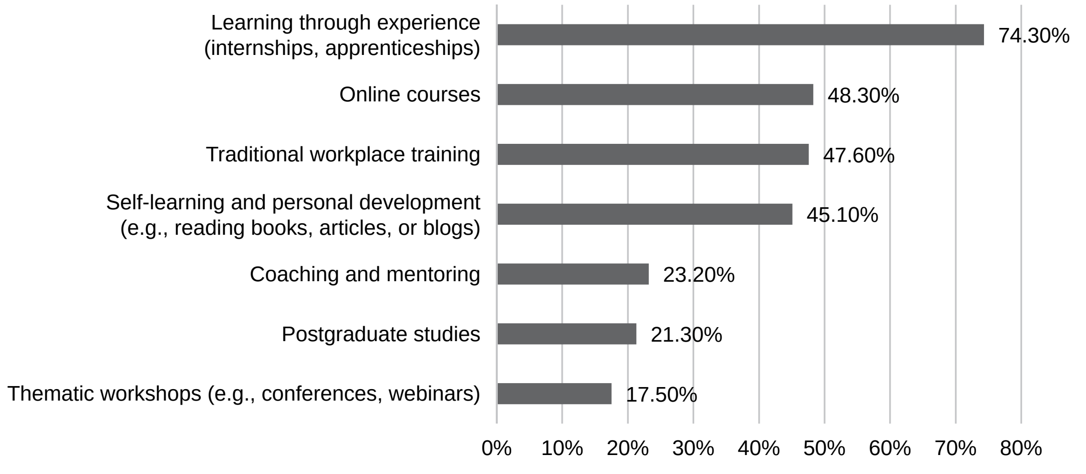
The fourth cluster consists of global and value-based competencies, such as foreign language proficiency, understanding cultural diversity, and practical knowledge of sustainable development and work ethics. These competencies reflect the growing importance of operating in a global environment and of addressing social responsibility, both of which are becoming increasingly relevant in the context of international cooperation and global challenges.

In response to the question about preferred forms of education for developing professional competencies, survey participants indicated a variety of methods they believe can support their career development (Figure 2). These findings are significant both for organisations seeking to effectively support employee development and for individuals looking to take an active role in shaping their careers.

The highest percentage of respondents indicated learning through experience (internships, apprenticeships), with 74.3% (234 respondents) choosing

Figure 2

Preferences of Generation Z for Educational Forms in Professional Competency Development



Source: authors' own work based on survey research conducted in October–December 2024.

this option. This result clearly highlights that for Generation Z, gaining practical skills in real work environments is a key factor in professional development. Experience acquired through internships or apprenticeships allows for the direct application of theory in practice and a better understanding of the specifics of various industries. Additionally, this form of education fosters professional relationships that support career growth.

In second place were traditional workplace training programs, selected by 47.6% of respondents (150 respondents). This result confirms that education conducted directly within an organisation still plays an important role in professional skill development. Such training enables employees to gain knowledge relevant to their job tasks.

Online courses were chosen by 48.3% of respondents (152 respondents), indicating their growing popularity, particularly among Generation Z. Online courses offer flexibility in learning, allowing individuals to adjust the pace and schedule to their personal needs. Furthermore, their accessibility and the ability to earn certifications make them particularly attractive to those who prefer digital forms of education.

Self-learning and personal development (e.g., reading books, articles, or blogs) were indicated by 45.1% of respondents (142 respondents). This result highlights Generation Z's independence in acquiring knowledge. Self-learning provides the opportunity to explore topics tailored to individual interests and needs, which is especially valued by those with strong internal motivation for growth.

Coaching and mentoring, as forms of skill development, were recognised by 23.2% of respondents (73 respondents). This method emphasises the importance of relationships with experienced professionals who can support the development of younger employees by sharing their knowledge and experience.

Postgraduate studies were chosen by 21.3% of respondents (67 respondents), indicating that formal academic education continues to be perceived as a valuable means of gaining knowledge. However, compared to more flexible methods such as online courses or practical training, traditional studies are selected less frequently.

The least popular form of education was thematic workshops (e.g., conferences, webinars), chosen by only 17.5% of respondents (55 respondents). This result may stem from the perception that such events are less interactive and more time-limited compared to more comprehensive and practical forms of learning. Nevertheless, workshops remain an important source of knowledge regarding industry trends and networking opportunities.

Based on the study, a competency framework can be identified that synthesises the most important skills influencing career development, as reported by Generation Z representatives. This framework comprises four main categories of competencies. The first group consists of technological and digital competencies, which encompass technological curiosity and openness to innovation, technological skills such as programming, and digital skills. These competencies indicate a clear orientation of Generation Z toward development in the area of modern technologies and the digitalisation of professional processes.

The second category comprises adaptive and developmental competencies, which include flexibility and the ability to adapt to change, the capacity for continuous learning and personal development, and independence in problem-solving. These competencies highlight the importance of adjusting to a dynamic work environment and taking initiative in one's professional development.

The third group consists of social and communication competencies, including communication skills, teamwork, negotiation and conflict-resolution skills, as well as empathy and emotional intelligence. These competencies are essential for effective collaboration, building interpersonal relationships, and engaging in successful interactions within teams, including virtual environments.

The fourth category includes competencies related to foreign language proficiency, understanding cultural diversity, practical knowledge of sustainable development, and ethics and responsibility in the workplace. These competencies reflect global challenges, the importance of working in international environments, and the growing role of social responsibility in career development.

The presented structure provides a coherent foundation for planning professional development strategies by both organisations and employees, enabling the conscious shaping of career paths in line with current labour market requirements.

Discussion

The study results indicate the key competencies that Generation Z considers the most significant for the future job market. Their analysis, compared with subject literature and international reports such as The Future of Jobs Report 2023 (WEF, 2023) and Future of Skills: Employment in 2030 (Bakhshi et al., 2020), allows for several important conclusions regarding directions for professional development amid changing technological and global conditions.

One of the most notable findings is that technological curiosity and openness to innovation (75.30%) are recognised as the most crucial future competency. This result aligns with the increasing role of technology in professional life, which is confirmed in academic literature, where skills related to technology utilisation, design, and programming are listed as essential (WEF, 2023, pp. 256–286). Similar conclusions emerge from employer expectations, where advanced digital skills (69%), such as proficiency in programming, graphic software, accounting software, or digital content creation, are deemed equally important (Karpińska & Owczarczuk, 2024, p. 80). This underscores the need to combine technological curiosity with practical application skills, which

Generation Z should consider in their education and career development.

Second in the ranking is flexibility and adaptability to change (71.40%), reflecting the growing demand for resilience and the ability to respond quickly to global challenges, such as the COVID-19 pandemic and rapid automation of work processes. Similarly, employers emphasise the importance of analytical skills (52%), which support effective decision-making and adaptation in a rapidly changing professional environment. Modern organisations require employees to navigate dynamic workplaces and analyse and interpret data – an essential aspect of efficient change management (Karpińska & Owczarczuk, 2024, p. 80).

Foreign language proficiency (66.20%) is another highly rated skill among Generation Z, reflecting the growing significance of globalisation and working in international environments. Employers also stress the necessity of this competency, highlighting that fluency at at least B2 level (57%) is crucial for communication and international collaboration (Karpińska & Owczarczuk, 2024, p. 80). This is further confirmed by a survey conducted by Pracuj.pl, where 46% of Generation Z respondents indicated foreign language proficiency as a key skill for career development (Pracuj.pl, 2024).

The study findings align with the conclusions of Bartkowski and Pytlak, who, based on their research, recognised that Generation Z entering the labour market in the Pruszków district brings valuable competencies, particularly appreciated in today's job market. These include advanced knowledge of digital technology and fluency in foreign languages, which are valuable assets in the era of globalisation and ongoing digitalisation. These skills equip Generation Z to significantly impact the labour market in this region, introducing innovative approaches to tasks and problem-solving in a rapidly evolving environment (Bartkowski & Pytlak, 2024, p. 16).

These abilities, combined with advanced digital competencies, form the foundation for successful navigation in the globalised job market. The Future of Skills report emphasises the importance of communication and collaboration, which can be interpreted as complementary to foreign language proficiency and technological skills. However, as the report highlights, communication skills – while fundamental – do not dominate young respondents' perceptions as strongly as technological competencies. This may stem from the belief in their universal nature (Bakhshi et al., 2020, pp. 93–100). The new generation of employees recognises that effective communication remains crucial in the professional world. In a study for Pracuj.pl, 49% of young respondents identified soft skills, such as communication, as key to career growth (Pracuj.pl, 2024).

Another essential aspect of the study results is the ability to engage in continuous learning and personal development (60.80%), which is highly valued by both respondents and employers. Academic literature (Marszałek, 2011; Minta, 2012) emphasises that in an evolving work environment, learning ability is the foundation for long-term career development. Employers also confirm the importance of basic digital skills (38%) and teamwork skills (77%), further reinforcing the need for flexibility and readiness to grow in various areas (Karpińska & Owczarczuk, 2024, p. 80).

At the same time, it is worth noting the relatively low rating of competencies related to cultural diversity (25.70%) and sustainable development (23.40%). These results suggest that both young professionals and employers primarily focus on technical and practical skills that directly impact professional productivity.

The study also highlights the significance of soft skills, such as teamwork (59.80%) and time management and work organisation, which align with employer expectations. In particular, teamwork (77%) is a crucial aspect of modern organisations. However, while these skills are important, young professionals tend to view them as more universal and naturally developed over the course of their careers, whereas technological competencies require more specific preparation in education.

The study results reveal that both Generation Z and employers focus on technology, innovation, and adaptability as key pillars of the future job market. However, some discrepancies exist, including lower perceived importance of social competencies, cultural diversity, and sustainable development. Looking ahead, it will be important to integrate technological skills with social abilities to meet the increasingly complex challenges of the job market (WEF, 2023).

The results of the study on preferred learning methods among Generation Z representatives and on employer practices indicate numerous similarities (Karpińska & Owczarczuk, 2024, pp. 83–84). The largest percentage of respondents (76.5%) indicated learning through experience, such as internships and apprenticeships, highlighting the importance of acquiring practical skills in real-world settings. This aligns with the popularity of development support methods used in small and micro-enterprises, such as on-the-job training and job shadowing. Despite their simplicity and low cost, these methods are valued for their effectiveness and adaptability to employees' real needs (Pracuj.pl, 2024).

In contrast, traditional internal training, chosen by 49.8% of Generation Z respondents, and online courses (48.2%) reflect the strategies of larger enterprises, which more frequently organise both internal and external courses and training. In large organisations, courses and training dominate as the primary means of supporting employee development due to their greater financial and organisational capabilities. As a result, young employees in larger companies have access to a richer educational offering, including more specialised and costly support forms, such as postgraduate studies or study visits (PARP, 2019).

It is also worth noting that self-education, chosen by 46.3% of Generation Z respondents, is an integral part of employee development practices. This is particularly evident in smaller organisations, where employers encourage employees to independently enhance their qualifications, often due to budget constraints. Meanwhile, less popular forms of education among young people, such as conferences, seminars, and workshops (21.9%), are relatively more frequently used by large enterprises as a way to develop specialised competencies and establish industry contacts (PARP, 2019).

A report by Ernst & Young confirms these observations, indicating that Generation Z respondents consider professional internships the most effective way to develop their skills – 59% of respondents rated them as the most important. In contrast, only 12% of Generation Z respondents preferred traditional education methods such as training sessions or lectures (Sawyer, 2021).

Conclusions

The conducted research has led to important conclusions regarding the educational preferences and key professional competencies of Generation Z in the context of the future labour market. The findings suggest that young employees primarily value practical experience gained in real work environments, such as internships and apprenticeships, recognising them as the most effective forms of learning and professional development. At the same time, the popularity of online courses and self-directed learning underscores the significance of flexibility and accessibility in education, which play a crucial role in an ever-evolving work environment.

There is also a noticeable increase in the value of technological competencies, such as programming, design, and advanced use of digital tools, which are considered fundamental in the modern labour market. In the context of globalisation, language skills and the ability to work in an international environment are particularly valued. Simultaneously, flexibility and adaptability to change are key in addressing challenges such as process automation and global crises.

Although teamwork and time management remain essential for both employees and employers, the research findings suggest that the younger generation perceives these skills as more universal and naturally developed throughout their careers. Meanwhile, relatively low interest in competencies related to cultural diversity and sustainable development highlights the need to raise awareness in these areas, as they are expected to gain increasing importance in response to global challenges.

The research results emphasise that the effective professional development of Generation Z requires integrating technological skills, social competencies, and learning flexibility. Organisations that aim to attract and develop young employees should create opportunities for practical learning, invest in modern education methods, and support adaptability in a changing professional environment. Looking ahead, it is essential to strive for a balanced approach that combines advanced technical skills with social responsibility and openness to diversity.

The study results provide important guidance for human resource management practitioners and educational institutions in preparing young employees for the requirements of the modern labour market. First, for HR professionals, the findings highlight the need for systematic development of technological and digital competencies among Generation Z employees. This means implementing training programs that cover both information technologies and digital tools used in daily work, as well as encouraging an innovative approach and experimentation with new solutions. At the same time, adaptive competencies – such as flexibility, the ability to work in changing conditions, and the capacity for self-development – should be strengthened through change management training, mentoring, and programs that support experiential learning.

In the area of social and communication competencies, the study results indicate a need to develop interpersonal skills, including effective communication, teamwork, negotiation, and emotional intelligence. HR should implement practical workshops, coaching programs, and mentoring initiatives that enable employees to gain experience in conflict resolution and relationship-building in professional environments, including remote and hybrid settings.

For higher education institutions, it is crucial to adapt curricula to the needs of Generation Z, with particular emphasis on experiential learning, internships, placements, and online courses that combine theoretical knowledge with practical application. Universities should also develop programs supporting soft and global competencies, such as foreign language proficiency, understanding cultural diversity, work ethics, and social responsibility, to prepare students for work in an international and diverse professional environment.

Implementing these actions will not only increase the attractiveness of organisations for Generation Z but also strengthen employees' competitiveness in the labour market. For educational institutions and HR departments, this means the need for systematically monitoring competency requirements and designing development programs based on research findings and current market trends, thereby enabling effective preparation of young employees for the demands of the contemporary economy.

Limitations

The conducted study has certain limitations that should be taken into account when interpreting the results. The research sample was purposive and included only representatives of Generation Z – students of economics-related fields at higher education institutions in Poland. The use of non-stratified sampling limits the possibility of fully generalising the conclusions to the entire population of young employees. Additionally, the study was based solely on closed-ended questions, both single-choice and multiple-choice, which may have restricted respondents' ability to fully express their opinions and may have led to the loss of important nuances in the perception of professional competencies.

Future Research

Therefore, future research should include broader generational groups, such as Millennials, Generation Y, or Baby Boomers, which would allow for comparing attitudes toward professional competencies across different generations. It would also be valuable to include representatives of various fields of study and industries in order to better capture the diversity of competency needs. The use of qualitative methods, such as in-depth interviews or focus groups, would allow for a deeper understanding of the motivations and expectations of young employees.

An additional direction for future studies could be panel research, which would enable analysis of changes over time and capture the dynamics of the evolving competency needs of Generation Z amid ongoing labour market transformations. Incorporating these perspectives would enable not only a more precise understanding of current preferences among young employees but also monitoring the processes shaping the future labour market and the resulting competency requirements.

The appendix is available in the online version of the journal.

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Tea Mijač

Rethinking Information System Success: Generative AI in the Hands of Future Business Managers

Abstract

Artificial Intelligence (AI) has rapidly evolved over recent decades, transforming various sectors. At the forefront of AI advancements is Generative Pre-trained Transformer technology, exemplified by ChatGPT, which demonstrates significant capabilities in generating human-like conversational responses. This study examines the perceived success factors of ChatGPT among Gen Z business students using the DeLone and McLean Information System Success Model. Utilising a qualitative methodology with a sample of 410 participants, the research assesses all six core dimensions while accounting for multidimensionality. The findings reveal that, while ChatGPT is widely adopted in academic contexts, higher-order construct analysis indicates that some traditionally validated dimensions did not achieve statistical significance in this specific setting. Notably, the research did not confirm that the quantity dimension is significantly related to intention to use, nor that intention to use significantly affects perceived net benefits, suggesting potential limitations of the model when applied to generative AI. This study highlights the need for updated or adapted theoretical models that better capture the unique characteristics and user interactions associated with modern AI tools such as ChatGPT. As these students transition into the workforce, their attitudes and experiences offer a valuable preview of how future employees may engage with AI in professional environments.

Keywords: generative AI, future business workforce, IS success, Gen Z, DeLone and McLean Model

Introduction

Artificial intelligence (AI) has become a transformative force in both business and society, reshaping how organisations operate and how individuals interact with digital services. Recent research has extensively examined the adoption and application of AI across a wide range of industries and domains, highlighting its growing strategic importance. The ability of organisations to successfully adopt and integrate technological innovations has become a critical determinant of competitive advantage (Ikhsan et al., 2025). Beyond technical implementation, this integration requires a clear understanding of how AI can be leveraged to generate economic value and organisational benefits. Consequently, defining effective governance mechanisms and strategic approaches to harness AI's economic potential has emerged as a key challenge for contemporary organisations (Chhillar & Aguilera, 2022). Different providers now depend on AI models to deliver personalised assistance and advice (Söllner et al., 2025). As a result, individuals and organisations now rely on AI-driven systems daily, often without fully recognising the extent of this dependence.

Although AI was introduced in the 1950s, widespread adoption did not occur until the launch of ChatGPT in November 2022. Why? Because it became available to the public, unlike previously, when AI was limited to highly educated individuals, because its use required expert knowledge. AI advancements include Generative Pre-trained Transformer (GPT) models, exemplified by ChatGPT (Dwivedi et al., 2023), which demonstrate significant capabilities for generating human-like conversational responses. Although generative AI (GenAI) represents only one segment of AI, it is currently among the most widely known and used tools, with ChatGPT increasingly recognised for its potential to enhance economic productivity (Turkes et al., 2024).

In today's labour market, there are Gen Z, millennials, Gen X, and boomers, and regardless of the industry in which these generations work, efficiency has always been

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and will continue to be one of the main goals, as it is well known that efficiency can increase revenue and, therefore, profit. Millennials, born between 1981 and 1996, grew up with rapid advances in IT, so this tech-savvy generation often adopts digital innovations early (Ikhsan et al., 2025). However, the new generation, known as Gen Z, is regarded as significantly more technologically proficient (Arkhipova et al., 2019) and currently constitutes a substantial share of the population in many countries (Abed, 2024).

Drawing on the Theory of Reasoned Action (TRA) and the Technology Acceptance Model (TAM), end users' perception of technology's usefulness is expected to increase their intention to use it and their actual usage. Additionally, to assess the overall success of an IS or digital service (regardless of whether it is based on AI or not), the DeLone and McLean Information System Success Model provides a well-established theoretical framework. Their model, referred to as the D&M IS success model, assesses system success across six dimensions: system quality, information quality, service quality, user satisfaction, intention to use/usage, and perceived net benefits.

The motivation for this empirical research stems from prior studies validating the IS success model or attempting to determine additional dimensions and relationships, so far studies focusing on AI based technologies success did not include all success dimension in their models (Minseong et al., 2025), or results were not consistent with the theory (Chen et al., 2024; Yoon & Kim, 2023). Additionally, the perceived net benefits of using GenAI in business remain under-researched (Chu, 2023). GenAI is highly interdisciplinary; thus, it is important to identify success factors (Söllner et al., 2025). In general, IS research and practice can benefit considerably from improved understanding of IS success (Jeyaraj, 2020).

The goal of this paper is to investigate whether the D&M IS success model, including all its core dimensions and considering their multidimensionality, adequately captures the success of GenAI tools such as ChatGPT when applied by Gen Z business students.

This paper is divided into seven sections. The first section examines relevant phenomena and identifies research gaps foundational to this study. The second section outlines the literature review, while the third establishes the framework and hypotheses. The fourth section outlines the research strategy and summarises the methodology. In the fifth section, the research findings are presented. The sixth section offers a theoretical and practical discussion of these findings. Finally, the last section concludes with a discussion of research limitations and suggests directions for future research.

Literature Review

Adoption of GenAI in the Business Context

The scientific landscape of AI research has flooded scientific databases. This is expected, given that the benefits of AI-based technologies are unquestionable across industries. Several studies have examined the usage of AI in the work environment, for example, in the field of project management (Vegar & Mijač, 2024), in a smart city environment (Ferreira dos Santos et al., 2025), energy efficiency (Fontoura et al., 2025), marketing (Gupta et al., 2025), banking sector (Ikhsan et al., 2025), etc.

Recent findings corroborate that AI and machine learning (ML) significantly impact firm performance and logistics efficiency, underscoring their essential role in companies' success (Garg et al., 2025). Recent studies have shown that adopting AI is also crucial for SMEs to realise both immediate operational improvements and long-term sustainability goals (Soomro et al., 2025). Evidence indicates that organisations using ChatGPT can experience improved creativity and innovation, increased work efficiency, and enhanced employee skills and competencies, thereby increasing employees' awareness of their organisation's sustainability commitments (Vrontis et al., 2023). However, another piece of empirical evidence on GenAI indicated that increased employee efficiency was rated lower than expected (3.05 out of 5). In contrast, cost savings were perceived as a more important benefit (3.41 out of 5) (Vegar & Mijač, 2024).

Despite the growing necessity of integrating AI into business, significant barriers to adoption remain. Although generative AI has rapidly become mainstream, resistance persists, highlighting a digital divide that extends into the workplace. A recent study found that managers perceive greater risk and are less willing to invest in AI applications for human resources than in finance and marketing. Furthermore, findings indicate that acceptance of this technology diminishes when its functionality exceeds a critical threshold, allowing AI to make decisions without human oversight (Gieselmann et al., 2025).

A recent study revealed that individuals who strongly embrace the idea of technosolutionism – believing that technology can solve problems – tend to favour robots over humans for job roles and prefer AI over human managers for decision-making in the workplace. This is significant because most studies indicate that people generally dislike the notion of being replaced or overseen by technology. However, those who are enthusiastic about technology solutions are more likely to adopt them (Nagpal et al., 2024). In addition, empirical research on project managers revealed a notable trend of limited adoption, with 56.5% of respondents reporting no use of AI (Vegar & Mijač, 2024). By contrast, research focused solely on employees of IT companies found that 69% of respondents held a positive view of ChatGPT's future development (Jakopec et al., 2023). These findings reveal disparities across industries, with the IT sector favoured. A recent study also examined ChatGPT and unequal adoption among Swedish workers, indicating that younger and less experienced workers are more likely to use ChatGPT (Humlum & Vestergaard, 2025). Additionally, the same analysis highlighted a significant gender gap in adoption, showing that women tend to be much less likely to use ChatGPT.

These findings suggest a gender and industry divide in AI adoption. Some possible reasons for low AI adoption in business environments (excluding the IT industry, which clearly has a high adoption rate) include limited awareness of the availability of AI tools and insufficient skills for their use (Vegar & Mijač, 2024).

TAM, UTAUT and D&M IS Success Model

The use, adoption, and success of technology have been a focus of research for more than four decades. It began in 1989, when Davis introduced the TAM, focusing on the antecedents of usage: perceived ease of use and perceived usefulness. TAM was extended into the Unified Theory of Acceptance and Use of Technology (UTAUT). In contrast, the D&M IS success model adopts a more comprehensive perspective while also accounting for usage and intention to use. The D&M model considers objective measures of systems that undoubtedly impact success (Delone & McLean, 2003). Unlike TAM and UTAUT, which are more oriented toward individuals' characteristics, the IS success model tends to examine success factors for achieving organisational and individual net benefits. TAM and UTAUT have been criticised for reaching a plateau in knowledge contribution due to their extensive use in research (Shachak et al., 2019). Similarly, some authors criticise the IS success model for oversimplifying the complex nature of ISs and for failing to fully capture the dynamic and contextual factors that influence success.

Some scholars have suggested integrating theoretical models or frameworks with specific ISs to better understand AI adoption (Abed, 2024). Given that IS success is a complex, multidimensional construct, with each dimension serving as a potential indicator of success (Mijač et al., 2024), this study applies the D&M IS success model to measure the success of ChatGPT among Gen Z. Additionally, previous research has shown that this model can be applied to AI chatbot adoption in the tourism sector (Abed, 2024), as ChatGPT exhibits characteristics typical of an IS (Chu, 2023).

Regarding the IS success model, a recent meta-study and review paper identified limitations that should be addressed: studies reported inconsistent use of indicators and results that were not aligned with the theoretical IS success model (Jeyaraj, 2020; Mijač et al., 2024). This inconsistency in the empirical results has also been noted in AI-related research. For example, user satisfaction with ChatGPT has not been confirmed to influence the intention to use ChatGPT (Minseong et al., 2025). Notably, recent research has not found a significant effect of information quality on satisfaction (Yoon & Kim, 2023). Additionally, research on ChatGPT has not found a significant impact of system quality on user satisfaction (Chen et al., 2024). In particular, the literature review indicates that empirical tests of the IS success model are often partial. For example, recent research on ChatGPT assessed success factors; however, it did not include service quality and information quality in its conceptual model (Marjanovic et al., 2024). In addition, a recent study that validated the IS success model on ChatGPT (Chen et al., 2024) did not include the net benefits construct, whereas Chu (2023) did not observe an intention to use/usage of ChatGPT; none of these empirical papers employed higher-order constructs in their conceptual models.

When discussing the quality subdimension, information quality is paramount in the context of GenAI, as the primary purpose of this digital service is to generate content. Thus, testing all quality aspects significantly contributes to overall success. Research focusing on information quality indicates that students are aware of ChatGPT's potential inaccuracies and perceive its answers as lacking accuracy or specificity, underscoring the need for caution (Tlili et al., 2023).

The authors confirmed the importance of information quality by examining its subdimensions and impact on user satisfaction with information quality (Fu et al., 2024). End users recognise that information quality can be questionable; however, only 32% of IT employees surveyed in a recent study reported that inaccuracies and ambiguities in responses are the main drawbacks (Jakopec et al., 2023).

The rationale for applying this theoretical model in this study lies in the study's business context, where measuring the success of ISs through the benefits they deliver is particularly important. After all, without tangible benefits, the implementation of AI technologies would lack clear justification. Nevertheless, all quality dimensions should be incorporated into the assessment of the success of GenAI digital services.

Research Model Development

ChatGPT exhibits features of a standard IS, aligning well with the academically validated IS success model (Chu, 2023); thus, the study's research model is grounded in the original dimensions of that model. The multidimensionality of the construct has been considered, as digital service quality is often conceptualised as a higher-order construct (HOC) in research (Aldholay et al., 2018; Ho et al., 2010; Isaac et al., 2017). The quality dimensions of the IS D&M success model refer to system quality, information quality, and service quality (Delone & McLean, 2003). Thus, ChatGPT quality in this paper is conceptualised as a multidimensional construct (Mijač et al., 2023), comprising system quality, service quality, and information quality as its subdimensions. Additionally, each of these three dimensions has been treated as a third-order multidimensional construct.

Most system quality indicators focus on engineering performance, particularly relating to program code quality and the development phase (DeLone & McLean, 1992; Semeon et al., 2010). Additionally, system quality can be defined as the capability of an IS to be used easily and correctly while continuously providing all functionalities specified in user requirements (Martins et al., 2019). In this research, system quality reflects the reliability, availability, security, functionality, response rate and usability for measuring system quality (Chu, 2023; Mijač et al., 2025).

Information quality refers to the desirable characteristics of an IS's outputs, such as reports or digital content (Petter et al., 2008). Essentially, it represents the perceived value of system outputs from the perspective of end users (Semeon et al., 2010). Several empirical studies have shown that information quality statistically influences higher system usage and overall user satisfaction (Chu, 2023). A recent paper confirmed a significant positive impact of information completeness, precision, timeliness, and convenience on user satisfaction with ChatGPT, whereas accuracy and reliability were not significant (Fu et al., 2024). This research used indicators: up-to-dateness, reliability, accuracy, completeness, timeliness, understandability and relevancy to measure information quality.

Enhancements in service quality, such as improved functionality, reliability, and support, are anticipated to boost user satisfaction (Al-Emran et al., 2025). Service quality has shifted from face-to-face to online modes, as the growing popularity of web-based environments has often replaced personal interactions with system interfaces (Chen & Chengalur-Smith, 2015). Regardless of the support channel used, standard measures of service quality include response time, accuracy, reliability, technical competence, staff empathy, and user guidelines (Chen & Chengalur-Smith, 2015; Petter et al., 2008). Service quality has very often been identified as a significant determinant of user satisfaction (Chu, 2023) and intention to use (Mijač et al., 2024).

Past studies have confirmed the impact of IS quality subdimensions on intention to use and user satisfaction; for example, in a recent study on Fintech payments, system, service, and information quality were directly associated with user satisfaction (Abed & Alkadi, 2025). Additionally, research involving 360 industry and academic experts confirmed the importance of all quality subdimensions for organisational performance (Al-Qerem et al., 2025). Recent research has confirmed that the system and service quality of AI-based speakers positively affect user satisfaction, and that user satisfaction significantly influences net benefits (Yoon & Kim, 2023). Similarly, user satisfaction with fintech payment apps has been found to positively influence users' intention to continue using them (Abed & Alkadi, 2025). The elevated satisfaction is expected to foster users' adoption of GenAI, prompting them to explore its capabilities further and integrate these tools more deeply into their activities (Al-Emran et al., 2025).

Recent research on ChatGPT has also confirmed the significant and positive impact of information and service quality on user satisfaction, as well as the impact of user satisfaction on intention to use ChatGPT (Chen et al., 2024). Empirical research on ChatGPT also confirmed that all quality subdimensions have a significant and positive impact on user satisfaction (Chu, 2023).

The primary criterion for evaluating IS success is its benefits, which entail assessing the advantages derived from the system's utilisation (Delone & McLean, 2003). A benefit is defined as a quantifiable improvement arising from a particular achievement and is observable to all stakeholders (Andrade et al., 2016). Based on the SLR, the most commonly used indicators for measuring perceived net benefits are: enhanced end-user performance, usefulness, time savings, and cost savings (Mijač et al., 2024). These benefits have also been applied to AI-related technologies, notably reduced costs (Yoon & Kim, 2023) and time savings (Marjanovic et al., 2024; Yoon & Kim, 2023). Recent research confirmed that ChatGPT increased worker productivity (Retkowsky et al., 2024). It is self-explanatory that without the utilisation of AI-based technologies, no benefits are provided. To truly achieve benefits, individuals must employ AI-based technologies.

Based on the literature review, the posed hypotheses are:

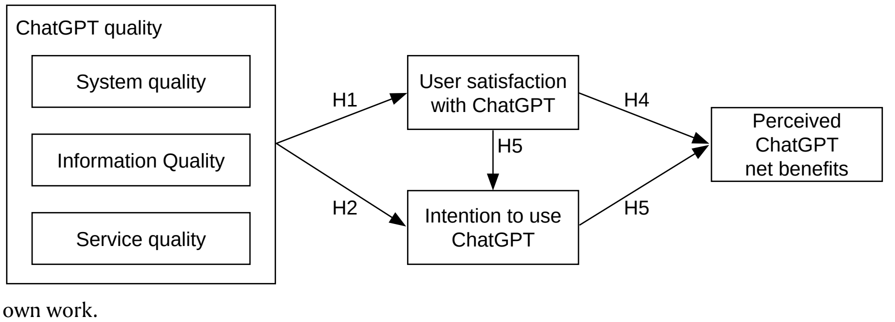
- H1 ChatGPT quality positively influences user satisfaction with ChatGPT.
- H2 ChatGPT quality positively influences the intention to use ChatGPT.
- H3 User satisfaction with ChatGPT positively influences the intention to use ChatGPT.
- H4 User satisfaction with ChatGPT positively influences the perceived net benefits of ChatGPT.
- H5 Intention to use ChatGPT positively influences the perceived net benefits of ChatGPT.

The developed hypotheses are presented in the conceptual model (Figure 1).

Methodology

The research focused on undergraduate and graduate students in business economics. An anonymous survey was administered in Croatia during the 2023/2024 academic year. In total, 410 surveys were completed.

Figure 1
Conceptual Model



Source: author's own work.

The minimum sample size of 300, meeting the study's requirements, was achieved (Hair et al., 2017a).

The instrument used in this study was adapted from a previous study (Mijač et al., 2023) and contextualised. Precisely, the final list consisted of 98 items rated on a five-point Likert scale.

Once the data was gathered, multivariate statistical methods were utilised. Data analysis was executed using IBM SPSS Statistics and IBM SPSS Amos for structural equation modelling (SEM).

Results

Descriptive Statistics

The collected data revealed that the sample consisted predominantly of female participants (approximately 67%), consistent with publicly available sex distribution data for economics and business students in Croatian higher education institutions. Additionally, more than 80% of participants reported having extensive experience with ChatGPT.

Descriptive analysis of constructs indicates that system quality received the highest overall evaluation (3.86), followed by service quality (3.49), whereas information quality received the lowest rating (3.39). Within system quality, availability and usability were the most positively evaluated attributes, whereas information quality indicators related to content currency and completeness were rated less favourably.

The intention to use ChatGPT was rated relatively high (3.84), with no significant gender differences. User satisfaction averaged 3.59 and perceived net benefits were rated at 3.76.

Multivariate Analysis

In covariance-based SEM, variables need to follow a normal distribution (Hair et al., 2017a). Consequently, skewness and kurtosis were computed, leading to the exclusion of all manifest variables that fell outside the acceptable range of [–2; +2] (George & Mallery, 2010). The theoretical framework suggests the possible multidimensionality of observed constructs, particularly HOCs (Awang et al., 2017; Hair et al., 2017b). Here, manifest variables are associated with first-order latent variables, which in turn are associated with second-order latent variables. First-order constructs are regarded as indicators of the HOC (Hair et al., 2017b).

A second-order construct may embody (sub)dimensions of third-order constructs, provided there is a conceptual and theoretical framework (Khan et al., 2019). Utilising HOCs enhances each dimension, rather than associating all manifest variables with a single first-order construct, especially when this approach could leave the construct's explanation insufficient.

The conceptual model features one HOC, one being the third-order construct of ChatGPT Quality (CQ), alongside three first-order constructs: User satisfaction (US), Intention to use ChatGPT (INT), and Perceived net benefits (NB). Additionally, CQ comprises two second-order constructs (System quality and Information quality) and one first-order construct (Service quality).

The evaluation of models that include HOCs follows the same approach as that for models with first-order constructs (Awang et al., 2017). To determine construct validity, Factor Loading (FL), Average Variance Extracted (AVE) and Composite Reliability (CR) were calculated. The findings demonstrate that all indicators conform to the reference values set by Hair et al. (2014; 2017a). Detailed results are reported in Appendix Table 1a.

Subsequently, for the second- and third-order constructs, FL, CR, and AVE were computed, and all results met established reference standards (Appendix Tables 2a and 3a).

The overall model fit was evaluated using several indices, following the methodology of Hair et al. (2014) and Marsh and Hocevar (1985). The Root Mean Square Error of Approximation (RMSEA) was 0.055, indicating a good fit to the data. The ratio of chi-square to degrees of freedom (CMIN/df) was 2.24, which falls within the acceptable range of less than 3. The Comparative Fit Index (CFI) was 0.88, slightly below the commonly recommended threshold of 0.90. However, values above 0.85 are sometimes considered acceptable in complex models or those with smaller samples (Bentler, 1990). Taken together, the indices suggest that the model demonstrates an adequate fit, particularly with respect to theoretical coherence and model parsimony.

After confirming construct validity, the next step was to assess discriminant validity. This research applied the Fornell-Larcker criterion (Afthanorhan et al., 2021). However, the results indicated that discriminant validity was not established, suggesting substantial construct overlap (Table 1). Specifically, the correlation between US and both INT and NB exceeded the square root of the AVE for the US. Similarly, the correlation between INT and NB was greater than the square root of the AVE for INT.

According to the methodology, the proposed construct should be removed from the initial conceptual model. Thus, the construct NB has been removed.

After the construct was removed, the same procedure was followed to assess reliability and validity indicators. However, this time the NB construct was excluded from the model. Results indicate that discriminant validity has now been achieved (Table 2).

Model fit was again evaluated using multiple indices as before. The CMIN/df was 2,318, indicating an acceptable level of fit. The RMSEA was 0.059, indicating a good fit with the data (Browne & Cudeck, 1992). The CFI was 0.88, slightly below the conventional cutoff of 0.90. However, values above 0.85 may still be considered adequate in complex models or those with smaller sample sizes (Bentler, 1990). RMSEA and CMIN/df support the conclusion that the model demonstrates a reasonable overall fit, especially when considered alongside theoretical justification and model parsimony.

Of the eight hypotheses tested in the study, six were supported (Table 3).

The results of the structural model are visually presented in Figure 2.

Table 1
Discriminant Validity Results

	CQ	US	INT	NB
CQ	0.887			
US	0.85	0.7649		
INT	0.67	**0.768**	0.825727	
NB	0.754	**0.83**	**0.87**	0.761534

Source: author's own work.

Table 2
Discriminant Validity Results after Removing the NB Construct

	CQ	US	INT
CQ	0.887		
US	0.847	0.765	
INT	0.664	0.757	0.826

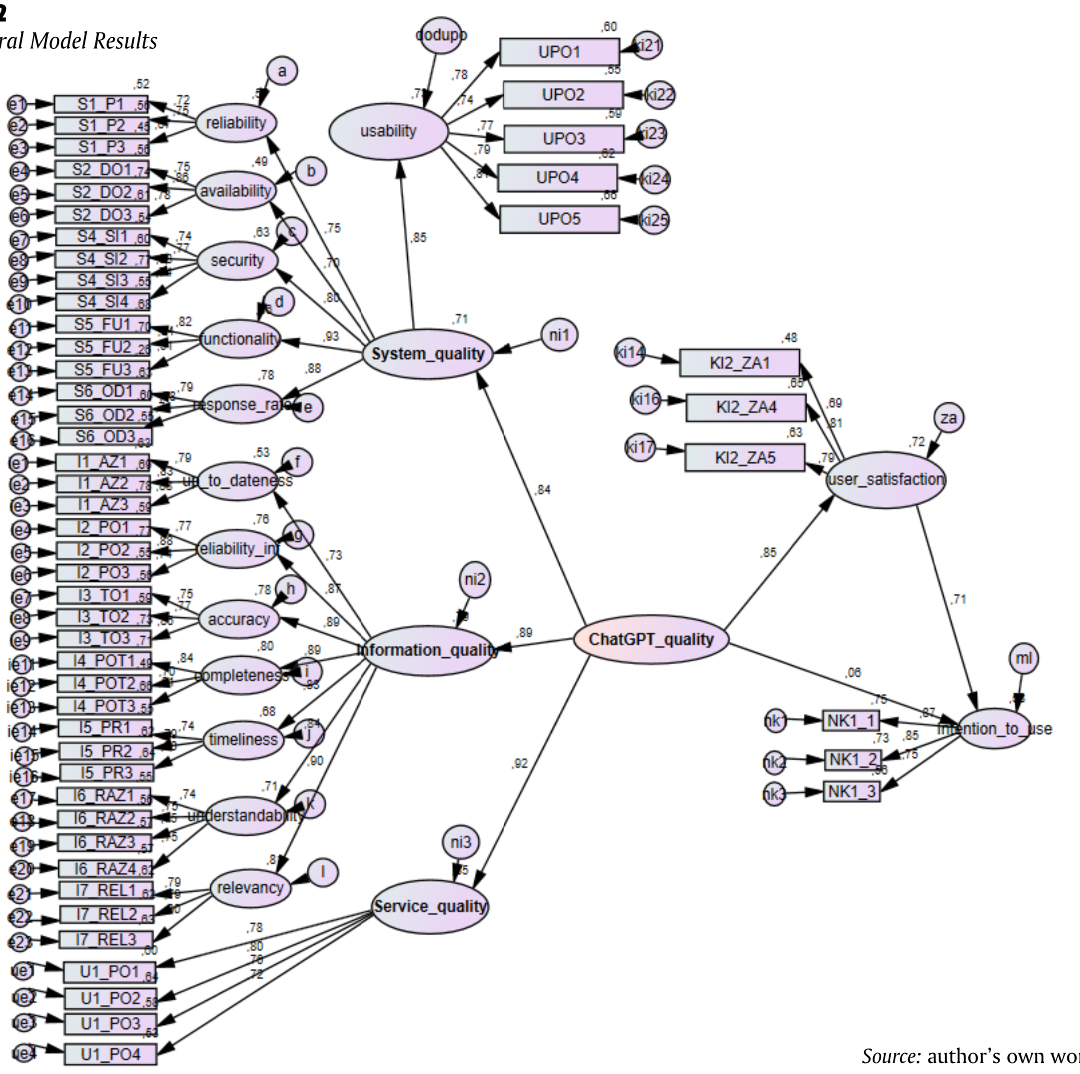
Source: author's own work.

Table 3
Hypotheses Testing

Hypotheses	*β*	*p-value*	Result
H1 ChatGPT quality -> user satisfaction with ChatGPT	0.845	0.000	supported
H2 ChatGPT quality -> intention to use ChatGPT	0.064	0.595	Not supported
H3 User satisfaction with ChatGPT -> intention to use ChatGPT	0.709	0.000	supported
H4 intention to use ChatGPT-> net benefits	NA		
H5 User satisfaction with ChatGPT -> net benefits	NA		

Source: author's own work.

Figure 2
Structural Model Results



Source: author's own work.

Discussion

ChatGPT is an AI-powered digital service, and its utilisation is increasingly integral to daily life and business operations. Rather than conducting internet searches, users are increasingly relying on ChatGPT for information, despite the explicit disclaimer that all data should be independently verified. The goal of this paper was to explore future managers' perceptions of GenAI and to investigate whether the D&M IS success model adequately captures the success of GenAI tools such as ChatGPT. The participants in this study were business economics students from Generation Z, a cohort that plays a crucial role in fostering innovation and whose engagement is central to realising the full potential of technology-driven business transformation (Truncale, 2025).

Previous research has shown that managers are increasingly reluctant to invest in AI, particularly for autonomous decision-making. However, previous studies also highlight differences in gender and domain. This study found that the future workforce demonstrates a firm intention to use AI technologies [3.8 out of 5], indicating a high openness to integrating such tools into their professional routines. Also, as the gender composition of correspondents favours female students, the intention is very high in both genders, and there is no statistically significant difference, unlike previously reported (Humlum & Vestergaard, 2025).

One of the theoretical contributions of this research lies in its treatment of ChatGPT quality as a multidimensional construct, which it inherently is. This approach enables a more comprehensive examination of ChatGPT quality. It provides a multidimensional perspective on this construct, rather than linking all items to a single first-order construct, which can lead to an incomplete explanation of the construct. Despite this, quality was often modelled as a first-order construct, and not all its dimensions are consistently included. The results of this research confirmed the indicators for each quality subdimension. ChatGPT system quality is manifested through reliability, availability, security, functionality, response rate and usability. In addition, ChatGPT information quality is measured using the following indicators: up-to-dateness, reliability, accuracy, completeness, timeliness, understandability, and relevance. These results are partially consistent with recent research indicating that indicators such as completeness, convenience, format, precision, and timeliness are now more indicative of user satisfaction in the context of ChatGPT than the traditional emphasis on accuracy and reliability (Fu et al., 2024). ChatGPT service quality is treated as a first-order construct, measured by four manifest variables.

Another theoretical contribution is regarding the net benefits of using ChatGPT. The statistical analysis revealed that discriminant validity was not achieved in validating the original D&M IS success model, particularly due to high correlations between perceived net benefits and intention to use. This research followed rigorous statistical methodology and applied the Fornell-Larcker criterion. In related studies examining the IS success of AI speakers, alternative criteria have been used to evaluate discriminant validity, reflecting ongoing methodological diversity in this research stream (Yoon & Kim, 2023).

The results indicating a strong correlation among perceived benefits, user satisfaction, and intention to use can be explained by the theoretical interdependence among these constructs. According to the Expectation-Confirmation Theory (Oliver, 1980), users form their satisfaction based on perceived benefits, which in turn leads to the intention to use. Additionally, according to TAM (Davis, 1989), perceived usability (which may be closely related to perceived net benefits) has been shown to affect intention to use, thereby explaining the high correlation. Another possible explanation is common method variance, given that all data were collected using the same questionnaire. This may have led respondents to rate related variables similarly.

While the success of GenAI and its economic implications, including productivity, efficiency and time reductions, were rated moderately high (3.87, 3.70 and 3.89 respectively), this construct could not be examined within the proposed IS success model. Despite existing research on the net benefits of using ChatGPT in business (Chu, 2023), this gap persists due to the lack of discriminant validity. Future research could consider separating the measurement over time or incorporating objective business indicators. This research gap should not be neglected. This opens new avenues for future research, especially in refining construct measurement and exploring deeper conceptual overlaps.

For hypothesis testing, only three hypotheses remained after removing the construct perceived net benefits from the model. Results showed that ChatGPT quality, consisting of its subdimensions, has a significant and positive impact on user satisfaction (H1) ($b = 0.845; p = 0.00$). Results from Marjanovic et al. (2018) partially align with those of this study. By contrast, authors who did not apply HOC did not find a significant impact of information quality on user satisfaction (Yoon & Kim, 2023) or of ChatGPT's usability on user satisfaction (Minseong et al., 2025).

Regarding the H2, ChatGPT quality has a significant and positive impact on intention to use; however, this finding was not supported. This suggests that ChatGPT quality, whether low or high, does not influence whether end users use it more. Even if users do not perceive ChatGPT as highly accurate or of high quality, they might continue to use it. This may mean that users already expect some degree of inaccuracy and are willing to work around it. These results are inconsistent with prior studies that found that perceived ease of use has a positive and significant impact on behavioural intention to use ChatGPT (Turkes et al., 2024).

The H3 was confirmed, indicating that user satisfaction with ChatGPT influenced the intention to use it ($b = 0.709; p = 0.00$). User satisfaction will influence their intention to continue using ChatGPT. If users are satisfied with their overall experience, regardless of its accuracy, they are more likely to continue using ChatGPT. Satisfaction, or emotional connection and a sense of being helped, can outweigh minor inaccuracies.

The intention-to-use construct impacts perceived net benefits (H4), and H5, which refers to User satisfaction and Net benefits, has not been tested. However, future research should investigate how user satisfaction with ChatGPT impacts net benefits and organisational performance and profitability.

Given that students of business economics will soon occupy decision-making roles in corporations, their experiences and evaluations of AI technologies like ChatGPT directly inform future corporate strategies regarding AI adoption, ethics, stakeholder engagement, and corporate social responsibility. Understanding their current attitudes toward AI can guide educators and policymakers in fostering ethically responsible, stakeholder-oriented approaches to AI integration in business.

The findings of this study, which highlight students' firm intention to use and continue using GenAI despite recognising the potential for information inaccuracies, should be carefully considered by the business sector. One crucial implication is that organisations should prioritise employee training programs to foster awareness of AI-related risks, inaccuracies, and potential negative consequences. Ensuring the competent, responsible, and ethically aware use of AI technology can significantly enhance a company's ability to manage stakeholder expectations, strengthen consumer trust, and enhance corporate reputation. Companies should be aware of the critical side effects of their GenAI adoption and advise managers to experiment with ChatGPT to understand its potential and limitations, thereby informing dynamic policies on its use.

Conclusion

The D&M model remains a highly relevant and widely used framework for evaluating IS success. This study provided a valuable lens for assessing the economic and organisational implications of GenAI, particularly ChatGPT. By connecting theoretical constructs and applying HOCs, the model contributes to the evaluation of AI's evolving role in the business and tech economy.

Findings suggest that Gen Z, tomorrow's managers and decision-makers, are already incorporating GenAI tools like ChatGPT into their daily academic and professional routines. While current managerial attitudes toward AI investments may still be marked by hesitation, the free and widespread availability of tools such as ChatGPT could lead to a gradual, even unnoticed, integration of AI-supported decision-making into organisational workflows.

As future business leaders, the respondents of this study will influence corporate policies on AI use, shaping governance, transparency, and ethical standards. Their early experiences with generative AI will therefore play a pivotal role in shaping how these technologies affect society over the long term. The way today's business students perceive and engage with AI is likely to echo in their future strategic, operational, and ethical decisions.

Despite awareness of the limitations and risks, particularly around accuracy and reliability, Gen Z continues to make extensive use of AI tools. This behaviour is expected to carry over into the professional sphere, underscoring the need for organisations to prepare for AI integration not only technologically but also culturally and ethically.

Rather than resisting AI, businesses must recognise its growing influence and adapt their operations accordingly. Responsible adoption will require clear frameworks addressing ethics, privacy, and governance.

This study is subject to several limitations. The use of a Gen Z student sample may limit the generalisability of the findings to other populations. At the same time, reliance on self-reported cross-sectional data limits causal interpretation and may introduce common-method bias. In addition, the inability to establish discriminant validity among specific constructs necessitated modifications to the original IS Success Model, suggesting that existing measurement approaches may require refinement for generative AI contexts.

Future research should also focus on quantifying economic benefits by using data from businesses that have adopted ChatGPT to calculate tangible outcomes, such as time savings, increased sales, or improved customer support performance.

A final, open question remains: can the DeLone and McLean model be effectively extended to measure the success of generative AI tools such as ChatGPT? While this study offers early insights, further research is essential to fully understand the model's applicability in this rapidly evolving domain.

The appendix is available in the online version of the journal.

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The Hybrid Model of Business Education – Preferences, Challenges, and Recommendations

Abstract

Hybrid education has become a lasting feature of higher education following the COVID-19 pandemic, particularly in business programs that combine theoretical instruction with practical and collaborative learning. This study examines how business students experience hybrid education in the post-pandemic context, focusing on perceived benefits, challenges, and conditions supporting effective engagement. The analysis is based on qualitative, semi-structured interviews with undergraduate business students conducted at leading universities in the Visegrad countries. Adopting a student-centred perspective, the study explores recurring patterns in students' accounts of learning flexibility, autonomy, interaction, and instructional design. The findings indicate that students generally prefer hybrid arrangements that combine online lectures with in-person practical classes, valuing flexibility, improved time management, and access to digital materials. At the same time, challenges related to concentration, limited social interaction, and insufficient adaptation of teaching and assessment practices were identified. The study concludes that the effectiveness of hybrid education depends on intentional pedagogical design, institutional context, and alignment between structural flexibility, student control, and engagement.

Keywords: hybrid learning, business education, student engagement, learning flexibility, digital transformation

Introduction

The rapid transformation of educational systems triggered by the COVID-19 pandemic posed one of the most significant challenges for contemporary higher education, particularly in business education. According to UNESCO (2020), school closures affected more than **1.5 billion students worldwide**, forcing educational institutions to adopt elements of remote learning, often without adequate infrastructural or pedagogical preparation. Although the pandemic demonstrated the potential of digital technologies and online tools to support teaching, it also exposed persistent challenges. Business education increasingly emphasises the integration of theoretical knowledge with experiential learning, practical problem-solving, and reflective competencies aimed at preparing students for complex economic and organisational environments (Sliż et al., 2024). As business programs rely heavily on direct interaction, teamwork, and international mobility (D'Abate, 2010), the abrupt shift to hybrid and remote models tested both curriculum effectiveness and institutional resilience.

The hybrid model of education (blended learning), defined as the intentional combination of in-person and remote learning supported by digital technologies (Garrison & Vaughan, 2008), evolved during the pandemic toward more flexible approaches, such as rotational models (Horn & Staker, 2014) and flex models (Graham et al., 2019).

In business education, where soft skills (e.g., negotiation, leadership) are as essential as analytical abilities, hybridisation has been met with mixed reactions. On the one hand, it enabled broader access to theoretical content (Means et al., 2010); on the other hand, it limited opportunities to develop practical competencies through direct interaction (Moskal et al., 2013).

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At the same time, the pandemic significantly impacted student educational mobility. Programs such as Erasmus+, traditionally seen as a cornerstone for developing international competencies (Teichler, 2017), were replaced with virtual exchanges. While these exchanges foster collaboration skills in digital environments, they do not fully replicate the benefits of physical presence abroad (Lewis & O'Dowd, 2016).

Although the literature widely describes the technological aspects of hybridisation, there is still limited research on the long-term impact of the pandemic on student motivation and the effectiveness of virtual internationalisation (Pandya et al., 2025). Prior studies have examined student motivation and engagement in remote and hybrid learning, particularly during the pandemic. This body of research remains largely descriptive and focuses on general outcomes rather than students' lived experiences of engagement (Krzyżak & Walas-Trębacz). Moreover, the literature acknowledges pedagogical challenges and resistance to change in the transition to hybrid learning environments (Clifft & Assiouras, 2023), there is still a lack of empirical evidence on how students perceive their own engagement and which factors, such as social interaction, teaching practices, and learning design, enhance or hinder this experience. Importantly, existing research rarely links students' experienced engagement with concrete pedagogical strategies that could effectively address these challenges and support a more sustainable adoption of hybrid learning models. Addressing these gaps may provide a valuable basis for strategic recommendations for higher education institutions.

Conducting the study in the immediate post-pandemic period, shortly after the most restrictive lockdowns, provided a unique opportunity to capture feedback from students who, under different circumstances, might not have engaged in online or hybrid learning formats, thereby allowing for the inclusion of diverse perspectives that are often underrepresented in traditional educational settings.

The aim of this article is to analyse business students' preferences for educational models in the post-pandemic era and to identify the challenges and opportunities associated with the hybrid model. The main research question is: What challenges, opportunities, and benefits arise in a hybrid education environment based on students' experience at leading universities in the Visegrad countries? The findings have practical implications for the design of curricula that integrate the flexibility of remote education with the essential practical component.

Hybrid Teaching Model

Internet and multimedia tools have become popular long before COVID-19 (Artal-Sevil & Romero, 2018). Over the last few decades, we have seen a push to develop the online environment for both business and academic purposes. The development of software supporting the online 'on-distance' connection of people has advanced significantly, and both research on the perception of telework in business (Matysová & Volfová, 2023; Volfová et al., 2023) and on online tools used within the academic environment are available to us. Academics face the challenge to fit the changing needs of students. Studies arising from the COVID-19 situation report both advantages and disadvantages, as well as positive and negative perceptions of the usability of online distance tools, impacts, consequences, etc. (Henze et al., 2022; Hitch & Zaman, 2022; Ndovela et al., 2022). Account is taken of various learning styles, perceived engagement and satisfaction (Ho et al., 2021; Shohel et al., 2020). As a result, the combination of online and in-person learning models may be the solution (Almahasees et al., 2021). Although hybrid education is often discussed as a single category, the literature clearly indicates that it encompasses several distinct instructional models rather than one homogeneous approach (Raes et al., 2020). These models differ in terms of the balance between online and in-person activities, the level of student autonomy, and the role of physical presence in the learning process. For the purposes of this study, hybrid education is treated as the focal construct, understood as an umbrella concept that intentionally combines in-person instruction with online or distance-learning components. The terms 'online learning' and 'distance learning' are used only to refer to specific modes within hybrid education rather than as independent constructs.

Based on recent research and educational approaches, hybrid learning in business education emerges as a versatile, scalable, and efficient method for building competencies. It supports personalised learning paths while also fostering the attainment of practical objectives and alignment with labour market demands (Tila, 2020). Hybrid teaching offers students the flexibility to choose between attending classes in person or online, presenting both opportunities and challenges related to accessibility, interpersonal connectedness, and digital proficiency (Mayer et al., 2024). This approach enables the inclusion of learners who may face geographical, personal, or other constraints that prevent participation in traditional on-site classes (Menzies & Tickle, 2024). This approach combines both online and face-to-face activities, unlike traditional university teaching, which relies solely on in-person sessions. In such environments, student-instructor interaction and teacher empathy, characterised by understanding, care, and authentic communication, are essential to fostering a sense of community and creating an inclusive learning space. Hybrid teaching integrates digital tools to create a more interactive learning experience and has been shown to enhance student engagement and satisfaction, particularly when learners have greater autonomy (Teoh et al., 2025).

Hybrid learning, referred to as blended learning, combines elements of in-person and remote education, using digital technologies to optimise learning outcomes. According to Garrison and Vaughan (2008), a key feature of this model is the integration of synergy between online and offline interactions, a point confirmed by recent studies in business education.

In business education, particular attention is given to the practical context. Research by Moskal et al. (2013) indicates that hybrid models are more effective for analytical subjects (e.g., finance), whereas courses requiring soft skills (e.g., negotiation, leadership) are better suited for in-person formats. This is echoed in student interview transcripts, where remote teamwork exercises were often criticised as 'unnatural' and lacking the dynamics of direct interaction.

The pandemic acted as a catalyst for the digital transformation of universities, forcing the widespread adoption of hybrid solutions. Research shows that during the pandemic, students complained about the decline in teaching quality in remote environments and requested that programs be redesigned to account for hybridisation (Hodges et al., 2020). At the same time, the pandemic highlighted the advantages of flexibility – 67% of students in a QS (2022) study expressed a preference for blended learning models. The future of business education will increasingly depend on the strategic use of artificial intelligence technologies, learning management systems, and innovative teaching methods, such as the flipped classroom model (Senali et al., 2022). Research shows that flexible learning environments combining physical and digital spaces are increasingly seen as essential for future universities, requiring holistic design to meet diverse needs (Miller et al., 2021). Student engagement varies notably between on-site and remote participants, with factors such as interactive teaching, social connection, and well-designed learning spaces playing a key role (Raes, 2022). Crucially, **evidence from post-pandemic qualitative research in Visegrad business schools indicates that student engagement in remote and hybrid learning is relational and interdependent, as declining student involvement was found to reduce lecturers' engagement, which in turn further undermined student motivation, creating self-reinforcing negative cycles** (Brzozowska et al., 2025). Hybrid learning models relying on direct substitution of face-to-face teaching with digital platforms (e.g., MS Teams) may fail to generate meaningful student engagement, as they represent a critical gap between pedagogical intention and technological implementation (Baker & Spencely, 2023). Effective hybrid education therefore requires purposeful instructional redesign rather than like-for-like technological replacement. What is more, the extent to which such engagement-enhancing practices can be implemented is strongly shaped by national regulatory frameworks governing higher education. Taken together, these findings suggest that student engagement should be understood as a dynamic and context-dependent process, which underscores the importance of in-depth research into how students experience their engagement and which factors shape it within hybrid learning environments.

Methodology

To gain a deeper understanding of the studied phenomenon, a qualitative primary research approach was employed between October 2022 and June 2023. Data collection was carried out through semi-structured interviews conducted by experienced researchers. The participants were undergraduate business students aged 18-22. The study focused on students from the four Visegrad countries: Poland, the Czech Republic, Slovakia, and Hungary.

These nations, forming the Visegrad Group (V4), are informally allied through a regional partnership based on geographical proximity, similar geopolitical conditions, and a shared historical and cultural background. Interviews were conducted in the respective national languages: Polish, Czech, Slovak, and Hungarian. The Visegrad context is not treated in this study as a representative or comparative case of global business education. Rather, it is approached as a shared institutional and regulatory setting in which hybrid education emerged amid rapid, pandemic-driven transformation. This regional configuration allows for an in-depth qualitative examination of how students experience hybrid learning in higher education systems characterised by centralised governance structures, limited pre-pandemic exposure to blended models, and accelerated digital adaptation in post-communist countries.

Across all analysed universities, the introduction of hybrid and remote teaching followed a similar pattern. Teaching procedures were implemented abruptly in response to the pandemic, and neither institutions nor academic staff were fully prepared for this transition. The shift occurred rapidly and without a comprehensive pedagogical plan. However, over time, universities gradually developed internal guidelines, training courses for academic staff, and basic standards for online and hybrid teaching. As a result, no substantial cross-institutional differences were observed in the overall deployment of hybrid education. Across the four universities, deployment followed a broadly similar trajectory: abrupt emergency adoption, followed by gradual institutionalisation through guidelines, staff training, and standardised procedures. Therefore, students' perceptions are interpreted primarily as responses to course-level design quality and interaction patterns, rather than to strongly divergent university strategies.

A total of 40 interviews were carried out – 10 per country. Each conversation, lasting approximately one hour, was recorded and later transcribed. The discussions centred around students' mental health during the pandemic and periods of online learning. Special attention was paid to factors that either supported or hindered their learning processes, as well as to lecturer behaviours that students found beneficial for their mental well-being.

The collected material was analysed using an inductive coding strategy, where codes are derived directly from empirical data before being conceptualised in the analytical phase (Bryda, 2014).

Analysis of Empirical Material

Recent post-pandemic evidence nuances the relationship between students' experiences and learning outcomes in hybrid education. Ochs et al. (2024) demonstrate that students attending hybrid classes online are more prone to off-task digital activities than their on-site peers, which negatively affects learning performance, a pattern that resonates with students' accounts in the present study, particularly regarding difficulties with concentration and sustained engagement in the online component of hybrid education. Complementing these findings, Ragni et al. (2024) show that the effects of hybrid teaching on academic performance are modest and context-dependent: hybrid formats may support study progress, such as the accumulation of earned credits, without necessarily translating into higher grades.

This observation aligns closely with student experiences documented in this study. One respondent described how hybrid education enabled her to pursue additional coursework that would otherwise have been impossible due to time constraints: "For example, during my bachelor's studies, I managed to take some master's courses, and I think I wouldn't have enrolled in them otherwise. I would have been more worried about the time if they had been in person, and I probably wouldn't have dared to take them. But this way, I thought, it's online, I can watch the lectures, I have nothing to lose. And to this day, it has helped me in terms of time" [R1].

This testimony reveals an important distinction: the value of hybrid education lies not necessarily in improving academic grades but in expanding access and enabling participation that would otherwise be unavailable.

Adding further nuance, Zunino et al. (2024) highlight a fundamental tension between digital distance and physical presence in hybrid teaching, showing that while physical attendance may hinder individual learning outcomes, it can simultaneously enhance team-based learning. Taken together, this body of research suggests that hybrid education does not automatically improve learning outcomes; rather, its effectiveness depends on how online and in-person components are strategically combined, how student engagement is managed, and how course design balances individual learning with collaborative interaction in the post-COVID context. The following discussion builds on these insights to interpret students' experiences of hybrid education in light of learning-relevant conditions and post-pandemic institutional practices. These interpretations provide the basis for the conclusions, which synthesise the implications of student perceptions for the design and effectiveness of hybrid education.

The study reveals several noteworthy themes. Firstly, the respondents discussed how education has evolved and what aspects they now consider important. This insight opens the door to exploring various solutions that could be particularly appealing and effective for business students. For most students, the opportunity to learn remotely represented a breakthrough in education. Previously, such options were rare and typically limited to individual courses. Suddenly, it became evident that remote learning could be integrated into mainstream, regular education: "I am definitely a supporter of the distance learning system. I think it was a really cool experience. And later I also noticed that this is probably a breakthrough moment, we can experience such a breakthrough moment, thanks to which the approach to learning will simply change" [R2].

According to the respondents, one of the significant advantages of the hybrid learning method is flexibility and the ability to use one's time most effectively.

This quote illustrates a key advantage of hybrid models: the ability to combine education with work. The student emphasises the practical benefits of saving time on commuting and greater flexibility in managing responsibilities: "University is more of a hybrid. I think that for some lectures, classes that are more about listening, the remote form is okay. I could work more remotely, even full-time, because it was convenient for me, that I didn't have to commute, that these lectures are more like listening than being active" [R1].

Students observed that the pandemic and the shift to remote learning pushed lecturers to move beyond traditional teaching schemes and adopt more engaging methods. Interestingly, although remote learning is often associated with challenges in group work, one respondent viewed it as an opportunity to discover how important collaboration is to her and to recognise her ability to work effectively in a team. This highlights that online learning is not only a way to acquire knowledge but also a space for self-discovery, helping students better understand their competencies, needs, and potential areas for growth.

> I think that many teachers could even partially force it, a different perspective on the classes they run and the need to change the form. Maybe greater integration of students into what is happening. Because many classes that were previously quite... or maybe not much, maybe that's the wrong word. But there were classes that were previously more talkative, and during the pandemic they became more interactive. And I really liked it. And there was definitely more group work, it probably depends on whether someone likes this type of work or not, but there was definitely more of it, which I think also affects the development of certain competences, or even the possibility of determining whether such group work is for me or whether I prefer individual work. [R2]

The next interviewee mentioned that a hybrid or remote model may be beneficial for students who prefer independence, autonomy, and flexibility in organising their learning. At the same time, the quote indicates a potential limitation in support from teachers, who engage mainly when a clear problem occurs rather than on a continuous basis: "Everyone prepared individually. It was more useful than sitting in classes, because I prepared by myself, studied more, and didn't waste time sitting in class. I could contact the teachers with a problem" [R8].

"But still, the structure of the course remained the same. Let's say, as I mentioned, that there really has to be exactly this test, and it will be taken online, but there will also be this component of supervision and sharing and everything. I think that, for example, they could have approached it more openly, like: even if the syllabus says something else, the final assessment of the course could look different, so that it would be more adapted to the technologies" [R16]. The quote shows that although teaching delivery was changed, the intention behind assessment remained the same as in the traditional on-campus mode. While instructional methods were modernised, assessment practices were not. The student highlights the need to adapt assessment to the technological and social possibilities of hybrid education, which aligns with the literature suggesting that without redesigning assessment, the transformative potential of blended learning remains limited (Raes et al., 2020).

The home environment can significantly enhance the comfort of learning by providing a familiar, low-stress setting that supports focus and individual pace. For many students, this translates into a greater sense of psychological safety and the ability to tailor their surroundings to their personal learning preferences. However, this increased comfort also raises important questions about the level of professionalism and sustained concentration during academic activities. The lack of formal structure and potential for distractions at home may challenge students' ability to remain fully engaged, prompting a broader reflection on how to balance flexibility with academic discipline in hybrid education models: "It was definitely a positive that I could turn it on, let it run and sit comfortably in a chair rather than having to sit at a desk and especially I could have a snack or a drink or something" [R15]. "For me, it was certainly partly a comfort, because these defences took place in places that were friendly to us, i.e. I defended myself in my own apartment, which also gave me the feeling that I was in a safe space" [R2].

The flexibility of remote learning enabled them to structure their day according to their natural rhythm, which not only enhanced productivity but also reduced the stress often associated with rigid academic schedules. This highlights how hybrid or remote models can cater to individual learning styles and promote greater autonomy: "I like to read, so I could always be at home and be calm and I was able to plan my time better that way, so I always just wrote on the board what I was going to do that day and I had it all in one place" [R21].

Below statement reflects a strong preference for autonomy and self-paced learning. The respondent appreciates having the freedom to work independently, without constant supervision or external control. The remote or hybrid learning environment suited them well because it allowed for a sense of calm, personal space, and flexibility in organising their work. What mattered most to them was not strict adherence to a predefined process, but the ability to focus on achieving meaningful outcomes in a way that aligned with their own working style. This underscores the importance of offering learning models that respect individual preferences, especially for students who thrive when given trust, independence, and control over their learning process: "From my point of view, for example, it suited me quite well and I'm like, let's say, I like to have my own peace of mind and that kind of allows me to do it, let's say, and I like to do things at my own pace. Actually, when there wasn't that chance, as if someone was checking on me as I was doing it, I could do it as I wanted, and it really depended more on the outcome than the process" [R28].

In some ways, online learning can prepare you to take responsibility for your work, which can be good preparation for future employers. This is why we should not hesitate to grant students greater autonomy and actively support them in learning how to manage their knowledge independently. The insights shared by our respondents clearly indicate that they value this freedom and feel empowered by the opportunity to take responsibility for their own learning process. Encouraging autonomy not only aligns with their needs but also helps develop essential skills such as self-discipline, time management, and critical thinking, competencies that are crucial for success in both academic and professional settings.

In distance learning, students appreciated the fact that all materials were easily accessible in electronic form: "We didn't have to lug around notebooks or search for it in notes, everything was in files" [R10].

For individuals who are easily distracted, the ability to attend lectures and participate in classes from environments with fewer stimuli proved to be a significant advantage. This setting allowed them to better focus and fully utilise their learning potential: "It was definitely harder to listen, there was really only one stimulus that stimulated, namely hearing" [R5].

As evidenced in the participants' statements, the issue of difficulty with concentration emerges repeatedly as a recurring theme. This suggests that maintaining focus during learning activities is a common challenge, further underscoring the relevance of flexible and accessible educational models that accommodate diverse cognitive needs and attention spans: "If some students don't pay attention to the 90% during the whole exercise or lecture, they can catch up with the remaining 10% by looking back at it, for example" [R18].

This quote illustrates a significant advantage of hybrid and distance learning, namely, the possibility of revisiting instructional materials after classes have concluded. It demonstrates that, even in cases where maintaining full concentration during a lecture or practical session proves challenging, learners are afforded the opportunity to review recordings or study materials at a later time. As a result, the hybrid learning model facilitates greater flexibility in managing the learning process and enables learners to supplement and reinforce knowledge according to their individual schedules and needs.

The complex social impact of online learning during periods of isolation, such as the COVID-19 pandemic. From the respondent's perspective, the shift to remote education not only altered academic routines but also significantly reshaped social dynamics. Increased time spent at home led to the deepening of relationships with immediate family members and those in close proximity, while connections with more distant acquaintances or casual friends weakened or disappeared entirely. The topic of building online relationships was also discussed during the interviews: "We spent more time together with family, personally, than in any other area, because with some people, for example, I became closer to those closest to me and with people we saw rarely or very little, I kind of completely lost contact. So I didn't see many people for a very long time. And we barely recognised each other on the street when we met later. So it also had an impact on such friendships. As I mentioned, the closest people, those are the ones who strengthened those bonds" [R33].

In the context of online learning, this highlights how the lack of physical presence in educational and social spaces can contribute to a narrowing of social circles. It suggests that while online education offers flexibility and safety, it may also reduce opportunities for informal interactions, peer bonding, and spontaneous social contact, elements that are important for student well-being and a sense of community. Thus, the social dimension should be carefully considered when designing hybrid or fully online learning environments, to mitigate potential feelings of isolation and to foster meaningful interpersonal connections.

Across the interviews, it became evident that students' experiences with hybrid education were not uniform, reflecting the diversity of hybrid configurations they encountered. These distinctions matter because treating hybrid education as a uniform concept risks oversimplifying both its opportunities and its limitations. The findings suggest that students' positive or negative evaluations are not directed toward hybrid education per se, but toward specific configurations of hybrid delivery. This highlights the importance of intentional design rather than ad hoc adoption of digital tools.

Conclusions

This study responds to the need for in-depth qualitative analyses of students' experiences in hybrid environments, which remain underrepresented in previous research dominated by quantitative approaches and a focus on academic effectiveness (Raes et al., 2020). The analysis of the interviews allowed us to identify both benefits (flexibility, the possibility of individualising the pace of learning, better time management) and challenges (limited support from teachers, difficulties with concentration, the need for a new didactic philosophy), which have not been widely described so far in the context of business education in the countries of Central and Eastern Europe. The results of qualitative analyses show that hybrid teaching models can effectively support the development of independence, responsibility and digital competences, but at the same time require well-thought-out organisational and psychological support.

The quotes indicate a preference among business students for a hybrid model, combining the flexibility of online lectures with practical classroom instruction. However, they also mention challenges such as a lack of standardised tools, low engagement in remote groups, and the need to change the didactic approach (not only technological).

Our research revealed a clear polarisation of experiences: while some appreciated the flexibility of remote learning, others pointed to the loss of development opportunities related to international internships or networking. It is also crucial to include students' voices in the design process, e.g., through consultation panels or educational hackathons. Insights gathered from student perspectives indicate a clear demand for more flexible, hybrid learning models. Many students express a desire for educational formats that allow greater autonomy, adaptability to individual needs, and the ability to balance academic responsibilities with personal and professional commitments. This growing interest stands in contrast to the still limited availability of hybrid options in the curricula of top universities, highlighting a gap between student expectations and current institutional practices. **Such a model would be particularly valuable in the context of inclusive education, which is still in the early stages of development in higher education. Only recently have researchers and educators begun to systematically examine the challenges some students face, such as sensory overload and neurodivergence-related difficulties. In line with inclusive education research emphasising the need to remove structural and pedagogical barriers to participation, universities have the opportunity to better adapt their structures and teaching methods to support diverse student needs** (Messiou, 2017). Students' perspectives offer valuable insights into how educational models can be adapted to enhance engagement, accessibility, and learning outcomes. Incorporating student feedback into the design of hybrid and inclusive learning formats can significantly contribute to the development of more responsive and effective higher education practices. As one of the interviewees summed up: "Hybrid learning won't work if it's a copy of the old system. We need a new philosophy, not just new tools" [R21].

The interviews show that, on the one hand, the introduction of hybrid education increases students' flexibility (e.g., in terms of time management, reduced commuting, and learner autonomy). On the other hand, it introduces consequences that are not the same for all students. For example, some participants reported a greater sense of control over the learning process, which increased their engagement. Another group indicated that the lack of imposed structure and greater flexibility intensified the need for self-regulation, sometimes leading to reduced engagement. At the same time, the findings raise an important question regarding what different students perceive as engaging and attractive, pointing to a broader debate on personalised education and differentiated learning pathways. The figure presents a conceptual framework of hybrid education, illustrating key domains and their interrelationships. Student engagement is positioned at the centre of the framework and is shaped by elements such as structural flexibility, perceived control over the learning process, learning opportunities and challenges, as well as teaching and assessment methods. The arrows indicate the declared mutual influence among these elements. The framework is embedded within a broader institutional and regulatory context, which may both enable and constrain the implementation of individual components of hybrid education. Future quantitative research could empirically test the relationships proposed in the conceptual framework, particularly the relative strength of structural flexibility, perceived control, learning opportunities and challenges, and teaching and assessment methods in predicting student engagement. This study provides insight into how hybrid education generates both opportunities and challenges through a **dynamic interplay of mechanisms rather than linear effects**.

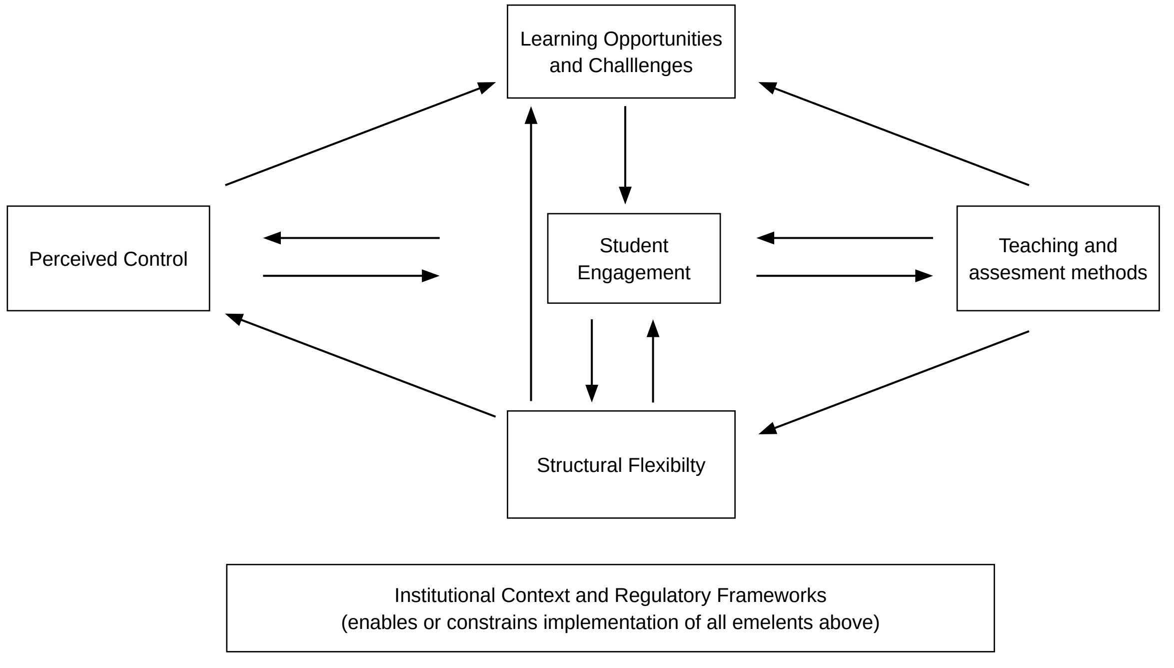
It is important to pay greater attention to hybrid teaching, as it remains relatively underdeveloped, particularly within universities in Eastern Europe. Despite the easing of the pandemic, many institutions in this region have yet to fully leverage the potential of combining in-person and online instruction, which limits both flexibility and accessibility for students. Therefore, advancing research and practical implementation in this area is crucial to support universities in optimally adopting hybrid learning models.

Recommendations for Universities and Lecturers in the Context of a Hybrid Education Model

The following recommendations are based on the findings of business school students in the Visegrad countries and reflect the conditions of this context. A key recommendation concerns the selective use of teaching modes depending on the type of classes. Research indicates that online theoretical lectures can be as effective as in-person classes when supported by high-quality multimedia materials and interactive platforms (Means et al., 2010). This approach has already been partially implemented at several analysed universities, where some lectures, mainly electives, are offered online or in hybrid formats, while core subjects remain on-site. Some institutions have also introduced online exams conducted in computer rooms, enabling faster assessment and efficient question randomisation.

A second recommendation concerns instructional design and staff preparedness for online interactions. Students' accounts indicate that remote engagement

Figure 1
Conceptual Framework of Hybrid Education



Source: authors' own work.

depends strongly on lecturers' ability to moderate discussions, structure group work, and remain visibly present in online settings. The use of interactive platforms and moderated breakout rooms is therefore essential. Previous research shows that supervised online group work significantly increases student activity (Graham et al., 2019).

The pandemic also highlighted the need for systemic mental health support for students. Interview data revealed experiences of chronic fatigue, isolation, and reduced motivation that frequently went unnoticed by universities. Recommended measures include a 24/7 crisis support platform, mandatory first-year workshops on time and stress management, and regular well-being surveys with referral mechanisms.

Finally, the study underscores the importance of inclusive and accessible hybrid learning environments, particularly in relation to neurodiversity and sensory sensitivity. While hybrid formats may reduce structural barriers through greater flexibility and learner control, this potential remains largely underrecognised in institutional practice (Armstrong, 2025). Overall, both student perspectives and prior research suggest that hybrid education is a desirable post-pandemic model in business education, provided that teaching formats are aligned with didactic goals and supported by appropriate organisational and technological structures (Chen et al., 2024).

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the analysis adopts a student-centred perspective, focusing on learners' interpretations of hybrid education and their lived experiences of teaching practices. Although students' accounts reveal differences in engagement, digital competence, and pedagogical organisation, the findings remain perception-based. As in most interview studies, narratives may be affected by recall bias or socially desirable responses. The use of semi-structured interviews focused on concrete situations helped reduce this risk; however, the study relies primarily on self-reported data. Future research could strengthen triangulation by combining interviews with institutional evaluations, incorporating both instructor and student perspectives, and applying mixed-method designs that link experiences to course-level outcomes.

Second, the study is based on qualitative interviews conducted within a specific regional and institutional context, undergraduate business programs at leading universities in the Visegrad countries, which may limit transferability to other disciplines, levels of education, or regions.

Third, the empirical material reflects experiences shaped by rapid and largely unplanned educational transformation during the COVID-19 pandemic. Some challenges may therefore be specific to emergency-driven hybrid arrangements rather than fully developed hybrid models.

Finally, the broadly similar implementation trajectories across the analysed universities restrict systematic cross-institutional comparison. Students' perceptions should thus be interpreted mainly in relation to course-level practices and interaction patterns rather than distinct institutional strategies.

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Agnieszka Alińska

Anna Olczak

Pocket Money and Financial Socialisation: Students' Spending Behaviours and Experiences

Abstract

The challenges of the modern economy require young people to possess increasingly advanced financial competencies and the ability to manage their own financial and economic resources. This article attempts to analyse the role of pocket money as a tool supporting the process of students' economic education. It is assumed that the regular receipt and independent management of pocket money help young people develop financial responsibility, budgeting skills, and an awareness of the value of money. The study aimed to identify the relationships between the amount and spending patterns of pocket money and students' level of financial independence, as well as their prior family experiences. The research employed a questionnaire survey conducted among 180 first-year students from both economic and non-economic majors, complemented by a structured narrative review of domestic and international literature. The results indicate that pocket money plays a significant role in shaping the economic competencies of young adults, and its importance increases during the transition from financial dependence on parents to economic independence. A well-designed practice of providing pocket money can serve as an effective element of early financial education, preparing young people for rational personal financial management in adult life.

Keywords: economic education, pocket money, financial competence, economic independence, students

Introduction

The dynamic and complex structure of today's economy places increasingly high demands on young people in terms of economic competence. The ability to manage one's personal finances is not only an essential skill for independent living but also a crucial factor influencing decision-making in areas such as entrepreneurship and the allocation of accumulated savings for investment purposes. Many individuals still lack adequate knowledge and understanding of effective and proper personal financial management. As a result, they are unable to plan and control their expenses in ways that support the achievement of long-term life goals (Novianti & Kurnia, 2023).

Economic education, both in Poland and worldwide, is recognised as one of the key components of general education, and its effectiveness largely depends on the influence of the family, the first environment for financial upbringing. A commonly used method of family-based financial education is pocket money, defined as the regular practice of giving children, adolescents, or students financial resources to cover their daily needs, such as food, clothing, or entertainment.

This article examines students' experiences and opinions regarding the role of pocket money in their financial education. The study hypothesises that pocket money serves as an important tool for developing students' financial independence. Attention was given to the relationship between students' opinions about pocket money and their family experiences, such as household income levels and parenting practices. As part of this analysis, a closed-question survey was conducted among 180 first-year regular studies students from both economic and non-economic programmes, and

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a systematic review of the literature was carried out. The analysis of the collected data provides a deeper understanding of how childhood and school experiences influence students' current financial attitudes, knowledge, and money-management skills.

Analysing pocket money among students is particularly important, as this social group stands on the threshold of economic independence and will, in the future, make decisions regarding the structure of household budgets. The period of higher education marks a transition from financial dependence on parents to gradual independence, and it is during this time that financial habits formed in earlier stages of life are tested in practice. A high level of financial competence among students translates into rational decision-making regarding expenditures, student loans, part-time work, and investments in professional development (Lusardi et al., 2010).

Methodology

The study used a questionnaire-based survey administered to 180 first-year students in economics-related and non-economics programmes. The research instrument was a structured 30-item questionnaire. The questionnaire consisted mainly of closed-ended items, including several rating-scale questions, most of which used a five-point Likert scale (1–5), along with one ranking question. The questions addressed issues related to pocket money, including its amount, frequency, how it was spent, and students' perceptions of its role in their financial education to date.

A purposive sampling approach was used, focusing on first-year university students, as they had relatively recent experience with receiving pocket money. Additionally, this group is often in the early stage of transitioning to greater financial independence, which may influence their perceptions and attitudes toward pocket money. Participants were recruited from universities in Warsaw due to the researchers' accessibility to this population. The empirical study was complemented by a structured narrative review of domestic and international literature.

The Essence and Functions of Pocket Money

Pocket money refers to the regular financial allowance given by parents or guardians to children, adolescents, or students to cover their personal, everyday needs such as food, clothing, entertainment, or small purchases. It serves as an early form of financial socialisation, introducing young people to concepts such as money management, budgeting, and decision-making about expenditures. As emphasised by Laily, pocket money serves as a means of fostering responsibility and as an educational tool for students to manage their finances effectively (Laily, 2016). Pocket money provides young people with an opportunity to develop a sense of independence and responsibility while simultaneously learning the consequences of their financial decisions. From an economic perspective, pocket money can be considered a micro-model of personal financial management, through which young individuals acquire basic experience in budgeting, saving, and spending. This process aligns with the concept of financial literacy, understood as the ability to make informed financial decisions based on knowledge and skills (OECD, 2016).

Pocket money, as one of the first financial experiences of young people, serves a range of functions that can be analysed from social, educational, and economic perspectives. Having one's own money and the ability to spend it according to personal needs forms the basis of its social function, as it allows young people to meet their needs and participate in social life (e.g., going to the cinema, engaging in sports, pursuing hobbies). Regular receipt of pocket money promotes social integration and fosters a sense of belonging to a group (Webley & Nyhus, 2006).

At the same time, pocket money is an element of the economic socialisation process, through which young people learn norms and values associated with possessing and spending money (Shim et al., 2010). Its educational function primarily relates to developing the skills needed to manage limited financial resources. Pocket money provides opportunities for practical financial learning, including budgeting, comparing prices, saving, and making consumption choices (Bucciol & Veronesi, 2014). From an educational standpoint, it represents a form of 'learning by experience', allowing young individuals to acquire economic knowledge in a natural and comprehensible way.

The financial function of pocket money involves introducing the basic mechanisms of money management, helping young people recognise its value and significance. Early and regular contact with money, for which they are responsible, enables an understanding of economic processes at both micro- and macrolevels, forming the foundation for future financial competencies. As Lusardi and Mitchell (2014) note, experiences from childhood and adolescence have a significant impact on the level of financial literacy in adulthood.

The Influence of Pocket Money on Financial Attitudes – A Review of Studies

Empirical research on the significance of pocket money for shaping financial attitudes has been conducted since the 1980s. Early studies by Furnham (1999) demonstrated that children who regularly received pocket money were more likely to exhibit pro-saving behaviours and higher financial awareness compared to their peers without such experience. Similar results were reported by Webley and Nyhus (2006), who found that both the amount and frequency of pocket money received correlated with a greater tendency to save in adulthood.

More recent studies, however, indicate a more complex nature of this relationship. Bucciol and Veronesi (2014) emphasise that the impact of pocket money on financial attitudes is mediated by the method of distribution–particularly whether parents use it as an educational tool (accompanied by discussion, explanation, and spending supervision) or treat it as an unconditional allowance. In the latter case, the educational effect may be limited, and young people may develop more impulsive spending behaviours.

Moreover, research by Shim et al. (2010) showed that early financial experiences, including receiving pocket money, significantly impact students' financial competencies. Individuals who managed their pocket money independently during childhood showed a greater propensity for budgeting, avoiding debt, and making rational financial decisions.

Some studies also highlight the importance of cultural and social context. Lozza (2023) notes that in societies with high levels of consumerism, regular access to money can lead to materialistic attitudes and impulsive purchasing decisions if it is not accompanied by financial education. This underscores the necessity of integrating the practice of giving pocket money with systematic instruction in personal finance.

Contemporary empirical research on the impact of pocket money yields mixed findings. Some studies point to positive effects, such as increased financial awareness, responsibility, and planning skills (Shim et al., 2010), while others suggest that regular access to money without the appropriate educational context, close parental involvement, or sufficient economic and financial knowledge may encourage the development of consumerist and impulsive spending behaviours (Lozza, 2023). These differences often result from variations in social and cultural models, as well as the level of educational support provided by families and educational institutions.

It should be noted that a family's economic status and the parents' level of education are among the key factors differentiating both the amount and regularity of pocket money provided. Research conducted by Furnham (1999) showed that parents with higher financial standing – most often middle class – are more likely to give their children regular, consistent pocket money. The author emphasises that in such households, financial support for children is perceived not only as part of maintenance but also as an instrument of economic education, enabling them to learn budgeting, independence, and responsibility for their own spending decisions.

Pocket Money and Financial Education at the Higher Education Level

In the context of higher education, pocket money can be viewed as one of the formative factors shaping students' early financial competencies. The university period marks a transition from financial dependence to independence, during which young adults begin making decisions regarding employment, saving, and credit. As noted by Lusardi, Mitchell, and Curto (2010), the level of financial literacy among students directly affects their ability to manage resources effectively, while earlier economic experiences – including the management of pocket money – are significant predictors of these competencies.

From a didactic perspective, analysing the phenomenon of pocket money among students can contribute to a deeper understanding of how economic competencies are acquired in practice. The literature emphasises that traditional, theory-based economic education is less effective without a practical component that allows students to learn through real-life experience, particularly in the area of personal finance management (Mandell & Klein, 2009). In this sense, pocket money can be seen as a form of 'learning by doing', fostering both financial independence and economic responsibility.

In an era of increasing financial market complexity and easy access to consumer credit, early economic experiences have gained even greater significance. Examining the relationship between the amount and frequency of pocket money received and students' levels of financial competence may help develop more effective educational strategies, both within families and in academic programmes.

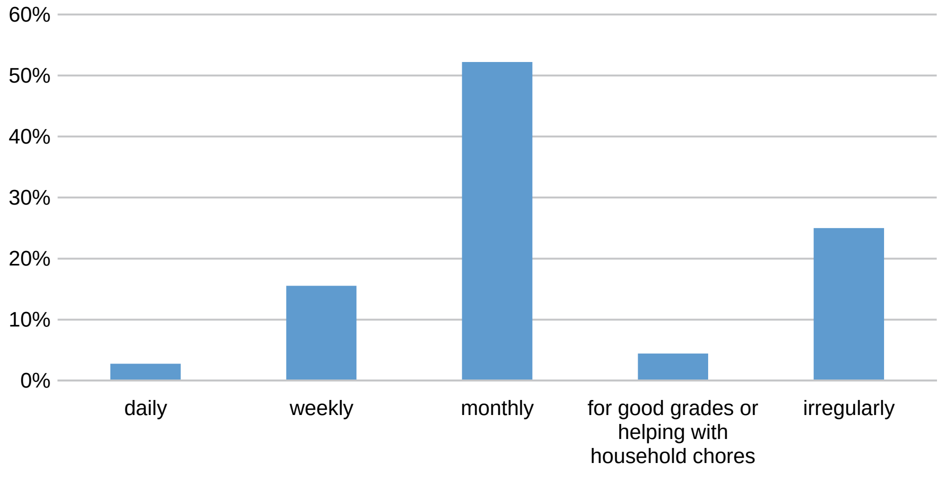
Pocket Money in Students' Experiences – Results of Own Research

Pocket money is a widely practised form of financial support and an element of economic upbringing within households, aimed at teaching children and young people basic financial responsibility. According to the conducted survey, the vast majority of students reported having received pocket money during their childhood – 156 out of 180 respondents (86.6%) declared that they had received pocket money, while only 24 respondents (13.4%) stated that they had never received regular financial allowances from their parents or guardians (Figure 1). Most of the surveyed students received pocket money on a monthly basis (94 responses).

The most frequently reported ranges of received pocket money were PLN 51–100 per month (61 respondents) and PLN 101–200 per month (48 respondents – 26.6%). The majority of participants considered the amount they received to be sufficient for their needs (136 out of 180 respondents). A total of 97 students (53.8%) indicated that the amount of pocket money they received was fixed, while 83 respondents stated that it depended on certain conditions – most often academic performance or involvement in household duties (Figure 2).

A clear majority of students (160 respondents – 88.8%) also admitted that, in addition to regular pocket money, they occasionally received extra funds for specific purposes, such as going to the cinema or meeting with friends.

Figure 1
How often did you receive pocket money?



Source: authors' own work.

The relatively modest sums of money received regularly by young people beginning their university studies may reflect established norms and the specific organisation of household finances in individual families. However, it is difficult to agree with the observed notion that a monthly allowance of around PLN 100–200 would be sufficient to cover living expenses in a university city. Student expenditures are typically much higher and differ significantly from the financial needs experienced during secondary education.

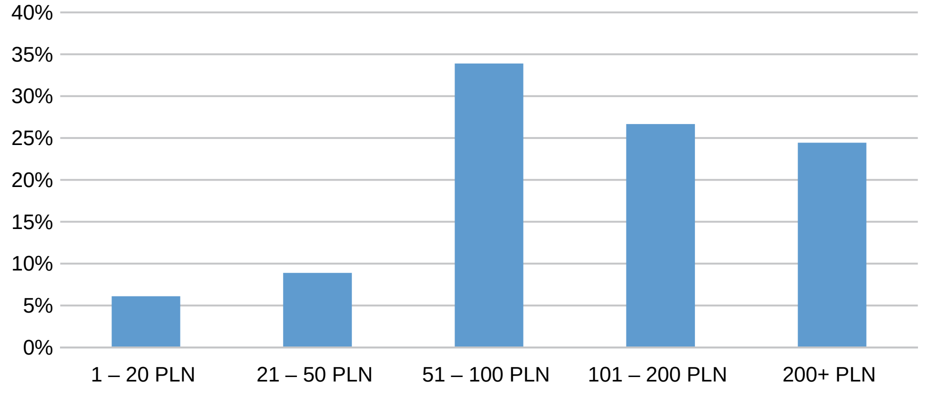
This situation suggests that students who do not work are often treated as dependent household members, with most of their financial needs and living expenses being covered directly from their parents' budgets, rather than from personal income or savings.

The level of spending on pocket money varies depending on household characteristics. In 2015, expenditures on pocket money were higher in rural households than in urban ones. The highest levels of such spending were recorded in households of farmers and manual workers, as well as in those where the head of the household had a relatively lower level of education.

The share of pocket money in total household expenditures has been systematically increasing, which, from the perspective of developing financial awareness, can be regarded as a positive phenomenon. As emphasised by Piekut (2018), this may indicate not only an improvement in the financial situation of Polish households but also a growing awareness of the importance of allowing young people to manage money independently.

The results of the conducted survey show that the majority of respondents (103 out of 180 – 57.2%) began receiving pocket money between the ages of 8 and 12. At this stage of development, children are

Figure 2
How much pocket money did you receive?



Source: authors' own work.

already capable of developing basic financial skills through practical experience – deciding whether to spend or save, comparing prices, and planning expenses. An important aspect of financial independence also involves making decisions about borrowing and repaying money.

The most effective way to acquire these skills is undoubtedly through personal experience, rather than merely receiving advice from adults.

In contemporary times, a noticeable shift has been observed in the form in which pocket money is provided. According to the report "Finanse młodych Polek i Polaków" [Finances of young Poles] (Autopay, 2025), the share of cash is steadily decreasing in favour of increasingly popular digital payment methods. Only 9% of children aged 12–14 receive their pocket money in cash, while as many as 74% receive it in a digital form.

The Impact of Pocket Money on Saving and Spending Planning Among Youth

Regular receipt of personal funds provides young people with the opportunity to make their first financial decisions, which can serve as a foundation for developing future personal budgeting skills. Pocket money enables adolescents to plan their expenditures independently, set priorities, and allocate funds toward specific goals. However, the ways in which young people manage their money vary considerably. The formation of financial habits in individuals controlling their own funds is influenced by multiple factors, including parental relationships and the household's economic situation (Lozza, 2023).

Findings from the conducted survey reveal a heterogeneous attitude among youth toward saving and expenditure planning. When asked, 'Have you saved a portion of your pocket money?' the majority of respondents (133 individuals) answered affirmatively, indicating a relatively strong propensity to save part of their received funds. Similar patterns were observed concerning larger financial objectives, such as purchasing electronic devices or financing a vacation, with 122 respondents reporting that they had set aside pocket money for specific goals. Notably, among those attempting to achieve larger financial objectives, most (93 respondents – 51.6%) successfully reached their intended outcomes.

The survey also investigated how respondents managed their funds. Only 71 participants reported planning their expenditures, whereas 109 admitted to spending spontaneously. This suggests that, despite a relatively high proportion of young people engaging in saving behaviours, systematic budget planning is not yet widespread.

Furthermore, nearly half of the respondents (97 individuals – 53.8%) indicated that they had experienced situations in which they ran out of money before receiving their next 'pocket money' payment. This finding underscores that, despite intentions to save and plan, many adolescents face challenges in balancing their expenditures with available funds. These difficulties may stem both from the limited amount of pocket money and from insufficient financial discipline.

The results of other studies on the impact of pocket money on saving and expenditure planning among young people are also inconclusive. The relationship between parental economic socialisation practices and the development of desired financial behaviours in children, such as expenditure control, is not statistically significant, according to Roszkowska-Hołysz (2018). The study indicated a weak positive correlation between regularly receiving pocket money and the propensity to save. The strongest tendency to spend money immediately was observed among individuals who received pocket money irregularly during childhood, whereas those who intended to save were predominantly respondents who had not received pocket money at all. Moreover, 82% of individuals who never received pocket money reported that managing expenditures posed no difficulty (Roszkowska-Hołysz, 2018).

Respondents' opinions regarding the influence of pocket money and family financial socialisation were also varied. When asked, 'Have you discussed your expenses with your parents or guardians?' 94 individuals answered affirmatively. This suggests that, in many cases, knowledge of money management may develop more through personal experience than through family discussions. Most respondents (103 out of 180) do not regard their parents as an authority on financial matters. This finding may indicate young people's pursuit of greater financial independence and autonomy in decision-making, as well as a weakening of parents' role in their children's education in economic matters.

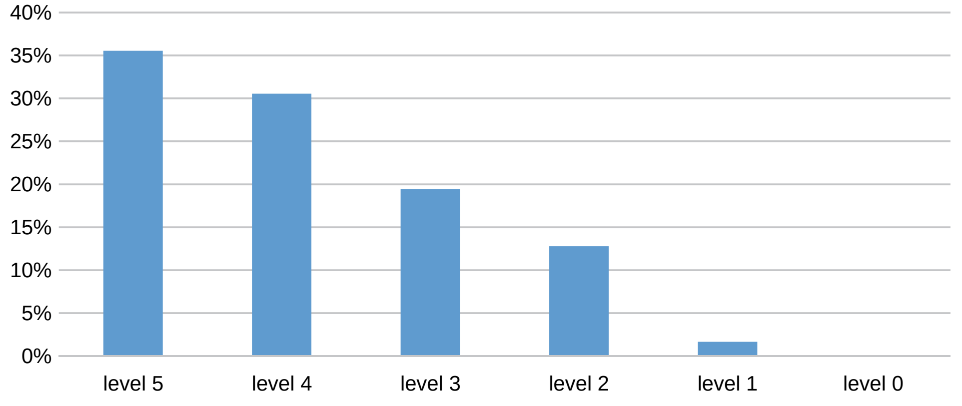
The results were somewhat more positive regarding parental guidance on money management and the impact of pocket money on the development of positive character traits. More than half of the respondents (105 out of 180) reported receiving advice from parents or guardians on managing money. Parents, therefore, often act as advisors, even if adolescents do not always perceive them as an authority in this area. The survey also included a question assessing the influence of pocket money on the development of positive character traits, such as patience, independence, and financial autonomy. Respondents evaluated this influence on a scale from 0 (no influence) to 5 (very strong influence). The results are presented in Figure 3.

Based on these data, the average rating was 3.9. Thus, the majority of respondents perceive pocket money as positively impacting the development of beneficial, constructive personal traits, such as patience and independence.

Perceived Financial Risks and Challenges

Although pocket money plays an important role in economic education and can foster the development of positive financial attitudes, it is not without certain

Figure 3
Do you think pocket money influences the development of positive character traits – for example patience or financial independence?



Note. 0 – no influence at all, 5 – very strong influence.

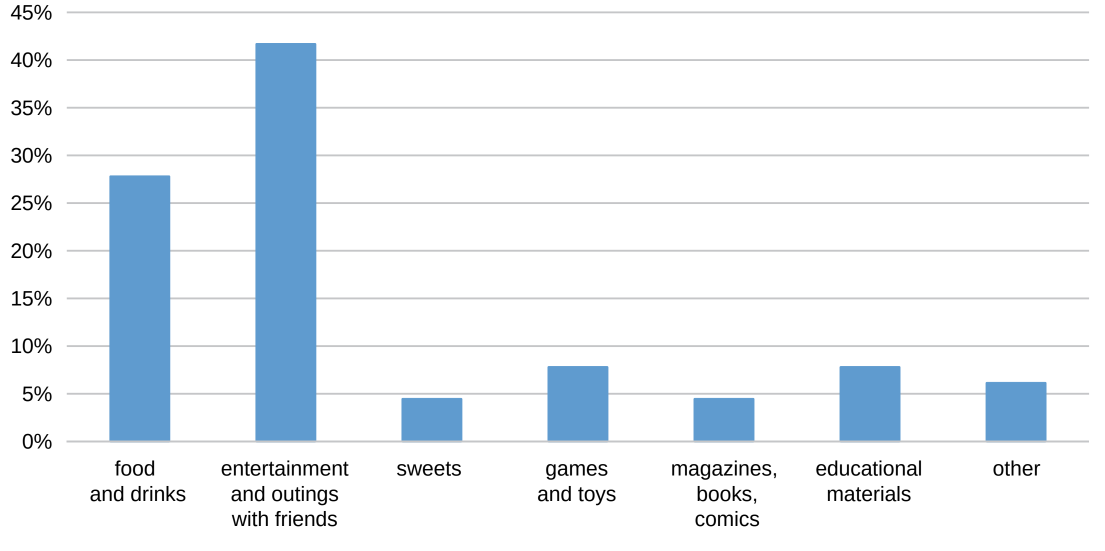
Source: authors' own work.

risks and educational challenges. The way in which young people manage their funds depends on factors such as family financial behaviour patterns, individual personality traits, and prior experiences. A lack of proper support or supervision may lead to undesirable outcomes, such as impulsive spending, poor budget planning skills, or excessive focus on consumption. These risks become particularly relevant in the context of new financial products, such as Buy Now, Pay Later (BNPL) schemes, which can increase the likelihood of entering a debt spiral early in adulthood.

An analysis of responses to the survey question (Figure 4), 'What did you most often spend your pocket money on?' indicates that entertainment and social outings with friends were the dominant expenditure category (75 respondents – 41.6%), followed by food and beverages (50 respondents). Other categories – such as games and toys, educational aids, magazines, books, or sweets – were reported much less frequently. These findings suggest that adolescents primarily use pocket money for social and consumptive purposes, while allocating less of it toward personal development or educational activities.

When asked whether the amount of pocket money could become a source of peer comparison or negatively affect well-being, as many as 133 respondents acknowledged that such a risk exists. A slightly lower, yet still noticeable, level of risk was associ-

Figure 4
What did you most often spend your pocket money on?



Source: authors' own work.

ated with potential conflicts between the child and parents arising from the amount of pocket money – 103 respondents considered this situation possible. The greatest concern, however, was whether regular pocket money, combined with limited parental supervision, might foster negative habits, such as unhealthy eating or substance use. In this category, 151 respondents (levels 3–5) indicated that there is a real risk of such behaviours occurring. Students thus recognise both educational and social risks associated with pocket money. The majority believe that giving children money can only produce positive effects if accompanied by appropriate support, discussion, and parental oversight.

The scientific literature frequently emphasises that pocket money, despite its educational function, may be associated with certain risks to the health and well-being of young people. Research by Ma et al. (2020) showed that children who receive regular pocket money are more likely to consume unhealthy products and sugary drinks, with higher amounts of money positively correlating with increased rates of overweight and obesity. Gotwald (2022) highlights that, in addition to the risk of overweight, children's financial autonomy may also be linked to poorer psychological well-being, including depressive symptoms (see Xiao et al., 2022). Similar associations are reported by Lozza (2023), who notes that access to money among adolescents increases the likelihood of engaging in risky behaviours, such as alcohol consumption, smoking, and gambling. Lozza emphasises that studies on Italian youth clearly show a relationship between the amount of pocket money and a greater propensity to use substances, as well as more frequent participation in out-of-home consumer activities.

Summary and Discussion of Research Results

The conducted study and literature analysis indicate that pocket money represents an important, though not unequivocal, element of young people's economic education. For many students, it served as the first tool for developing financial independence, learning to plan expenditures, and setting aside funds for specific goals. The survey results confirm that most respondents express only a tendency to save and perceive pocket money positively, as a means of fostering traits such as responsibility and independence. However, the reality reflects the actual financial situation of Polish students. Young people generally receive small amounts from their parents, which are mostly spent on entertainment and social activities with friends.

At the same time, a relatively large number of respondents admitted that planning expenditures and maintaining financial balance remain challenging, indicating a need for further support in developing financial discipline. The risks and potential drawbacks associated with giving pocket money should not be overlooked, including peer comparison, conflicts with parents, and the development of undesirable consumption habits. These findings highlight the importance of parental involvement and financial education, grounded in knowledge of financial institutions and a clear understanding of household budget management principles.

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