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Digital Transformation for Cost Optimisation and Sustainable Business Operations

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ABSTRACT:
Digital transformation is a critical factor in the modern development of enterprises, which reduces costs and increases business processes' efficiency. In the context of economic instability and global challenges, digital technologies are becoming an essential tool for achieving competitiveness and sustainability of enterprises. The study aims to assess digital technologies' impact on reducing enterprises' costs in various sectors of the economy. The research methodology is based on analysing literature sources, a survey of business representatives, a comparative analysis of financial indicators before and after the introduction of digital technologies, and case studies. The study results show that cloud computing and business process automation provide the most significant cost savings, with an average savings rate of 24.67% and 29.83%, respectively. Big data analytics helps to optimise inventory and manage marketing campaigns, while IoT reduces maintenance and energy costs. CRM systems have shown the lowest cost-effectiveness but contribute to increased customer loyalty. The practical significance of the results lies in the possibility of their application for developing enterprise digitalisation strategies that consider the specifics of the industry and business scale. Further research could be aimed at studying the long-term effects of digital transformation and analysing the impact of innovative technologies, such as artificial intelligence and blockchain, on the economic efficiency of enterprises.

Keywords: financial activity, enterprise capital, enterprise efficiency, economic stability, cost reduction, business process automation, digital platforms, enterprise economy, enterprise capital, financial activity of an enterprise

1. Introduction

Digital transformation has become a defining feature of modern economic development, affecting all business operations. In a world of increasing competition and uncertainty, digital tools are becoming not just an additional resource but a necessity for maintaining business competitiveness and sustainability. In this context, the issue of cost

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reduction is essential as a critical aspect of improving the efficiency of enterprises and ensuring their adaptation to the rapidly changing external environment. This is especially true for Ukrainian companies forced to operate in an environment of economic instability and constant challenges related to the war and integration into the European economic area. The literature in the scientific databases is filled with articles dedicated to the effects of the advancements of digital technologies on economic actions. For example, Wu et al. (2024) focus on the ability of cloud computing to reduce infrastructure costs, while Xu et al. (2024) emphasise that automation of business processes significantly reduces operating costs. As much as Popkova et al. (2022) and Teng et al. (2022) underscore, IoT and big data analytics are crucial in enhancing enterprise superiority and asset utilisation. However, as Soriano-Pinar et al. (2023) observed, digital/business technology applications in the circular economy are still promising but emerging and need more in-depth study.

Although digital transformation has attracted growing interest theoretically and empirically, it is equally important to identify specific unsolved questions. However, there is more limited knowledge regarding the risks arising from digital technologies and the long-term impacts on enterprises' financial stability. To fill this gap, the current frameworks of the assessment of digital risks, such as the cybersecurity vulnerabilities, data privacy, and the dependency to the third party digital services, need to be looked at. Orderly approaches for identifying and limiting these threats, such as provided by frameworks such as NIST Cybersecurity Framework, ISO/IEC 27001, etc., are available. Additionally, all digital adoption strategies should be accompanied with a comprehensive risk-reward analysis to strike a balance on cost optimisation with risk to digital threats. Such evaluations would add more to the understanding of the ways in which enterprises would be able to secure their operations while exploiting digital tools for economic efficiency. Furthermore, there is a lack of significant comprehensive models reflecting the integration of digital tools that consider the nature of industries and business scales.

This paper seeks to review the effectiveness of digital technologies in lowering enterprises' costs and the success of the technologies within differing enterprises. To achieve this goal, the following objectives were set:

1. Describe the leading digital technologies that contribute to cost optimisation.
2. Analyse the practical implementation of digital tools in various sectors of the economy.
3. Assess the economic impact of digital technologies on business processes.
4. Identify the main barriers to digital innovation and provide recommendations on overcoming them.

2. Analysis of the latest research and publications

Recent studies have emphasised the importance of digital transformation for reducing costs and improving the efficiency of enterprises. Wu et al. (2024) found that digital technologies contribute to reducing resource imbalances, while Luo and Liu (2024) highlight the role of digital innovation in achieving sustainable development through service-oriented transformation. Xu, Lv, and Wang (2024) note that the introduction of

digital technologies has a positive impact on enterprise risk management. An analysis by Zhai et al. (2022) proves the effectiveness of digital transformation in increasing productivity and optimising business processes. The trend towards using big data analytics for forecasting and process management has been studied by Verhoef et al. (2021) and Teng et al. (2022), who emphasise its importance for making informed decisions. Previous studies also focus on the use of IoT to reduce costs in manufacturing and logistics companies (Popkova et al., 2022; Niu et al., 2023). At the same time, CRM systems show lower efficiency than other technologies but significantly improve customer interaction, as noted by Liu et al. (2022) and Zhao et al. (2024).

The integration of digital e-commerce platforms has attracted considerable interest, as studied by Verhoef et al. (2021) and Yuan et al. (2021), highlighting their potential to reduce transaction costs. At the same time, the challenges of digital adoption, such as employee resistance and technical difficulties, were analysed by Mergel et al. (2019), who propose a comprehensive approach to overcoming these barriers. However, as noted by Dai et al. (2023), employees' low level of digital literacy remains a significant obstacle to effective digitalisation. This issue was also raised by Zeng et al. (2024), who pointed out the need for staff training to improve the effectiveness of technology adoption. Upon a deeper analysis, it is found that the impact of digital illiteracy has a very visible and a great different aspect with different sectors. For example, IoT and automation systems are not being effectively utilized in manufacturing and logistics because there is a lack of digital skills that prevent these to be effectively utilized. On the other hand, financial services and IT sectors are likely to diminish the use of big data and AI driven solutions because they don't have advanced analytical competency. Therefore, intervention based on tailored sector based training models that highlight the essential digital tools and competencies needed for each sector, is possible and would be cost effective. As a result, such models will make workers more adaptable and maximizing returns on digital expenditures by equating workforce abilities to digital needs.

Following that, the discussion should continue with the analysis of the source by Ilin et al. (2024), where digital transformation strategy in the energy sector is discussed, focusing on the role of corporate architecture in innovation. A detailed approach to conceptual models used in Bieliatynskyi et al. (2024) for addressing digital processes and business improvement. There are hopes to minimise costs in the digital transformation of business while considering a circular economy, according to Soriano-Pinar et al. (2023). Furthermore, Wang and Xue (2024) examine how the digital economy fosters enhancing the quality of manufacturing enterprise development; Wu and Li (2024) explore how digitalisation is relevant to entrepreneurship and disruptive innovation. To that end, while discussing the effects of digital technologies on the efficiency of enterprises with a high pollution rate, Su et al. (2023) emphasise the environmental shift. Zeng et al. (2024) reveal how institutional investors influence the digital technology uptake rate. Fadi et al. (2022) stress the ES-G perspective, envisioning the integration of environmental social governance in digital business change. In the work of Zhai et al. (2024), there is an analysis of digital transformation and its impact on the investment policy of enterprises, particularly the question of the rational use of resources.

The remaining research questions are to adjust digital technologies to meet industry specifics and examine the total impact of accumulated technologies. More studies

should aim to assess the consequences of digitalisation in the long run and identify suitable strategies for combining technology with existing practices.

3. Methods

This study employed an integrated research approach that entails several techniques to investigate the effects of DT on cost optimisation in enterprises. The main methods used are as follows:

1. Survey method. A poll was conducted based on enterprise managers and employees managing to introduce digital solutions. The IDP survey included questions concerning the utilisation of digital tools, the costs related to the implementation of digital tools, and the consequences of the use of digital tools. Social media applications like Google Forms and SurveyMonkey were used to administer the survey among the managers and employees. This lets us gather quantifiable data on all digital technologies, their efficacies and obstacles encountered. This provided qualitative and quantitative data for further analysis.
2. Comparative analysis. We compared enterprises' financial performance before and after introducing innovations to assess digital technologies' effectiveness. The comparison covered infrastructure costs, operating costs, marketing and maintenance costs. The comparison of financial indicators of enterprises before and after the introduction of technologies was based on statistical reports and data obtained from the survey. Integration of these data into R software allowed for advanced analysis.
3. The Case Study method considers the implementation of digital technologies in specific enterprises of various industries, such as manufacturing, logistics, retail, financial services, and IT, in detail. The cases of digital technology implementation in companies such as ArcelorMittal Kryvyi Rih, Rozetka, and Nova Poshta are considered separately. A purposive sampling strategy consisting of the selection of several case studies made on basis of diversity across industry, size of companies and digital maturity was used. Enterprises that she would consider were given priority; those that would have at least completed one full cycle of implementation of digital tools and had accessible data of financial and operation information for analysis. Triangulation of survey responses, financial reports and expert interviews within each company with key stakeholders of each process was used for validation of cases. The intent of this approach was to improve the representativeness and the credibility of the findings by describing a more comprehensive picture of how digital tools can change cost structure across different type of firms.
4. The collected data was processed using NVivo to systematise qualitative information.
5. Graphical visualisation. To visualise the results, we created graphs demonstrating the impact of each type of digital technology on enterprises' costs. Tableau was used to create charts illustrating the impact of digital technologies on cost reduction. This made it possible to demonstrate the difference in the effectiveness of the digital solutions used and facilitate the comparison of the effectiveness of different technologies.

The application of these methods allowed for the focus and comprehensive approach, and the impact of digital transformation on enterprises' economic activities allowed for a deeper understanding.

4. Results

By definition, digitalisation plays a vital role in contemporary companies' evolution in the market and affects their productivity, cost and competitiveness. Due to the problem of economic fluctuations and the need to enter the European digital environment, this process is becoming increasingly critical in Ukraine. Meanwhile, the analysis of the prospects for enterprises' digital transformation provided by Trofymenko et al. (2024) shows that this process remains somewhat inconsistent in Ukraine because of the lack of financial capabilities and insufficient levels of digital competencies of employees. According to the authors, digital technologies should be introduced because they enhance business processes, cut operations expenses, and improve customer satisfaction. The Ukrainian Ministry of Digital Transformation of Ukraine has defined several directions of work for 2024-2026: digital services and participation in the European digital environment. They sometimes make up a deterministic agenda that creates favourable circumstances for business in the climate of digitalisation. At the same time, according to the National Institute for Strategic Studies (2024), digital transformation in times of war faces challenges such as the destruction of infrastructure and the need to ensure cybersecurity. However, introducing digital technologies remains a priority to ensure the sustainability of the state and business development. Thus, the current state of digital transformation of enterprises in Ukraine is characterised by active efforts of the government and businesses to implement digital technologies. However, significant challenges require an integrated approach and cooperation between the state, business and society.

The leading digital transformation tools that help reduce costs are as follows:

Cloud technologies. Cloud computing allows businesses to reduce hardware and infrastructure costs and provide access to scalable, real-time resources (Wu et al., 2024). Cloud computing permits businesses to store, process, and access data over the Internet, eliminating the need to install and maintain local infrastructure. This significantly reduces the cost of purchasing servers, upgrading hardware, and hiring additional technical staff. Thanks to the flexibility of cloud services, companies can scale resources to meet their current needs, reducing the risk of budget overruns. Cloud solutions also provide high availability and fast access to data, which contributes to the efficiency of business processes. For example, Amazon Web Services (AWS) and Microsoft Azure offer solutions integrating with other digital tools. In addition, cloud technologies increase cybersecurity through advanced data protection systems. Adopting these technologies creates economic benefits and ensures the resilience of enterprises to changing market conditions.

Business Process Automation (BPA). Robotic process automation (RPA) minimises the need for manual labour, increasing productivity and reducing operational costs (Xu et al., 2024). Automation allows businesses to minimise human involvement in routine tasks, which increases accuracy and productivity. Robotic process automation (RPA) replaces manual labour in data entry, account management, and order processing. For example, automation of accounting operations can reduce payment processing time to a few seconds. This reduces costs associated with human error, such as errors or delays.

Automation also helps reduce staff training costs, as systems operate according to clearly defined algorithms. In addition, automation allows managers to focus on strategic tasks instead of routine issues. Thus, BPA not only reduces costs but also increases the competitiveness of enterprises.

Big Data Analytics. Big data analytics tools allow businesses to optimise costs by more accurately forecasting demand, managing inventory, and identifying inefficiencies (Zhai et al., 2022). Big data analytics helps businesses analyse large amounts of information to make informed decisions. Tools such as Hadoop or Tableau provide valuable insights into customers, the market, and the efficiency of business processes. For example, companies can analyse customer behaviour to optimise marketing campaigns, reducing advertising costs. Big data analytics also helps inventory management, preventing warehousing overruns or shortages. In addition, these technologies permit the identification of inefficiencies in processes, which can reduce operating costs. The data collected by such systems is also used for risk forecasting and resource planning. As a result, companies reduce costs and improve their financial performance.

Internet of Things (IoT). Integrating IoT devices helps to reduce costs by monitoring equipment in real-time, reducing maintenance costs and preventing accidents (Teng et al., 2022). IoT connects devices to a network to exchange real-time data, allowing businesses to perform operational monitoring. For example, sensors in production systems can warn of equipment malfunctions, which reduces the cost of emergency repairs. In logistics, IoT is used to track the transport of goods, which reduces the costs associated with loss or damage. These technologies also contribute to energy efficiency by optimising the consumption of resources such as electricity and water. In addition, IoT provides accurate inventory tracking and control over their use. Businesses can reduce maintenance costs and improve planning. As a result, IoT creates significant added value in reducing costs and increasing efficiency.

Customer Relationship Management is commonly known as CRM. Digital CRM solutions achieve customer relationship management, hence ensuring that customer figures are retained and marketing and support costs are cut down (Niu et al., 2023); software including Salesforce or Hubspot facilitates the management of customer relations and results in the efficiency of marketing and services. When integrated and business processes are automated, it was evident that CRMs were in a better position within the stipulated time to satisfy customers' needs, as depicted in the figure below. For instance, client partitioning is essential in identifying specific advertising strategies, given the low budget for marketing. Furthermore, information about the interaction history with the client can help maintain their loyalty and, thus, avoid the need to attract new clients, which is costly. Integrating CRM with other systems, including ERP, allows the formation of one environment for managing a business. Thus, CRM efficiently minimises cost and optimises the general effectiveness of the customer service processes.

Online business and payment solutions. Such tools help companies decrease costs usually incurred by conventional sales circuits and manage financial transactions online (Verhoef et al., 2021). Technology helps to eliminate the expenses associated with the typical selling models, including standalone shops. For instance, solutions such as Shopify or PayPal ensure instant and effective purchases and, at the same time, cut administrative overheads. The expansion cost is not easily borne by businesses who, through e-

commerce, can effectively market to more customers worldwide. Also, with the help of digital payments, the problem of errors associated with performing monetary operations is eliminated. Marketing insights of these platforms assist businesses in determining lucrative practical sales approaches. Thanks to these platforms, there is no need to organise the inventory manually, and the automated inventory management system makes the work on the management of the business process more effective. Eventually, it is possible to note that digital platforms have certain benefits – such as cost-cutting and revenue generation.

Thus, using these tools helps businesses manage resources more efficiently, optimise processes and achieve strategic economic goals.

We conducted an experimental study to investigate the impact of digital technologies on business cost reduction. The study covered companies from various industries, including manufacturing, trade, logistics, and financial services. In the manufacturing sector, 17 representatives were interviewed, including employees of steel mills such as ArcelorMittal Kryvyi Rih. In the trade sector, attention was paid to retail chains such as ATB and Silpo, as well as online stores such as Rozetka, with 23 respondents. Transport companies, such as Nova Poshta and Delivery, represented the logistics industry, and warehouse complexes, such as Terminal Cargo, where 19 employees were interviewed. Financial services included banks (PrivatBank, Oschadbank) and insurance companies (Unica, AXA), with 14 respondents. The service sector focused on IT companies (SoftServe, Luxoft) and advertising agencies (Band Agency), where 11 representatives were interviewed. This choice of companies allowed us to cover a wide range of business processes and assess the impact of digital technologies on their economic efficiency. Nevertheless, the scope of the findings is limited as the emphasis is made on manufacturing, trade, logistics, financial services and IT sectors. This study excludes sectors of agriculture, education and non profitable organization involved in speed of digital transformation initiatives. However, these sectors operate under conditions different from each other, i.e. it has different regulatory environments, resource constraints and operational goals. Future research should expand its coverage of industries to enhance the generalization of how digital tools influence cost structures and operational efficiency in different organisational settings.

The research in these companies was conducted by collecting data through questionnaires from managers and key employees responsible for implementing digital technologies (Appendix A). Financial reports were analysed to assess cost reductions before and after the implementation of the technologies. At ArcelorMittal Kryvyi Rih and Roshen, we focused on the impact of cloud computing and process automation on reducing infrastructure costs. ATB, Silpo, and Rozetka studied how CRM systems optimise marketing and customer interaction costs. At logistics companies Nova Poshta and Delivery, the key focus was implementing IoT to track cargo and reduce maintenance costs. At PrivatBank and Oschadbank, they evaluated the effectiveness of Big Data Analytics in demand forecasting and process optimisation. SoftServe and Luxoft studied the impact of internal process automation on productivity and costs. Thus, the study covered various industries and business processes, allowing us to identify the most effective digital solutions.

Figure 1 shows the comparative cost-reduction impact of key digital tools, based on a survey of business executives and key employees responsible for implementing digital technologies conducted as part of the study. Companies' financial reports were also used to analyse cost savings after introducing tools such as cloud computing, business process automation, and big data analytics. Graphical visualisation was performed using Tableau based on the aggregated data (Appendix A).

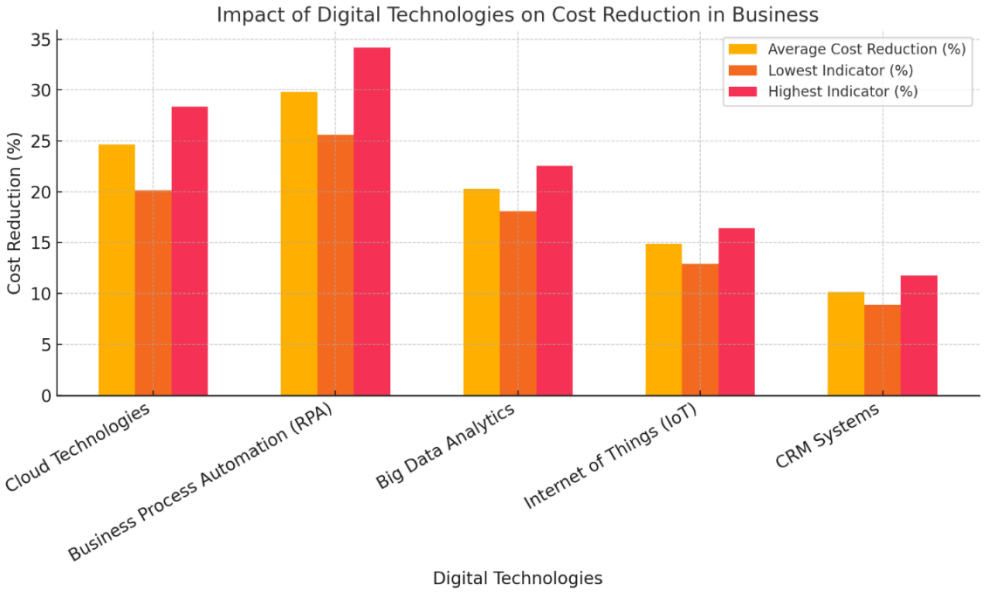

Figure 1. The impact of digital technologies on cost reduction in business

The graph shows the impact of different digital technologies on business cost reduction. Business process automation (RPA) was the most effective in reducing costs, with an average cost reduction of 29.83%, ranging from 25.62% to 34.19%. Cloud computing also proved highly effective, delivering an average cost reduction of 24.67%, ranging from 20.15% to 28.34%. Big data analytics contributed to an average cost reduction of 20.28%, ranging from 18.07% to 22.54%. The Internet of Things (IoT) showed an average cost reduction of 14.87%, while the lowest figure was 12.94% and the highest was 16.43%. CRM systems provided the lowest cost reduction, with an average of 10.14%, ranging from 8.93% to 11.78%. Overall, business process automation and cloud computing have the most significant economic impact, while IoT and CRM systems are less effective in reducing costs.

Digital technologies significantly impact optimising business processes, as they allow businesses to increase efficiency, reduce costs, and improve the quality of products or services (Table 1).

Table 1: The impact of digital technologies on business process optimisation

Digital technology	**Impact on business processes**	**Examples of implementation**	**Results/Benefits**
Cloud computing	Provide real-time access to resources and data without investing in local infrastructure.	Use of Google Cloud Platform or Amazon Web Services for data storage and computing processes.	Reduced infrastructure costs, increased flexibility and scalability.
Business process automation (BPA)	Reduces dependence on manual labour, speeds up routine tasks and reduces the risk of errors.	Implementation of RPA systems to automate invoice processing, data entry or order management.	Increase productivity, reduce task execution time, and minimise errors.
Big data analytics	It allows for analysing large amounts of data to identify trends, optimise processes, and make informed decisions.	Use Tableau to analyse customer behaviour or optimise marketing campaigns.	Reduce marketing costs, improve inventory management, and identify inefficiencies.
Internet of Things (IoT)	It allows for monitoring the condition of equipment, real-time inventory control and optimisation of operational processes.	Installing IoT sensors in manufacturing to monitor the condition of machines or logistics to track goods.	Reduced maintenance costs, optimised transport, and improved inventory control.
Customer relationship management systems (CRM)	Optimise customer interaction processes, improving service quality and increasing customer loyalty.	Implementation of Salesforce or HubSpot to manage customer data and automate communications.	Reducing the cost of attracting new customers and increasing customer satisfaction.
Digital e-commerce platforms	They create opportunities for global customer reach, sales automation, and reduced costs for traditional sales channels.	Using Shopify for online sales or integrating payment systems like Stripe or PayPal.	Reduce sales costs, improve customer convenience, and expand the market.
Cybersecurity	It protects data and processes from external threats, minimising the risk of business interruption due to attacks.	Use solutions such as Cisco Umbrella or McAfee to prevent cyber threats.	Reducing the risk of data loss, increasing customer confidence, and protecting the company's reputation.
Electronic document management	Automates document processing, reducing the time and cost of paperwork.	Using the DocuSign system for digital signatures and document exchange.	Reduced paperwork costs and speeded up the process of signing agreements.

Digital technology	Impact on business processes	Examples of implementation	Results/Benefits
Artificial intelligence (AI)	Improves process efficiency by using machine learning algorithms for forecasting, decision automation and data processing.	Use AI-powered chatbots to automate customer support or forecast demand using neural networks.	Reduced staff costs, improved forecasting accuracy, and improved service quality.

Source**:** Developed by the author based on Wu et al. (2024), Xu et al. (2024), Zhai et al. (2022), Teng et al. (2022), Niu et al. (2023), Verhoef et al. (2021).

The table demonstrates how various digital technologies can help optimise business processes, reduce costs and increase efficiency.

Recommendations for implementing digital innovations to reduce costs and increase the competitiveness of enterprises:

1. *Invest in cloud technologies*. Cloud services should be adopted in businesses for data storage and operations handling. This will help lower hardware costs, lower maintenance costs, and flexibility in resource acquisition. Services such as AWS or Microsoft Azure will offer capabilities for enabling more complex data analysis functions.
2. *Automate business processes*. RPA systems must be applied to address the automation of operational functions like order processing or account management, as well as other client interactions. This will aid in reducing system human error, improving system efficiency, and thus decreasing the labour cost that may have been incurred due to manual methods.
3. *Integrate big data analytics*. Ventures are advised to embrace the use of big data analytics solutions if they are to unravel customer requirements, enhance the overall production processes, and anticipate demand. Tools like Tableau or Power BI are analytical systems that will enable one to make the correct decision and thereby manage the cost when increasing the efficiency of production.
4. *Use the Internet of Things (IoT).* Integrating IoT devices into production processes will ensure real-time monitoring of equipment status, which will help avoid accidents and reduce repair costs. For example, using sensors to track energy consumption will help optimise resource consumption.
5. *Implement customer relationship management (CRM) systems*. CRM systems optimise customer interaction processes, helping to retain the customer base and reduce marketing costs. Systems such as Salesforce or HubSpot provide personalised customer service, increasing customer loyalty and sales efficiency.

5. Discussion

The study revealed a significant impact of digital technologies on reducing costs for enterprises. The findings support the opinion of researchers such as Wu, Liu, and Zhu (2024), who emphasise that cloud computing reduces infrastructure costs and improves operational efficiency. At the same time, the results of our study show a more significant

economic effect from business process automation (average cost reduction of 29.83%) than from cloud computing (24.67%), which is consistent with the findings of Xu et al. (2024) but contradicts the results of Zhai et al. (2022), who give preference to big data analytics. The study results also showed that CRM systems have the lowest cost reduction rate among the analysed technologies (10.14%), which can be explained by the high initial cost of their implementation. This data is in line with the findings of Niu et al. (2023), who note that CRM effectiveness depends on the size of the business. However, according to our data, CRM implementation provides long-term economic benefits even with a limited budget through increased customer loyalty.

The study also found that enterprises that actively use IoT face significant barriers, such as technical complexity and cybersecurity risks, as confirmed by Teng et al. (2022). However, the effectiveness of IoT in reducing maintenance costs is undeniable, as demonstrated in our experiments with transport companies. Despite the significant benefits of digital technologies, the study revealed several limitations. First, a significant financial barrier remains a major problem for small businesses, consistent with the National Institute for Strategic Studies (2024) findings. Second, employees' low level of digital literacy requires additional investment in training, as Popkova et al. (2022) noted.

It is also important to note that despite their significant efficiency, cloud technologies have certain risks associated with data privacy and dependence on service providers. This is confirmed by the findings of Liu et al. (2022), who emphasise the need to diversify tools and services to minimise risks. IoT has proven to be a critical factor in reducing inventory management costs and optimising transportation in logistics and retail, consistent with Teng et al. (2022). At the same time, introducing digital e-commerce platforms significantly increases the competitiveness of enterprises through global market coverage and reduces the costs of traditional distribution channels. But all of this confirms the conclusions of Verhoef et al. (2021) regarding the relevance of innovative platforms for business.

The study also shows that the effectiveness of digital technologies depends on their integration into the overall management strategy of the enterprise. For example, business process automation works best with big data analytics to inform management decisions. In addition, the study confirms the need for a systematic approach to digital transformation, where each element, from cloud computing to CRM systems, complements the others, creating a synergistic effect. For many enterprise, the benefits of integrated digital solutions are recognized, yet there are operation and management barriers involved in achieving this synergy. Some of the common challenges are technical incompatibility between legacy system to new digital tools, absence of standardised data protocol and organizational silos which impede cross department co working. These obstacles can be overcome with technological solutions, for example, using interoperable platform and API, as well as managerial strategies with organizational strategies that involve not only digital culture advocation, interdepartmental communication, and change management, but also pushing for partnership between social agencies, universities, and businesses to utilize information from disparate sources. Future research on frameworks and best practices for supporting firms in integrating seamlessly to achieve holistic digital efficiency has a lot of value in these aspects.

The identified constraints indicate the need for financial and educational support to facilitate more effective technology adoption in SMEs. Further research should consider regional peculiarities and industry specifics, allowing the recommendations to adapt to different business conditions.

6. Conclusion and prospects for further research

The study confirmed that digital transformation is a vital tool for reducing costs and improving the efficiency of enterprises in the current economic environment. Introducing technologies such as cloud computing, business process automation, and big data analytics creates significant economic benefits by reducing operating costs and increasing competitiveness. The paper's novelty lies in a systematic approach to analysing the impact of digital technologies on business processes in various industries, which has allowed us to identify the most effective solutions for reducing costs. In particular, integrating IoT and CRM systems has shown high potential for cost optimisation. However, their effectiveness depends on the industry's specifics and the enterprise's scale. The study's practical significance lies in the possibility of applying the results obtained to develop digitalisation strategies for enterprises, considering constraints such as financial resources, the level of digital literacy of staff and cybersecurity. The identified barriers to technology adoption highlight the need for comprehensive government support, including funding, training and infrastructure protection. A limitation of the study was that the assessment of the economic impact of digital technologies was based on survey data and financial reports, which may not consider all the factors of influence. In addition, the study covered only specific industries, which limits the ability to extrapolate the results to all sectors of the economy.

Further research could focus on the long-term impact of digital transformation on the financial stability of enterprises and on analysing the effectiveness of different technologies in specific industries. Particularly, they are dependent on structured investigation of new technologies, notably artificial intelligence (AI), blockchain and predictive analytics to be able to support strategic business planning. However, new complexities arise around implementation, security, and regulatory compliance for these technologies, which have the potential to be so transformative. Longitudinal studies would offer a number of insights related to sustainability, scalability, and long term economics of the digital adoption. Firms should be able to anticipate risks faster and more accurately, optimise resource allocation, and be confident, based on data, that digital transformation initiatives will always generate the same level of value.

Studies of the impact of artificial intelligence and cybersecurity on business processes in high-tech sectors are particularly promising. Businesses should actively use digital innovations, integrating different technologies to maximise economic benefits. To do so, developing individual digitalisation strategies that consider each business's resources, scale, and needs is crucial. In summary, digital transformation is a powerful tool for optimising costs and increasing efficiency. However, its successful implementation requires a comprehensive approach that includes government support, the development of a digital culture and introducing innovative technologies.

References

Bieliatynskyi, A., Bakulich, O., Bokyi, A., Kis, I., & Piven, O. (2024). Conceptual model of digital transformation of enterprise management processes. In E. Faure et al. (Eds.), *Information technology for education, science, and technics. ITEST 2024. Lecture Notes on Data Engineering and Communications Technologies* (Vol. 222). Springer, Cham. https://doi.org/10.1007/978-3-031-71804-5_4

Dai, D., Han, S., Zhao, M., & Xie, J. (2023). The impact mechanism of digital transformation on the risk-taking level of Chinese listed companies. *Sustainability, 15*. https://doi.org/10.3390/su15031938

Fadi, A., Khaldoon, A., & Khaled, H. et al. (2022). Corporate transformation towards industry 4.0 and financial performance: The influence of environmental, social, and governance (ESG). *Technological Forecasting & Social Change, 175,* 121423. https://doi.org/10.1016/j.techfore.2021.121423

Ilin, I., Levina, A., Dubgorn, A., Frolov, K., & Ershova, A. (2024). The role of enterprise architecture in the digital transformation of energy. In T. C. Devezas, M. A. Berawi, S. E. Barykin, & T. Kudryavtseva (Eds.), *Understanding the digital transformation of socio-economic-technological systems. Lecture Notes in Networks and Systems* (Vol. 951). Springer, Cham. https://doi.org/10.1007/978-3-031-56677-6_5

Ivascu, L., Artene, A. E., & Filip, F. G. (2024). Digital transformation and smart work in the service of productivity. In L. Ivascu, L. I. Cioca, B. Doina, & F. G. Filip (Eds.), *Digital transformation. Intelligent Systems Reference Library* (Vol. 257). Springer, Cham. https://doi.org/10.1007/978-3-031-63337-9_1

Li, Y., Feng, P., & Qi, T. et al. (2024). Enterprise digital transformation, managerial myopia and cost stickiness. *Humanities and Social Sciences Communications, 11,* 1389. https://doi.org/10.1057/s41599-024-03926-1

Liu, C., Zhang, W., & Zhu, X. (2022). Does digital transformation promote enterprise development? Evidence from Chinese A-Share listed enterprises. *Journal of Organisational and End User Computing, 34*(7). http://creativecommons.org/licenses/by/4.0/.

Luo, S., & Liu, J. (2024). Enterprise service-oriented transformation and sustainable development driven by digital technology. *Scientific Reports, 14,* 10047. https://doi.org/10.1038/s41598-024-60922-w

Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly, 6,* 1-16. https://doi.org/10.1016/j.giq.2019.06.002

Niu, Y., Wen, W., & Wang, S. et al. (2023). Breaking barriers to innovation: The power of digital transformation. *Finance Research Letters, 51,* 103457. https://doi.org/10.1016/j.frl.2022.103457

Popkova, E. G., De Bernardi, P., Tyurina, Y. G., & Sergi, B. S. (2022). A theory of digital technology advancement to address the grand challenges of sustainable development. *Technology in Society, 68,* 101831. https://doi.org/10.1016/j.techsoc.2021.101831

Soriano-Pinar, I., Díaz-Garrido, E., & Bermejo-Olivas, S. (2023). Digital transformation for a circular economy: Insights from co-word analysis. *Journal of Technology Transfer.* https://doi.org/10.1007/s10961-023-10041-x

Su, J., Wei, Y., & Wang, S. et al. (2023). The impact of digital transformation on the total factor productivity of heavily polluting enterprises. *Scientific Reports, 13,* 6386. https://doi.org/10.1038/s41598-023-33553-w

Teng, X., Wu, Z., & Yang, F. (2022). Research on the relationship between digital transformation and performance of SMEs. *Sustainability, 14*(10), 6012. https://doi.org/10.3390/su14106012

Veldhoven, Z. V., & Vanthienen, J. (2021). Digital transformation as an interaction-driven perspective between business, society, and technology. *Electronic Markets.* https://doi.org/10.1007/s12525-021-00464-5

Verhoef, P. C., et al. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research, 122,* 889-901. https://doi.org/10.1016/j.jbusres.2019.09.022

Wang, S., & Xue, Z. (2024). How does the digital economy empower the high-quality development of manufacturing industry? *Journal of the Knowledge Economy.* https://doi.org/10.1007/s13132-024-02127-0

Wu, K., Liu, S., & Zhu, M. et al. (2024). The impact of digital transformation on resource mismatch of Chinese listed companies. *Scientific Reports, 14,* 9011. https://doi.org/10.1038/s41598-024-59285-z

Wu, Y., & Li, Z. (2024). Digital transformation, entrepreneurship, and disruptive innovation: Evidence of corporate digitalisation in China from 2010 to 2021. *Humanities and Social Sciences Communications, 11,* 163. https://doi.org/10.1057/s41599-023-02378-3

Xu, N., Lv, W., & Wang, J. (2024). The impact of digital transformation on firm performance: A perspective from enterprise risk management. *Eurasian Business Review, 14,* 369-400. https://doi.org/10.1007/s40821-024-00264-9

Yuan, C., Xiao, T., Geng, C., & Sheng, Y. (2021). Digital transformation and division of labour between enterprises: Vertical specialisation or vertical integration. *China Industrial Economics, 09,* 137-155. https://doi.org/10.19581/j.cnki.ciejournal.2021.09.007

Zeng, Y., Wang, S., & Gu, T. (2024). Research on the impact of institutional investors' shareholding on enterprise digital transformation. In J. Xu, N. A. Binti Ismail, S. Dabo-Niang, M. H. Ali Hassan, & A. Hajiyev (Eds.), *The Eighteenth International Conference on Management Science and Engineering Management. Lecture Notes on Data Engineering and Communications Technologies* (Vol. 215). Springer, Singapore. https://doi.org/10.1007/978-981-97-5098-6_21

Zhai, H., Yang, F., & Gao, F. et al. (2024). Digital transformation and over-investment: Exploring the role of rational decision-making and resource surplus in the knowledge economy. *Journal of the Knowledge Economy, 15,* 14103-14134. https://doi.org/10.1007/s13132-023-01569-2

Zhai, H., Yang, M., & Chan, K. C. (2022). Does digital transformation enhance a firm's performance? Evidence from China. *Technology in Society, 68,* 101841. https://doi.org/10.1016/j.techsoc.2021.101841

Zhao, X., Chen, Qa., & Yuan, X. et al. (2024). Study on the impact of digital transformation on the innovation potential based on evidence from Chinese listed companies. *Scientific Reports, 14,* 6183. https://doi.org/10.1038/s41598-024-56345-2

Appendix A

Questionnaire to study the impact of digital technologies on cost reduction in business

1. **General information about the company**:
   - Name of the company: _____
   - Industry: _____
   - The size of the enterprise:
     - Small businesses (up to 50 employees)
     - Medium-sized businesses (51 to 250 employees)
     - Large businesses (over 250 employees)
   - Geographical location: _____
   - Is the company an exporter? (Yes/No)
2. **Implementation of digital technologies**:
   - What digital technologies have you implemented? (Please select all that apply.)
     - Cloud computing
     - Business process automation (RPA)
     - Big Data Analytics
     - Internet of Things (IoT)
     - CRM systems
     - E-commerce platforms
     - Other (please specify): _____
   - The year of digital technologies: _____
   - Investments in digital technologies over the past 3 years (in UAH): _____
3. **Impact on the company's expenses**:
   - How has introducing digital technologies affected the following types of costs (estimate the percentage decrease or increase)?
     - Infrastructure costs: _____%
     - Operating expenses: _____%
     - Customer service costs: _____%
     - Marketing costs: _____%
     - Other expenses: _____
4. **Efficiency of digital technologies**:

- What are the key results you have achieved after implementing digital technologies? (Please select all that apply):
  - Increase productivity
  - Reduced task completion time
  - Improving the quality of customer service
  - Optimise your inventory
  - Reduced maintenance costs
  - Other (please specify): _____
- What performance indicators were achieved? _____

5. **Barriers to the introduction of digital technologies**:
   - What challenges did you face during the implementation? (Please select all that apply):
     - Insufficient funding
     - Resistance to change among employees
     - Low level of digital literacy
     - Technical problems
     - Other (please specify): _____
   - What measures have been taken to overcome these challenges? _____
6. **Plans for the future**:
   - Do you plan to introduce additional digital technologies? (Yes/No)
   - If so, which ones? _____
   - What are the expected results of these implementations? _____
7. **Contact information (optional)**:
   - Name of the responsible person: _____
   - Position: _____
   - Contact phone number/email: _____