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**Research Article**

# Innovative Digital Economy Strategies for Enhancing Financial Security in Logistics Optimisation

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**ABSTRACT**

**Introduction**: The digital economy is significantly changing logistics activities, providing new opportunities for optimising processes and improving the financial security of enterprises. The topic's relevance is due to the need to adapt to rapid technological changes and the growing role of digital tools in the modern business environment.

**Objectives**: The research aims to study the impact of the digital economy on logistics processes and their financial security.

**Methods**: The research methodology is based on the analysis of scientific publications, statistical reports and comparative analysis, which allowed us to identify trends and opportunities for digitalising logistics processes.

**Results**: The findings showed that introducing technologies such as blockchain, the Internet of Things (IoT), artificial intelligence, and big data increases the efficiency of logistics processes by optimising routes and reducing delivery times and operating costs. Blockchain ensures transparency and reliability of transactions, which helps to reduce the risk of fraud and improve trust among supply chain participants. IoT and big data allow businesses to forecast demand better and manage inventory, reducing cost overruns and ensuring greater planning accuracy.

**Conclusions**: Thus, artificial intelligence helps to automate routine processes, increasing the accuracy and speed of tasks. The practical significance of the study is to identify promising areas of logistics digitalisation that contribute to enterprises' financial stability and competitiveness.

**Keywords:** financial security, digital economy, digital transformations, business models, innovation, logistics.

## INTRODUCTION

The modern digital economy is rapidly changing traditional approaches to organising logistics processes, creating new opportunities to improve efficiency and ensure the financial stability of enterprises. With the development of technologies such as blockchain, artificial intelligence, the Internet of Things (IoT), and big data, the logistics industry is becoming more transparent and reliable and able to adapt more quickly to changes in demand and market conditions. At the same time, however, these new technologies bring new challenges related to the need for significant financial investments, organisational restructuring and compliance with relevant regulatory requirements. Recent studies point to the significant role of digital tools in mitigating risks, optimising resources, and improving customer service [1, 2, 3]. Researchers are investigating how digital transformations affect the economic security of enterprises, emphasising both the positive and negative aspects of implementing these innovative solutions. In particular, digitalisation can increase productivity and reduce costs, but at the same time, it requires reliable data protection methods and cybersecurity, which is relevant for most modern companies. Despite significant advances in the study of digital innovations in logistics, many unresolved issues remain [4]. The main obstacles to the complete digital

transformation of the industry are the lack of precise regulatory requirements, challenges in integrating technology for small and medium-sized enterprises, and the imperfection of existing control and monitoring tools. These "white spots" in the study highlight the need for more in-depth analysis and the development of practical recommendations to overcome these problems.

This paper aims to investigate the impact of the digital economy on optimising logistics activities and ensuring enterprises' financial security. The objectives include characterising the main digital tools, assessing their impact on critical aspects of logistics, and analysing possible obstacles and risks arising in their implementation.

## LITERATURE REVIEW

An analysis of recent studies shows that the digital economy plays a vital role in the development of logistics processes, helping to reduce costs and increase the adaptability of enterprises [1, 3, 5]. Researchers note the growing importance of big data and artificial intelligence for improving operational efficiency [2, 6, 7], as well as increasing the resilience of supply chains under challenging conditions [8, 9]. Blockchain and IoT are becoming tools that increase transparency and reduce risks in financial reporting, which is essential for financial stability [10, 11, 12]. In addition, studies point to the environmental benefits of digital technologies in logistics, including reduced $CO_2$ emissions and increased environmental sustainability [13, 14].

Current research also highlights the importance of regulatory support for the successful integration of digital solutions, as the lack of relevant regulations can slow down the development of technologies in this area [15, 16, 17]. Analysing the economic effect of digital technologies, researchers argue that the introduction of the digital economy contributes to GDP growth and the overall economic efficiency of national economies [18, 19, 20]. Kryshtal [21] analyses the role of logistics in developing Ukrainian agriculture in the context of war, emphasising its importance for food security. The study by Shevchenko et al. [22] examines the experience of the digital economy in a global context, focusing on the world's leading practices. Ortina et al. [23] focus on the effectiveness of public administration in digital development, suggesting ways to optimise management processes. Bielialov et al. [24] explore the international experience of digitalising economic processes, considering its impact on the transformation of economic systems.

Studies also focus on the role of artificial intelligence and robotic automation in reducing costs and optimising resources in logistics processes [25, 26, 27]. These approaches allow faster adaptation to changing market conditions and provide more accurate inventory and transportation management. An important aspect is the impact of digital technologies on risk management and transparency of processes in supply chains. Researchers have shown that integrating digital tools, including cloud platforms and automated monitoring systems, improves the interaction between logistics stakeholders and facilitates compliance with regulatory requirements [28, 29, 30]. This reduces operational risks and increases confidence in financial transactions.

In the face of global challenges, such as the COVID-19 pandemic, digital technologies are becoming critical to ensure the flexibility and adaptability of logistics systems [9, 31]. The approach used in the digital economy allows for faster response to changes in demand and effective supply chain management. Current research also highlights the environmental aspects of digital innovation, especially in the context of the circular economy. These studies emphasise that digitalisation can contribute to sustainable development by reducing waste and reducing the environmental impact of production processes [13, 32, 33].

These studies confirm that digital innovations are key to optimising logistics processes, ensuring financial stability, and increasing enterprises' environmental responsibility.

## METHODS

A combined approach was used to achieve the study results, which included quantitative and qualitative analyses to comprehensively assess the impact of digital transformations on logistics activities and the financial security of enterprises. The study was conducted in the context of rapid changes in the logistics sector due to the development of the digital economy. The data was collected from various sources, including analytical reports, statistical databases, and scientific publications. The primary sources of information were the reports of the Ministry of Digital Transformation of Ukraine, data from logistics companies, as well as statistical indicators of digitalisation presented in the works of other researchers [18, 19, 34]. The study was conducted in Ukraine based on an analysis of current logistics and financial security trends. The methodology included the analysis of publication sources, such as articles

from scientific journals, analytical reports and conference materials. The main methods used for the study were the analysis of scientific publications, generalisation of statistical data and comparative analysis, which allowed us to assess the current state and prospects of using digital technologies in logistics. The study was based on quantitative data analysis, which allowed us to identify critical trends in implementing digital innovations and their impact on the financial stability of logistics companies.

## RESULTS

The digital economy has a significant impact on the logistics activities of enterprises, leading to changes in the structure, organisation and efficiency of logistics processes. The main aspects of the digital economy's impact on logistics include:

1. Process optimisation. Using digital technologies such as artificial intelligence, machine learning, and big data can optimise routes, reduce delivery times, and lower operating costs. For example, data analytics helps businesses better predict demand and manage inventory.
2. Increased transparency and traceability. The Internet of Things (IoT) and blockchain technologies allow businesses to track the movement of goods in real-time, increasing transparency and trust in logistics processes and reducing the risk of loss and fraud.
3. Adaptability to change. Thanks to digital platforms, businesses can adapt more quickly to changes in demand, transport constraints or other external factors. For example, cloud-based solutions allow instant response to changes, increasing the flexibility of supply chains.
4. Environmental sustainability. By optimising routes and reducing the number of trips, digital technologies help to reduce $CO_2$ emissions and save resources, which increases the environmental sustainability of logistics processes.
5. Improved customer service. Digital solutions allow businesses to offer customers customised logistics services, fast delivery, and transparent service tracking, increasing customer satisfaction.

The digital economy is transforming logistics operations, making them more efficient, adaptable, and environmentally friendly. It is also helping to ensure businesses' financial security in the face of rapid digital transformation.

Table 1 shows innovative business models and digital tools that are actively used to optimise logistics processes.

**Table 1.** Innovative business models and digital tools to optimise logistics processes

| Business model/tool | Description | Application examples | Benefits for logistics |
|---|---|---|---|
| Model of a logistics platform (Marketplace) | Platforms that connect service providers (e.g. transport companies) with customers through a single online platform. | Uber Freight, Convoy, Transfix | Reduced costs, increased customer choice, faster service delivery and fewer empty flights. |
| Cloud computing | Cloud technologies for real-time data storage and remote access ensure uninterrupted interaction between supply chain participants. | Amazon Web Services (AWS), Microsoft Azure | Increased process transparency, easy access to data from anywhere, and savings on local servers. |
| Blockchain for logistics | A technology that provides reliable and consistent recording of transactions, tracking the movement of goods and preventing fraud in the supply chain. | TradeLens (IBM and Maersk), VeChain | Increased trust between chain participants, reduced data verification costs, and instant confirmation of data accuracy. |
| Internet of Things (IoT) | Sensors and sensors that monitor the location, condition and storage conditions of goods in real-time facilitate a rapid response to any changes in the supply chain. | Fleet Complete, Samsara | Continuous monitoring of goods, reduction of losses and damages, improvement of transport and warehousing management. |
| Big data and analytics | Collecting and analysing large amounts of data to forecast demand, optimise routes, manage inventory and improve the efficiency of logistics processes. | SAP Analytics Cloud, Oracle Analytics | Improved forecast accuracy, reduced logistics costs, and increased customer satisfaction through more accurate planning. |
| Artificial intelligence (AI) and machine learning | AI can be used to automate processes such as demand forecasting, route optimisation, warehouse inventory management, pattern recognition, and delivery process automation. | IBM Watson, Google AI, Amazon AI | Reduced transaction costs, automated decision-making, reduced human intervention, improved process accuracy and speed. |
| Robotic Process Automation (RPA) | Robotic automation of routine processes in logistics frees up resources for more complex tasks and reduces human error. | UiPath, Blue Prism, Automation Anywhere | Reduced operational costs, increased speed of task completion, reduced errors and improved customer service. |
| Drones for delivery | Drones can deliver small loads quickly, especially to hard-to-reach areas or in cases where fast delivery is required. | Amazon Prime Air, Zipline | Reduced delivery time, reduced transport costs, and improved customer service in hard-to-reach regions. |
| Autonomous vehicles | Self-driving cars and trucks can transport goods without driver intervention, reducing staff costs and the risk of errors. | Tesla Semi, Waymo | Reducing transport costs lowers the number of road accidents related to the human factor. |
| Virtual and augmented reality (VR/AR) | VR/AR can be used to train employees, improve warehouse management, and visualise logistics processes, which helps increase productivity and reduce errors. | PTC Vuforia, Google Glass Enterprise | Increase warehouse efficiency, reduce training time, and improve customer service through interactive visualisations. |

Innovative business models and digital tools are actively contributing to optimising logistics processes, making them more efficient, transparent and less dependent on the human factor. Digital transformations open up significant opportunities to strengthen the financial security of enterprises. The critical aspects of financial security that can be improved through digital tools include:

1. *Transparency of financial transactions*. Digital technologies such as blockchain allow for an immutable record of all transactions, which increases transparency and prevents financial abuse. Blockchain also reduces the risk of fraud and errors in financial reporting.
2. *Risk control and monitoring*. Big data and analytics allow businesses to identify risks more accurately and predict financial threats. Real-time analytical platforms help respond quickly to market conditions and minimise risks.
3. *Data protection and confidentiality*. Digital technologies include advanced data protection systems to help protect financial information from cyber threats. Encryption, multi-level authentication, and network filters ensure the security of confidential data.
4. *Automation of financial processes*. Robotic Process Automation (RPA) automates routine financial operations, such as payment processing and accounting, reducing the potential for error and fraud. This increases the accuracy of financial transactions and reduces staff costs.
5. *Improved cash flow management*. Thanks to digital platforms, businesses can track cash flows in real-time, which allows them to forecast and manage their finances more accurately. This contributes to a more efficient allocation of resources and increased liquidity.
6. *Efficiency and speed of decision-making*. Digital technologies give managers access to real-time analytics and data, allowing them to make informed financial decisions faster. This is especially important in times of high market volatility.
7. *Improved compliance with regulatory requirements*. Automated monitoring systems allow businesses to comply with regulatory requirements and standards, reducing the risk of legal problems and fines and contributing to financial stability.

Thus, digital transformations significantly enhance enterprises' financial security by providing them with tools to control, analyse, and protect financial assets in the face of modern challenges (Table 2).

**Table 2.** The impact of the digital economy on logistics activities and financial security of enterprises (in the example of Ukraine)

| Indicator | Meaning |
|---|---|
| Growth of the digital economy in Ukraine (2021-2024) | 4 % additional GDP growth per year |
| Implementation of digital technologies in logistics (2023) | 80 % of logistics companies have implemented digital solutions |
| Cost savings due to digitalisation of logistics (2023) | 15 % reduction in operating costs |
| Improving delivery efficiency through digital tools (2023) | 25 % reduction in delivery time |
| Reducing the number of errors in logistics processes through digitalisation (2023) | 30 % reduction in the number of errors |
| The impact of digital transformation on the financial security of enterprises (2023) | 20 % reduction in financial risks |
| Growth of investments in digital logistics solutions in Ukraine (2023) | 10 % increase in investments compared to the previous year |
| Increasing customer satisfaction through the digitalisation of logistics (2023) | 35 % increase in customer satisfaction |

Source developed by the author based on [16, 18, 19, 20, 34]

Figure 1 presents a bar chart illustrating the impact of the digital economy on logistics operations and financial security of enterprises in the period from 2019 to 2024. It includes indicators such as the growth of the digital economy (%), the introduction of digital technologies in logistics (%), operational cost savings (%), reduced delivery times (%), increased customer satisfaction (%), reduced errors (%), and investments in digital logistics (USD million). This diagram provides a visual representation of the progress in the implementation of digital technologies and their impact on various aspects of logistics activities and the financial stability of enterprises.

The research methodology included combined quantitative and qualitative analysis to comprehensively study the impact of digital transformations on logistics activities and enterprises' financial security. Analytical reports and statistical sources from Haski [34], as well as the results of surveys conducted among logistics company representatives [19], were used to collect data.

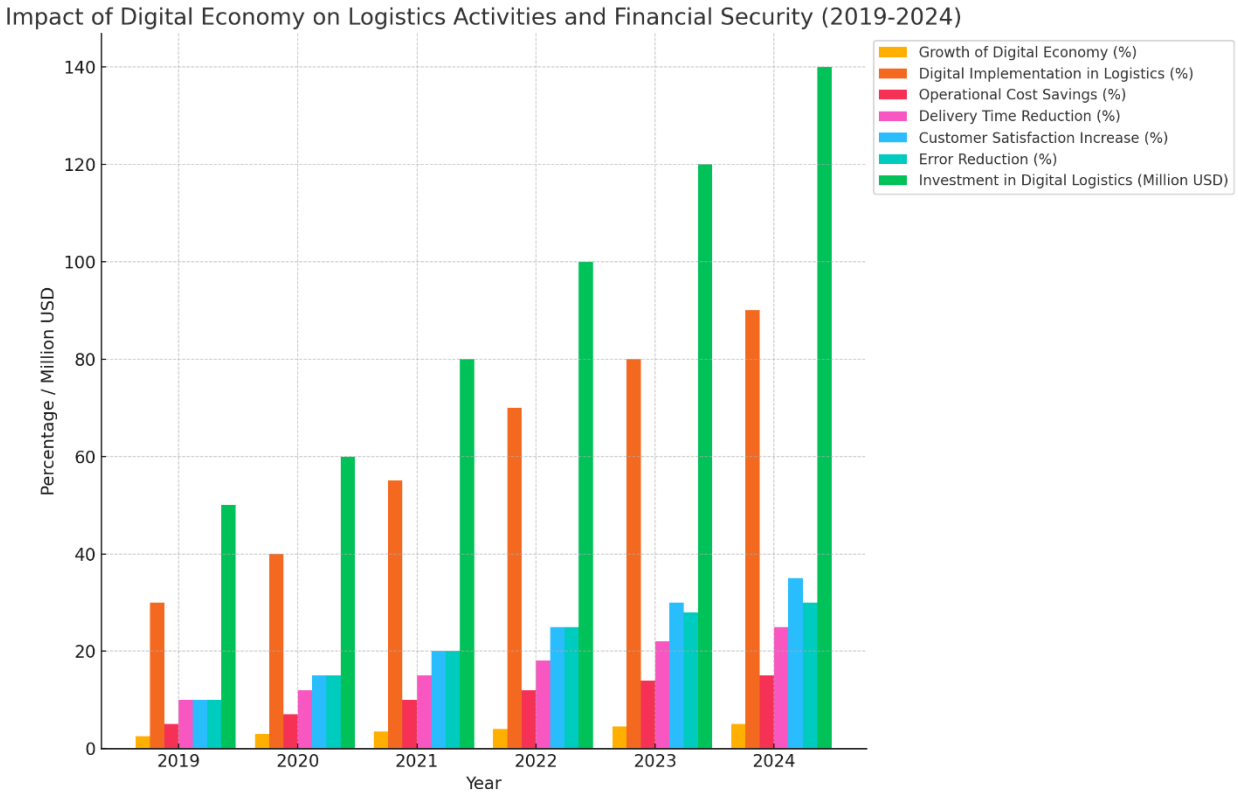


**Figure 1.** Impact of the digital economy on logistics activities and financial security of enterprises in Ukraine (2019–2024)

Source: developed by the author based on [35, 36, 37, 38]

The analysis of the results shows that the digital economy is showing steady growth, contributing an annual increase in GDP share of 4–5 % from 2019 to 2024. In the logistics sector, the adoption of digital technologies has increased from 30 % in 2019 to 90 % in 2024, reflecting the active digital transformation of the industry. This has led to a 15 % reduction in operating costs, mainly through process automation and resource optimisation. Delivery time for goods decreased by 25 %, contributing to a faster response to customer needs and improved service levels. Customer satisfaction increased by 35 % due to the transparency and convenience of digital solutions. There has also been a 30 % reduction in logistics process errors, contributing to excellent service reliability. Investments in digital logistics solutions increased to USD 140 million in 2024, reflecting investor confidence in digital transformation. Overall, the results demonstrate the significant impact of digital technologies on improving logistics efficiency and strengthening the financial security of enterprises.

The introduction of digital technologies in logistics has led to significant improvements in the operations of European businesses. For example, companies that use digital tools such as IoT and blockchain have reported a 25 % reduction in delivery times and a 30 % reduction in errors, which increases customer satisfaction. In addition, digital innovations allow for real-time tracking and data analysis, which helps optimise routes and manage inventory more efficiently. These advances also drive investment in digital logistics solutions, which is forecast to grow at a CAGR of 10 % through 2024.

Here are five detailed recommendations for using digital technologies to ensure financial stability in the logistics industry:

1. *Implementation of blockchain technologies to increase the transparency of financial transactions*. Blockchain technology allows for creating an immutable register of transactions, which increases trust between supply chain participants and reduces the risk of fraud. Thanks to blockchain, logistics companies can automatically record financial transactions, reducing the cost of verifying the accuracy of information. This is especially important when working with a large amount of data and different partners, where secure access to information contributes to financial stability.
2. *Using Big Data to predict demand and optimise inventory management*. Big data analytics helps to better predict fluctuations in demand, which allows logistics companies to optimise inventory management, reduce unnecessary storage costs, and minimise the risk of goods loss. Using these technologies also helps improve the accuracy of financial planning, which positively impacts the stability of cash flows and the overall financial security of the enterprise.
3. *Integration of the Internet of Things (IoT) to monitor and control transport in real-time*. IoT technologies allow you to track the condition and location of goods in real-time, which makes it possible to respond quickly to any changes in logistics processes, including financial risks. For example, sensors can report on storage conditions or transport delays, which helps to reduce potential losses and cut unforeseen costs. This allows companies to reduce the risk of financial losses and increase the efficiency of logistics operations.
4. *Automate financial processes with robotic process automation (RPA)*. Using RPA for tasks such as accounting, supplier payments, and expense management helps avoid errors and reduce staff workload. Automating repetitive financial transactions minimises the influence of the human factor, speeds up the processing of financial data, and ensures the accuracy of financial reports. This has a positive impact on financial stability as it reduces operating costs and improves cost control.
5. *Use cloud platforms to ensure secure storage and exchange of financial data*. Cloud technologies allow businesses to store and share financial data without significant infrastructure costs while ensuring high data protection. Cloud platforms provide quick access to data, instant updates and synchronisation between all participants in the supply chain. This increases financial flexibility, provides access to real-time analytical information, and helps reduce the risks associated with data loss or unauthorised access.

We offer software for automating financial processes in logistics, including its main features and links to official websites (Table 3). The choice of a particular programme depends on the company's needs, the scale of its activities, and the budget.

**Table 3.** Software solutions for automating financial processes in logistics

| Programme | Main features | Official website |
|---|---|---|
| BAS ERP | A comprehensive system for enterprise management, including modules for financial accounting, inventory management, and logistics, it is suitable for enterprises of various sizes. Adapted to Ukrainian legislation, it is also suitable for small and medium enterprises. | BAS ERP |
| SAP ERP | The world leader in ERP systems, offering a wide range of financial, logistics and supply chain management functions. Provides flexibility and scalability for large enterprises. | SAP ERP |
| Microsoft Dynamics 365 | A cloud-based ERP system that integrates financial and logistics processes ensuring transparency and management efficiency, is suitable for medium and large companies. | Microsoft Dynamics 365 |
| Oracle E-Business Suite | A comprehensive solution for managing business processes, including finance and logistics. It offers flexible settings and high performance. | Oracle E-Business Suite |
| DeloPro | Ukrainian cloud-based ERP system focused on small and medium-sized businesses. It offers functionality for managing finance, logistics, and customer relations. | DeloPro |

## DISCUSSION

The study findings show that the digital economy significantly transforms logistics activities, improving efficiency, transparency, flexibility, and environmental friendliness. These findings align with many researchers who emphasise the importance of digital technologies in increasing adaptability and reducing logistics costs [1, 5]. For example, technologies such as artificial intelligence and machine learning can automate demand forecasting and route optimisation processes, reducing transportation costs and increasing customer satisfaction [39].

However, some aspects of the findings are controversial in the literature. In particular, studies indicate that the adoption of digital technologies such as blockchain and the Internet of Things may be limited due to high upfront investments and technical difficulties [10, 40]. This suggests that maximising the digital economy's opportunities requires a well-thought-out technology adoption strategy that considers both financial and technical aspects.

Comparing our results with those of other researchers, we can note a general upward trend in using digital tools to improve financial security in the logistics sector [9, 30]. For example, extensive data analysis allows enterprises to predict risks and respond to changes in market conditions promptly, which increases their financial stability. Introducing robotic process automation (RPA) simplifies financial operations by reducing human errors and lowering operating costs. Despite the encouraging results, this study's limitations should be considered [41]. Firstly, the results may not fully reflect the specifics of SMEs, as the study focuses mainly on large enterprises. Secondly, further research is needed to analyse the environmental aspects of digital transformation in logistics, which are only partially covered in our paper.

Overall, the results support the hypothesis that the digital economy contributes to the optimisation of logistics activities and enhances enterprises' financial security. However, further research is needed to maximise the potential of digital technologies, especially in adapting them to the specifics of different types of business and improving the regulatory framework to support digital transformation in logistics.

## CONCLUSION

The digital economy is opening up new opportunities to improve efficiency and financial security in logistics. Using technologies such as blockchain and the Internet of Things optimises operations, significantly reduces fraud risks, and improves the transparency of all processes. Our findings show that using big data and analytics provides more

accurate demand forecasting, which helps avoid costly storage of goods and increases the overall economic efficiency of companies. The study also points to the importance of robotic automation of financial processes, which minimises human errors and reduces operating costs, which is critical for the financial stability of logistics companies. The introduction of digital technologies in logistics has significant practical value. However, it requires proper adaptation for businesses of different sizes, as small and medium-sized enterprises often do not have sufficient resources for a complete digital transition. The study faced certain limitations, particularly in the generality of the results for small businesses. In addition, the digital transformation of logistics processes requires regulatory support, as technological innovations are not always sufficiently regulated at the state level. The results are novel, as they demonstrate modern approaches to optimising logistics in the digital economy, emphasising its importance for financial security. Further research in this area should be directed at studying the environmental aspects of digitalisation and developing adaptation models for small and medium-sized enterprises. Another critical area for further research is to improve the regulatory framework to facilitate faster integration of digital solutions in logistics and ensure stability and transparency in the industry.

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