UDC 336.74:004.7
JEL O52, O31, P43, P45
DOI 10.32782/2617-5940.2.2025.6

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THE IMPACT OF FINTECH INNOVATIONS ON THE TRANSFORMATION OF MODERN PAYMENT SYSTEMS

Abstract. *This article aims to conduct a comprehensive study of the impact of financial technologies (FinTech) on the transformation of modern payment systems. It will identify the main trends in FinTech development in the context of the digitalisation of the global economy and assess the risks and challenges associated with integrating innovative technologies into financial infrastructure. To achieve this, the article will analyse key areas of FinTech innovation, particularly the introduction of blockchain technologies, artificial intelligence, cloud computing, and big data analytics. It will also consider the impact of these technologies on the efficiency, security, and accessibility of payment services. The article examines the impact of financial technology (FinTech) on the transformation of modern payment systems within the context of the global digitalisation of the financial sector. It reveals the key technological drivers behind the growth of the FinTech industry, particularly the impact of the internet, mobile technology, cloud computing, artificial intelligence, machine learning, and big data analytics on the efficiency of financial transactions. It analyses the main areas of FinTech innovation, including digital payment services, blockchain technologies, electronic wallet systems, cryptocurrency platforms and robo-investing solutions. The article concludes that FinTech is a key driver of payment infrastructure modernisation, contributing to lower transaction costs, increased security and transparency of settlements, and expanded access to financial services for the general public. However, active digitalisation was also found to be accompanied by risks such as an increase in cyber threats, regulatory uncertainty and technological dependence on global platforms. It is concluded that a balanced FinTech development policy is necessary to ensure a combination of innovation, reliability and financial security in payment systems. The study's findings can inform state strategies for the digital transformation of the financial sector and the creation of national standards for regulating FinTech company activities.*

Keywords: *FinTech, financial technologies, payment systems, digitalisation, blockchain, artificial intelligence, electronic payments, financial security.*

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ВПЛИВ ФІНТЕХ – ІННОВАЦІЙ НА ТРАНСФОРМАЦІЮ СУЧАСНИХ ПЛАТІЖНИХ СИСТЕМ

Анотація. *Метою статті є комплексне дослідження впливу фінансових технологій (FinTech) на трансформаційні процеси у сучасних платіжних системах, виявлення основних тенденцій їх розвитку в умовах цифровізації світової економіки, а також оцінка ризиків і викликів, що супроводжують інтеграцію інноваційних технологій у фінансову інфраструктуру. Досягнення поставленої мети передбачає аналіз ключових напрямів FinTech-інновацій, зокрема впровадження блокчейн-технологій, штучного інтелекту, хмарних обчислень та аналітики великих даних, з урахуванням їхнього впливу на ефективність, безпеку та доступність платіжних сервісів. У статті досліджено вплив фінансових технологій (FinTech) на трансформацію сучасних платіжних систем у контексті глобальної цифровізації фінансової сфери. Розкрито основні технологічні чинники розвитку фінтех-індустрії, зокрема роль Інтернету, мобільної телефонії, хмарних обчислень, штучного інтелекту, машинного навчання та аналітики великих даних (Big Data) у підвищенні ефективності фінансових операцій. Проаналізовано основні напрями FinTech-інновацій, серед яких цифрові платіжні сервіси, блокчейн-технології, системи електронних гаманців, криптовалютні платформи та рішення у сфері робоінвестування. Визначено, що FinTech є ключовим драйвером модернізації платіжної інфраструктури, сприяє зниженню транзакційних витрат, підвищенню безпеки та прозорості розрахунків, а також розширенню доступу до фінансових послуг для широких верств населення. Разом з тим виявлено, що активна цифровізація супроводжується низкою ризиків – зростанням кіберзагроз, регуляторною невизначеністю та технологічною залежністю від глобальних платформ. Зроблено висновок про необхідність формування збалансованої політики розвитку FinTech, яка забезпечуватиме поєднання інноваційності, надійності та фінансової безпеки платіжних систем. Результати дослідження можуть бути використані у процесі розроблення державних стра-*

тегій цифрової трансформації фінансового сектору, а також при створенні національних стандартів регулювання діяльності фінтех-компаній.

Ключові слова: *FinTech, фінансові технології, платіжні системи, цифровізація, блокчейн, штучний інтелект, електронні платежі, фінансова безпека.*

Introduction. In the modern era of global digitalisation, payment systems are becoming a key element of the financial infrastructure, ensuring the efficient circulation of capital and the continuity of economic processes [4]. The introduction of financial technologies (FinTech) has led to radical changes in payment mechanisms, contributing to the formation of a new architecture of financial relations. That is why the analysis of the impact of innovative technologies on the functioning of payment systems is particularly relevant in the context of forming a competitive and secure financial ecosystem.

Modern payment systems play a key role in ensuring the stability, reliability and efficiency of the global financial infrastructure. They are the basis for the continuous movement of financial flows that support trade transactions, investment processes and the activities of public financial institutions [2]. In the context of the dynamic development of financial technologies (FinTech), payment systems are undergoing a profound transformation, manifested in the introduction of digital innovations capable of significantly changing the architecture of financial relations and settlement mechanisms.

Among the technologies that have the greatest impact on modern payment systems, blockchain, artificial intelligence, big data processing technologies, and mobile financial platforms stand out. Their implementation ensures faster transactions, lower transaction costs, improved security, and expanded opportunities for personalising financial services [17]. As a result, digitalisation is creating new forms of interaction between banks, non-bank institutions, businesses and consumers, forming a multi-vector ecosystem of financial services.

It is important to note that the impact of FinTech technologies extends beyond merely improving the technical efficiency of payment systems. It also involves creating new business models based on open banking principles, such as decentralisation and customer focus. Integrating innovative technologies contributes to the active development of e-commerce and expands access to financial instruments for a wide range of users, while simultaneously lowering barriers to entry into financial markets.

This research is important because we need to understand how FinTech is changing payment systems in an increasingly global and digital world. Understanding these trends enables us to recognise the potential benefits and risks surrounding data security, regulatory uncertainty and technological vulnerabilities. Studying these aspects enables us to identify strategic directions for further developing payment systems to increase their efficiency, transparency and resilience to external challenges.

Literary review. The rapid development of technology has resulted in the digitisation of the global economy and the creation of a number of new payment instruments. Among contemporary Ukrainian researchers working on digital transformation issues in the financial sector and payment systems, the following stand out: Gavrilyuk V. M. [11], Davydenko N. M. [3, 5], Dmitrik O. O. [6], Zatonaetska T. G. [8], Kozyr Y. R., Kotenko A. M. [6], Lavrentiev M. M. [8], Polishchuk V. G., Riznyk D. V. [11], Stender S. V. [11], Suslenko V. V. [8], Tokareva K. O. [6], Trusova N. V. and Chkan I. O. [12], among others. Their work explores issues such as the integration of digital payment instruments, the use of blockchain technology, the implementation prospects of central bank digital currencies (CBDCs), the development of contactless payments, and cybersecurity challenges in payment systems. Their work covers a wide range of topics, including improving the regulatory framework for financial technologies and assessing the effectiveness of digital platforms in payment systems.

In the context of the rapid development of electronic payment systems, analysing their current state remains a relevant scientific issue. To identify possible discrepancies and opportunities for implementation in domestic practice, it is advisable to analyse the development of electronic payment systems in Ukraine in comparison with global trends.

Methodology. The study is based on a systematic approach that considers payment systems to be a complex financial and technological entity operating under the influence of digital innovations. The following methods were employed:

– The analytical method was used to generalise scientific approaches to defining the essence and structure of the FinTech sector.

– Comparative analysis was used to assess the differences in the implementation of innovative payment technologies in various countries.

– The structural-functional method was employed to determine the relationship between technological factors (the internet, mobile services, big data and AI) and the efficiency of payment systems.

– The generalisation and systematisation method was used to inform the author's conclusions regarding the prospects and risks of FinTech development.

– The visualisation approach was employed to present key trends and risks in the form of tables and diagrams reflecting the structure of FinTech innovations and their impact on the payment infrastructure.

The purpose of the article is to conduct a comprehensive study of the impact of financial technologies (FinTech) on transformation processes in modern payment systems, identify the main trends in their development in the context of the digitalisation of the global economy, and assess the risks and challenges associated with the integration of innovative technologies into the financial infrastructure.

The main part. The current stage of the financial system's development is characterised by a profound digital transformation at the heart of which lies financial technology (FinTech) [14]. FinTech is shaping a new architecture for interaction between financial market participants, increasing the efficiency of payment processes and ensuring financial services are accessible to the general public [1]. Consequently, FinTech innovations are regarded not only as a technical enhancement of financial infrastructure, but also as a strategic approach to modernising the entire financial ecosystem.

The development of financial technologies is driven by a complex set of technological factors. The widespread use of the internet, mobile telephony, cloud computing, artificial intelligence, machine learning and big data analytics all play a key role in this development. Together, these tools lay the groundwork for a new digital architecture in the financial sector, ensuring the speed, flexibility, and personalisation of financial services.

The widespread adoption of the internet and mobile communications technology has laid the groundwork for a new generation of financial services, including online banking, mobile wallets, instant payment systems and mobile applications for managing personal finances. Consequently, access to financial services is no longer restricted to customers being physically present at a bank branch, and transactions can be carried out remotely 24/7.

Cloud technologies have enabled financial institutions to achieve a new level of flexibility. They can now scale their IT infrastructure, reduce server maintenance costs and accelerate the processing of large volumes of transactional data. Using cloud platforms also makes it easier to integrate various financial services – such as banking, insurance and investment – into a single digital ecosystem.

Artificial intelligence (AI) and machine learning (ML) technologies are important for improving the efficiency of financial flow management. These technologies can be used to automatically detect fraudulent transactions, analyse customer behaviour, predict borrower solvency and generate personalised offers for users. This enables financial institutions to mitigate credit risk, enhance decision-making accuracy, and provide personalised customer service.

Using big data analysis technologies is particularly important because it allows large amounts of information to be processed comprehensively in real time. This paves the way for the development of analytical models that can forecast demand for financial services, assess risks, and inform strategic decision-making based on reliable data.

These technologies, when combined, form the basis for the 'digital renewal' of the financial sector. Not only does it ensure the technical modernisation of payment systems, it also creates conditions for their strategic transformation – namely, the transition from traditional centralised structures to flexible, customer-oriented, secure digital platforms (Tabl. 1).

Financial technologies cover a wide range of areas that are transforming all levels of the payment system. The most developed of these are the new generation of payment services, financial peer-to-peer (P2P) platforms, crowdfunding technologies, internet banking, blockchain solutions and robo-advisory and robo-investment systems. Table 2 shows the impact of each of these areas on the transformation of payment systems.

The adoption of FinTech solutions in the payments sector has transformed the way financial transactions are conducted, making them faster, more reliable and more

Table 1

Technological factors in the development of financial technologies and their impact on payment systems

Technological factor	Contents and examples of use	The main impact on payment systems
Internet and mobile telephony	Online banking, mobile wallets, remote payments, QR transactions	24/7 access to financial services, reduced transaction time, expanded financial inclusion
Cloud Computing	Use of cloud platforms for storing data and processing transactions	Reduced IT infrastructure costs, system scalability, increased transaction speed
Artificial intelligence (AI)	Automatic transaction analysis, chatbots, anti-fraud systems	Improved safety, automated maintenance, reduced human factor
Machine learning (ML)	Risk prediction algorithms, customer behavioural modelling	Personalisation of financial products, improving the accuracy of analytics
Big data analysis	Processing large arrays of customer and transaction data	Optimisation of management decisions, deeper analysis of financial flows, fraud prevention
Cybersecurity technologies	Encryption, biometric identification, blockchain	Ensuring payment security, transaction transparency, and increasing user confidence

Source: summarised by the author based on [6–8, 15]

Table 2

The impact of FinTech innovation on payment systems is significant in several key areas

FinTech direction	Key technologies	Key effects for payment systems	Potential risks
New generation payment systems	Contactless payments, digital wallets, QR payments	Increased transaction speed, reduced operating costs	Cyber threats, fraud
P2P platforms	Online platforms for direct transfers between users	Reduction of intermediaries and lower service costs	Lack of regulatory oversight
Crowdfunding, crowd investing, crowd lending	Collective financing platforms	Expansion of sources of capital raising, development of small businesses	Risks of non-repayment
Robo-consulting and robo-investing	Algorithmic finance management, artificial intelligence analytics	Personalisation of financial services, automation of decisions	Algorithmic errors, ethical risks
Internet and mobile banking	Mobile applications, API interfaces, open banking	24/7 access to payments, service integration	Data leaks, technological failures
Cryptocurrencies and blockchain	Decentralised registries, smart contracts	Transaction transparency, no intermediaries	Volatility, regulatory uncertainty

Source: summarised by the author based on [3, 6, 7, 15]

convenient for users. Whereas payment transactions previously required the involvement of several financial intermediaries and took a considerable amount of time, digital tools such as mobile applications, electronic wallets and instant payment systems now enable transactions to be settled almost instantly [16]. Reducing processing times from hours or days to seconds increases the efficiency of financial circulation and has a positive impact on business processes by accelerating enterprise capital turnover and contributing to e-commerce development.

In addition, FinTech has significantly reduced operating costs by automating settlement procedures and minimising reliance on human input. Algorithmic solutions enable the reduction of manual operations, optimisation of document flow and improvement of accounting accuracy. This enables banks and non-bank financial institutions to reduce administrative costs, increase their transaction margins and, consequently, lower the cost of financial services for consumers.

Another important consequence of digitalisation is increased financial inclusion. Mobile payment platforms, online banking and digital wallets have made basic financial services accessible to those who were previously unable to use banking products, including residents of remote regions, small businesses and young smartphone users. This contributes to the development of an inclusive financial ecosystem, which increases well-being and stimulates domestic demand and entrepreneurial activity [9].

Increasing the transparency and security of payment transactions is a key consideration. Using blockchain and biometric identification technologies minimises the possibility of fraud and ensures the reliability of personal data storage [5]. The distributed nature of information storage in blockchain systems renders unauthorised changes to payment records impossible, thereby significantly strengthening trust in digital financial services. The result is a more transparent, controlled and secure financial infrastructure, forming the basis for stable economic processes in the digital environment.

In short, FinTech innovations improve the technical aspect of payment systems and create conditions for deeper economic and social change. They contribute to the development of e-commerce, stimulate investment activity, reduce transaction costs and boost trust in financial institutions. Consequently, payment systems are evolving into dynamic, technology-driven networks that can swiftly adapt to the challenges of the global digital economy [13].

The transformation of banking institutions' business models, with an increasing implementation of open banking and decentralised finance (DeFi) concepts, deserves special attention. These approaches facilitate data exchange between financial institutions via standardised application programming interfaces (APIs), contributing to the development of new financial services and enhancing market transparency. In this context, FinTech optimises payment transactions and acts as a catalyst for innovation in financial management, attracting investment and building trust among financial service users.

Despite its obvious advantages, actively integrating financial technologies into the payment system carries a number of technological and systemic risks. First and foremost, these include increased cyber threats due to the growing number of digital transactions and the storage of large amounts of financial data in cloud environments [12]. Malicious interference with payment platforms, theft of personal data, and hacking of financial systems can result in significant reputational and financial losses for individual institutions and the state as a whole.

In addition, regulatory uncertainty remains one of the most serious issues affecting the development of FinTech. The rate at which new financial instruments emerge often exceeds the capacity of existing legislation, resulting in legal loopholes and complicating the management of digital financial services [11]. The absence of unified standards for regulating financial innovation increases operational risks, makes abuse more likely, and reduces consumer confidence in digital financial products.

Dependence on digital platforms, particularly global providers of payment services, cloud storage and software solutions, is a particular cause for concern. Such dependence could make the national financial system vulnerable to external cyber attacks, technical failures, or restrictions on access to critical technological resources.

In these circumstances, the role of state bodies and financial regulators becomes particularly important, as they must ensure the formation of a balanced FinTech regulatory policy. This should include creating effective risk management mechanisms, developing a cybersecurity system, improving the regulatory framework for digital finance and strengthening inter-agency and international coordination for countering financial cyber threats [10].

Harmonising the digitalisation processes in the financial sector with an appropriate level of security and stability is a key condition for the sustainable development of modern payment systems, user trust and integration into the global financial space.

Thus, FinTech innovations are becoming a key factor in the evolution of modern payment systems, combining technological capabilities, economic efficiency and consumer orientation. They are not only changing approaches to the organisation of financial settlements, but also forming the basis of a new model of global financial interaction, centred on speed, security, transparency and accessibility.

Conclusions. Our research has enabled us to conclude that financial technology (FinTech) plays a strategic role in transforming modern payment systems and forming a new financial sector paradigm. FinTech innovations are driving increased efficiency and flexibility in settlement operations, reducing transaction costs and payment times, and expanding financial inclusion.

An integrated digital ecosystem is being formed through the use of artificial intelligence, blockchain technologies, cloud services and big data analytics. This ecosystem gives financial institutions, business structures and consumers access to innovative payment instruments that increase the transparency and personalisation of financial services.

At the same time, the active introduction of digital technologies gives rise to a number of systemic risks, including cyber threats, regulatory uncertainty, the risk of abuse of digital assets and technological dependence on global financial platforms. These risks could potentially cause financial market instability, undermine user confidence in electronic payment instruments and pose additional challenges to state financial security.

In this regard, we believe it is crucial to develop a comprehensive FinTech regulatory policy that strikes a balance between innovation and financial stability. This

would involve improving the legal framework, creating a unified system for supervising digital financial services, developing a national cyber security infrastructure and introducing state monitoring mechanisms for digital risks.

The prospects for our further scientific research lie in the development of adaptive models for integrating payment systems into the digital economy, particularly taking into account the impact of artificial intelligence, blockchain architectures and smart contracts. It is also advisable to develop a methodological toolkit for assessing the digital maturity of national financial systems, which will allow us to identify the strengths and weaknesses of their functioning and determine strategic directions for their sustainable development.

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Стаття надійшла: 13.10.2025
Стаття прийнята: 28.10.2025
Стаття опублікована: 27.11.2025