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**Victoria Kovalenko**

D.Sc. in Economics, Professor of the Department of Banking, Odesa National University of Economics, Odesa, Ukraine;  
e-mail: [kovalenko-6868@ukr.net](mailto:kovalenko-6868@ukr.net)  
ORCID: [0000-0003-2783-186X](https://orcid.org/0000-0003-2783-186X)  
(Corresponding author)

**Sergii Sheludko**

Candidate of Economy Sciences, Associate Professor, Project & Program Manager of the Department of Valuation and Collateral Operations, Pivdenny Bank PJSC, Odesa, Ukraine;  
ORCID: [0000-0003-0636-4940](https://orcid.org/0000-0003-0636-4940)

**Kateryna Cherkashyna**

Candidate of Economy Sciences, Associate Professor, Rua Prof. Reinaldo dos Santos, Business and Economics School, Lissbon, Portugal;  
ORCID: [0000-0001-8651-3883](https://orcid.org/0000-0001-8651-3883)

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# DIGITAL TRANSFORMATION OF BANKING BUSINESS: PRESENT AND FUTURE

## ABSTRACT

This article delves into the nuances of digital transformation within the realm of banking, prompted by the pervasive global digitization of economies. This phenomenon has profoundly shaped the trajectory of financial technologies, giving rise to innovative banking products. The primary objective of this study is to elucidate the essence of digital transformation and assess its efficacy in shaping the development of the banking sector.

The digitization of banking involves the transformation of all associated processes and information. Consequently, the integration of digital technologies into the banking domain necessitates a comprehensive consideration of the needs of three key stakeholders: the consumer, the investor, and the bank itself. The authors conducted an analysis of the regulatory and legal landscape accompanying the digital transformation of the banking sector. The study concludes that the contemporary legal framework governing the use of digital technologies in banking is aligning with current global trends.

The digital transformation of the banking industry is observed to manifest in several dimensions, encompassing remote and Internet banking, electronic payments, FinTech and innovation, blockchain and cryptocurrencies, cyber security systems, electronic identification and document circulation, as well as interoperability.

The domestic banking system has exhibited noteworthy progress in digitalization in recent times. However, external factors, notably the incursion into Ukraine, have introduced certain adjustments. These include the outflow of intellectual human capital abroad, diminished financial literacy due to population migration, and the closure of bank outlets, particularly affecting territorial communities, especially rural areas, resulting in a loss of connectivity with banks.

In light of these observations, it is asserted that future digital transformational endeavours in the banking sector should prioritize enhancing the financial literacy of consumers of banking services. Additionally, there is a need to fortify regulatory frameworks governing the cryptocurrency market in Ukraine and establish unified standards for the regulation and supervision of banks and FinTech companies providing digital financial services.

**Keywords:** digital transformation, banking business, financial technologies, electronic banking services, mobile banking, Internet banking, electronic payments, blockchain, cryptocurrency, cyber security, electronic identification, interoperability

**JEL Classification:** G21, O31, G28

## INTRODUCTION

Socio-economic and political turbulences, which are observed both in the whole world and in Ukraine, caused the rapid development of digital technologies in the banking business. It should be noted that the spread caused by COVID-19 "corona-crisis", although it is a negative phenomenon for society, acted as a lightning impulse for the activation of digitization processes in banking. In the future, this experience had the opportunity to level the collapse of the domestic banking sector on February 24, 2022, which was accompanied by a full-scale invasion of Ukraine. The banking system of Ukraine, due to the constructed powerful digital infrastructure, had the opportunity to satisfy the demand of the state, corporations and households for financial resources.

The past decade has witnessed the digitalization of the global economy, presenting novel challenges to the banking system primarily driven by heightened competition within the financial services market. The evolution of digital technology has spurred a global transformation in financial services, shifting towards a more customer-centric paradigm. Noteworthy developments include the emergence of entirely mobile application-based banks and the expansion of online payment service providers into the realm of consumer lending. Furthermore, there is a notable proliferation of alternatives to correspondent accounts, wherein liquidity is obtained on demand through digital assets, supplanting the traditional use of prepaid accounts.

The establishment of banks featuring radically innovative management systems is presently a rarity. More frequently, entities with analogous functions leverage highly innovative technologies to provide existing financial services with enhanced terms and cost structures for customers. Alternatively, such entities embark on the development of novel technical solutions and payment tools, exemplified by the advent of FinTech and digital ecosystems [12, p. 127]. Instead, Ukraine is still in need of a retail payment system accessible via smartphone apps that are inexpensive for users, particularly small merchants. Alternative cross-border payment channels are also underdeveloped in Ukraine. However, it should be considered the fact that the digitalization of Ukraine is a development instrument, not an end in itself, as defined in the fundamental study "Digital Agenda of Ukraine 2020" [29].

Therefore, the issue of researching the trends of digital transformation in banking, caused by such specific features as economic cyclicity, globalization of the global economy and the level of implementation of digital technologies, is becoming more and more relevant.

## LITERATURE REVIEW

The digitization of economic processes has received considerable attention from both foreign and domestic scientists, particularly in the banking sector.

Thus, P. Mura and L. Donath conducted an analysis of the use of digitized technologies by estimating the econometric model with balanced panel data, and the analysis covers a 22-year period from 2000 to 2021. The main finding is digitalization creates a positive and significant effect on economic growth, even when several control variables are considered. The main conclusion is to take measures that support a more coherent digitalization policy, favouring a new business model based on digitalization [13].

F. Niu's scientific inquiry [21] delves into the examination of the impact of the digital economy on social management mechanisms, adhering to a positivistic philosophy and employing a cross-sectional influencing survey approach. The study's focal point encompasses employees from four distinct professions: economists, financial analysts, managers, and teachers. A Random Sampling Method was employed for data collection, utilizing a questionnaire as the primary instrument. Structural Equation Modeling (SEM) served as the analytical method. The outcomes of the investigation revealed a favourable influence of the digital economy on the mechanisms of social management. Additionally, the study established a positive correlation between the digital economy and social reforms, with a reciprocal relationship indicating that social reforms positively contribute to the digital economy's sustainability. Through the examination of indirect effects and the structural model, it was affirmed that social reform plays a partially mediating role between the digital economy and a sustainable digital economy. Furthermore, the sustainability relationship confirmed partial mediation between the digital economy and the social governance mechanism. Ultimately, the analysis underscored a consistent mediation encompassing the digital economy, social reforms, a sustainable digital economy, and the social governance mechanism. Consequently, policymakers and governmental authorities are advised to enhance the digital economy to fortify the social governance mechanism.

S. Shibata highlighted the ongoing discourse surrounding digitization, emphasizing the lack of a definitive answer regarding its potential impact on socio-economic institutions, the efficacy of its implementation, the prospective role of the state in overseeing digital technology deployment, and the potential ramifications for broader political and economic contexts when executed [26]. The discussed article scrutinizes the unfolding process of digitization within the Japanese service sector. Drawing on qualitative interviews with executives in the hospitality industry and officials from trade unions, the paper presents a perspective that diverges markedly from the optimistic outlook of some commentators, contending that digitization has the capacity to enhance working conditions and foster a more sustainable form of growth. Instead, the study employs regulatory theory to assert that the adoption of digitization aligns with a broader trend of neo-liberalization. Consequently, digitization contributes to de-skilling, work task fragmentation, the digital divide, intensified workloads, and heightened workplace supervision, signalling a further erosion of the social compromise that underpinned Japan's previous economic growth phase.

In a separate work, M. Nadeem and co-authors demonstrated that the virtualization of the economy entails a model where traditional financial transactions, interactions, and actions are either replaced or facilitated by digital instruments, emphasizing their indispensability for contemporary economic development [14]. The study underscored obstacles to economic digitalization, particularly in underdeveloped and developing nations. Through the application of Interpretive Structural Modeling (ISM) and fuzzy Quality Function Deployment (QFD), the research identified significant barriers such as the absence of adequate ICT infrastructure, limited awareness of business opportunities and benefits, and market challenges. The study recommended measures like the incorporation of artificial intelligence (AI), machine learning, advanced analytics, research and development, and standardization of digital processes as effective strategies. This research contributes to the literature on research methods by proposing a hybrid methodology integrating ISM and fuzzy QFD, with findings applicable to developing countries.

In a different vein, V. B. Nguyen conducted research to empirically evaluate the impact of foreign direct investment (FDI) and digitalization, along with their interactions, on income inequality in developed and developing countries spanning from 2002 to 2019 [20]. Employing a systematic Generalized Method of Moments (GMM) for 30 developed and 35 developing countries, the study disclosed that FDI heightens income inequality in developed nations but reduces it in developing ones. Digitalization, on the other hand, diminishes income inequality in both groups. Furthermore, the interaction term was found to narrow income inequality in developed countries while widening it in developing nations. This paper marks the first instance of integrating digitization into the examination of the relationship between FDI and income inequality, providing empirical evidence that elucidates the differing roles of digitalization in the dynamics between developed and developing countries.

Among domestic economists, the publications of S. Reverchuk and O. Tvorydlo should be singled out, which forecast the development of the banking sector and offer recommendations for strengthening the regulatory and institutional framework for the regulation of the banking sector in the conditions of digital changes [25]. In particular, the key parameters of the regulatory framework for the regulation of digital lending programs have been defined: as direct movement of funds; payment of commissions and additional payments by the creditor; transparent service; ensuring data protection; publication of reports; and organization of the complaints process.

A. Kasych identified the factors of the development of the digital economy, namely: caused by COVID-19 "corona-crisis", digital finance, social networks, digital identification, data revolution, the improvement of the competitive environment and investment attractiveness [10]. The author of the paper also proved that in order to achieve the development of domestic banks' digitalization, it is expedient to focus on the main components of modern digital bank management, such as multi-channel banking, modular banking, open banking and smart banking.

The publication by N. Panteleeva, which emphasizes the threats and challenges of the digitalization of the banking business [22, p. 72], deserves attention. Among the primary tasks, the author of the paper considers the need to determine the priorities of digital initiatives and establish their clear coherence with the corporate development strategy of banks; recognition of the dichotomy of traditional and digital corporate culture, which requires the definition of common goals, cooperation and joint responsibility; determination of the principles of cooperation with FinTech companies, criteria for assessing the contribution of such cooperation to the creation of additional value, efficiency and security for the client and banks in general.

Attention is drawn to the approach of the young scientist D. Akopian regarding the role of digitization in the banking business [1]. The author identified the main trends of changes in banking business models under the influence of technological innovations: the blurring of the border between banks and SuperFinTech; using the Banking-as-a-Service (BaaS) platform as a step towards creating long-term sustainable value; introduction of cloud technologies in the field of banking business; creation of subsidiary digital banks by the leading banks, since the existing intra-bank system is usually not flexible enough for rapid digitalization. In the conditions of the new banking era 'Banking 4. X', data ecosystems allow to improve the customer experience through the provision of hyper-personalized services, to implement the program of expanding access to financial services, and also help to identify and prevent financial and non-financial risks. It is advisable to prioritize cyber security, as banks implement multi-factor and biometric authentication to prevent unauthorized access, data theft and other types of fraud [1, p. 54].

## AIMS AND OBJECTIVES

The purpose of this study is to substantiate the essence of digital transformation and determine the effectiveness of its impact on the development of banking business.

To achieve this purpose the following tasks were defined:

- to investigate the economic content of the “digitalization” concept;
- to analyze the legal regulations contributing to the digital transformation of the banking business;
- consider and analyze the main areas of banking business activity covered by digitalization processes;
- identify the main threats associated with the process of digitalization of banking business;
- to propose recommendations for further digital transformation of the banking business.

## METHODS

The focus of this investigation involves elucidating the fundamental nature of digital transformation and assessing its efficacy in influencing the advancement of the banking business.

The attainment of the study objectives necessitates the application of various research methods, including:

- systematic approach in determining the main evolutionary positions of the digital transformation of the banking business;
- analysis, synthesis and generalization in the investigation of the areas of activity of banks covered by digitalization;
- expert assessments and comparisons in formulating recommendations for further digital transformation of the banking business.

This research is grounded in the following hypothesis. To identify the paramount influence of digitalization on the progress of the banking business, a preliminary examination of the conceptual underpinnings of digitalization and the legal framework governing this process is deemed essential.

It should be considered the approaches to the interpretation of the “digitalization” concept (Table 1).

Author	Interpretation
Klyoba L.G.	Digitization in banking is the set of innovations of an economic, institutional, organizational and management nature in any sphere of the bank's functioning, which are related to the implementation of digital technologies [11].
Andreton R., Jarvis V., Labhard V., Petroulakis F., Ruben I.	Digitization is the spread of digital technologies leading to a digital economy, resulting in changes in consumption and production patterns, business models, preferences and relative prices, and thus the economy as a whole [2].
De Clerck J.-P.	Digitization is the use of digital data and technology to generate revenue, improve business by transforming business processes, and creating a digital business environment in which digital information is the foundation [4].
Reiss J., Amorim M., Melao N., Cohen I.	Digitization is the digitization of analogue data, which, in turn, can improve the relationship between the customer and the company, bringing added value to the entire economy and society [24].
Borysiuk O., Datsyuk-Tomchuk M., Lipovska-Makovetsk N.	The conversion of information into a digital format, often resulting in cost reduction and the creation of novel opportunities, among other outcomes, constitutes a broader trend in global development effectiveness. However, for digital information transformation to contribute meaningfully to this trend, it must adhere to specific criteria: encompassing realms such as production, business, science, the social sphere, and the everyday lives of citizens. Moreover, its efficacy is contingent upon the effective utilization of the outcomes, ensuring that users of transformed information have access to and possess the necessary skills to proficiently work with digital information [3].

Based on the presented definitions, it is possible to conclude the digitalization of the banking business is related to the digitization of all business processes and information regarding the bank's activities. Therefore, the introduction of digital technologies in the banking business requires the consideration of the needs of this process' three subjects – the consumer, the investor and the bank itself.

When performing their activities, banks become participants and sources of creating a large amount of information, which has different forms and different purposes, for its use, therefore, a specified regime should be established. Regulation of banks' work with information, which is primarily related to confidential information, is important for the entire banking sector.

The authors of the paper [32] attributed the main factors that influence the process of digitalization of banking business: the formation of the concept of digitalization, the formation of digital competencies in personnel and the rejection of outdated technologies.

The object of use for digital technologies is still banking services. In the context of digitalization, the question of digital service arises. Normatively established definitions of this concept are presented in Table 2.

**Table 2. Characteristics of the concept of "service" and "digital service".** (Source: systematized by the authors based on current legislation)

Legal source	Characteristics
Civil Code of Ukraine (Vol. 1, Art. 901)	A service is a certain intangible good that is provided by one person (performer) and consumed by another person (customer) in the process of the performer executing certain actions or performing a certain activity. The service has an intangible nature, its result does not acquire a tangible form, it is closely related to the person of the performer and the process of his performance of certain actions (performance of a certain activity), but does not coincide with the very actions (performance of activity) of the performer, as a certain intangible good is consumed in the process of committing a certain action or execute a certain activity [36].
Law of Ukraine "On Protection of Consumer Rights" (Art. 1, Clause 17)	The "service" is delineated as the action undertaken by the provider to deliver (transfer) a specified tangible or intangible entity, as defined by the contractual agreement, to the consumer. This action is executed in accordance with the individualized request of the consumer, aiming to fulfil their personal requirements [37].
Law of Ukraine "On Payment Services" (Art. 1, Clause 58)	Payment service – the activity of the payment service provider for the execution and/or support of payment transactions [38].
Law of Ukraine "On Financial Services and State Regulation of Financial Services Markets" (Art. 1, Clause 5)	A financial service entails engaging in transactions involving financial assets, conducted on behalf of third parties, either at the service provider's cost or the cost of the concerned individuals. In instances sanctioned by law, such transactions may also be executed using borrowed financial assets from external sources, with the primary objectives of attaining profit or safeguarding the genuine value of financial assets [39].
Law of Ukraine "On electronic trust services" (Art. 1, Clause 11)	An electronic service encompasses any service delivered through an information and telecommunications system [40].
Law of Ukraine "On Electronic Commerce" (Art. 3, Clause 9)	Electronic information services refer to remotely delivered services, whether paid or free, pertaining to the processing and storage of information. These services are provided at the specific request of the recipient through information and telecommunication systems [41].

In order to resolve the issue of cloud computing – the technology of distributed processing the digital data, which is able to provide the user with not only hosting, that is, the service of providing disk space, network connection and other resources for placing physical information on a server that is constantly in the network (for example, Internet) but also to provide remote computing power to the client, the Law of Ukraine "On Cloud Services" [42] was adopted. The law establishes the provision of cloud services and/or data processing centre services to public users of cloud services must be performed in compliance with the requirements of the legislation on personal data protection, information protection and cyber security. It is prohibited to process information that constitutes a state secret, official information, state and unified registers, the creation and operation of which is established by law, using cloud resources and/or a data processing centre located outside the borders of Ukraine or on the temporarily occupied territory of Ukraine; belong to a state recognized by Verkhovna Rada of Ukraine as an aggressor state or an occupying state; belong to entities whose activities are subject to the Law of Ukraine "On Sanctions" [42; 44].

To address matters associated with the movement of virtual assets, the Ukrainian legislation introduced the "On Virtual Assets" law in 2022. This legal framework delineates the legal relationships arising in connection with the circulation of virtual assets within Ukraine. It outlines the rights and obligations of participants in the virtual assets market and elucidates the fundamental principles of state policy governing their circulation [45].

Therefore, digital services refer to services delivered via information and telecommunication systems and do not constitute a distinct category within the framework of service provision contracts.

Regarding the use of Internet technologies in banking, it is possible to outline a number of legal acts that determine the basic regulations.

One of the main steps towards ensuring the development and large-scale access to the Internet for households and non-financial corporations in Ukraine was the Decree of the President of Ukraine from 07.31.2000 No. 928/2000 "On measures to develop the national component of the global Internet information network and ensure wide access to this networks in Ukraine" [43].

For the proper functioning of electronic systems in Ukraine, a number of laws were adopted: "On information" [48], "On scientific and technical information" [46], "On the concept of the National Informatization Program" [47], "On electronic documents and electronic circulation" [35], "On the protection of information in information and telecommunication systems" [34] and so on.

In the conditions of digitization of the economy of Ukraine, it is expedient to include the developed concepts related to the introduction of digital technologies to the regulatory provisions in the field of Internet banking.

Primarily, the foundation for the advancement of the digital economy in Ukraine lies in the "Concept of the Development of the Digital Economy and Society of Ukraine for 2018-2020" and the subsequent endorsement of the implementation plan. This initiative provides the necessary impetus for digitalizing the economy and public and social spheres. It fosters awareness of prevailing challenges and instruments for the enhancement of digital infrastructures, and the cultivation of digital competencies among citizens, and identifies crucial areas and projects for digitalization. Additionally, it encourages the internal market for the production, utilization, and consumption of digital technologies [23].

Secondly, the evolution of the digital economy is underpinned by the conceptual framework of digitalization outlined in the collaborative initiative "Digital Agenda of Ukraine – 2020", conceived in 2016 [29].

Thirdly, to ensure the financial stability of banks, the National Bank of Ukraine presented a new strategy for the development of the financial market until 2025 under the name "Financial Fortress of Ukraine" [15]. This strategy contains five objectives. Among them is the fourth goal "Modern financial services": the financial market is a digital fortress; Power banking 2.0 – restoration of infrastructure in the de-occupied territories; technological development of the financial market; stability, efficiency and customer orientation of cash flow; virtual assets and digital money of the NBU – clear regulation to ensure monetary sovereignty; digital financial services are part of the digital country [15].

As a technological facet of digitizing the banking sector, it is imperative to underscore the following objectives: the establishment of digital assets within the banking system, the enhancement of the digital information and communication infrastructure in the banking domain, and the evolution of digital financial and banking services in support of the cross-border landscape of the digital economy. Additionally, the creation of digital financial networks within the industrial Internet framework is integral.

Aligned with the FinTech Development Strategy in Ukraine until 2025, formulated by the National Bank of Ukraine, three fundamental and interconnected propositions for the advancement of FinTech have been delineated:

- "Why the FinTech strategy?": the strategy for the development of FinTech in Ukraine until 2025, the vision of strategic goal 2 "Ensuring the development of the FinTech market, digital technologies and regulatory platforms" of strategic direction V "Innovative development" of the Strategy for the development of the financial sector of Ukraine until 2025;
- "What does the FinTech strategy provide?": defines the role of FinTech in the financial ecosystem; provides a vision of the mission and strategic directions until 2025; lays the foundation for creating a sustainable FinTech ecosystem; offers product areas – the "sandbox" concept and an academic program on digital finance; determines the perimeter of related projects;
- "What the FinTech strategy is based on?": the experience of 30 leading FinTech ecosystems in the world; on the legislative framework and approaches to FinTech development by leading financial regulators [17].

Thus, it can be concluded that the modern legal framework, which regulates the use of Internet technologies in banking, is approaching very modern world trends.

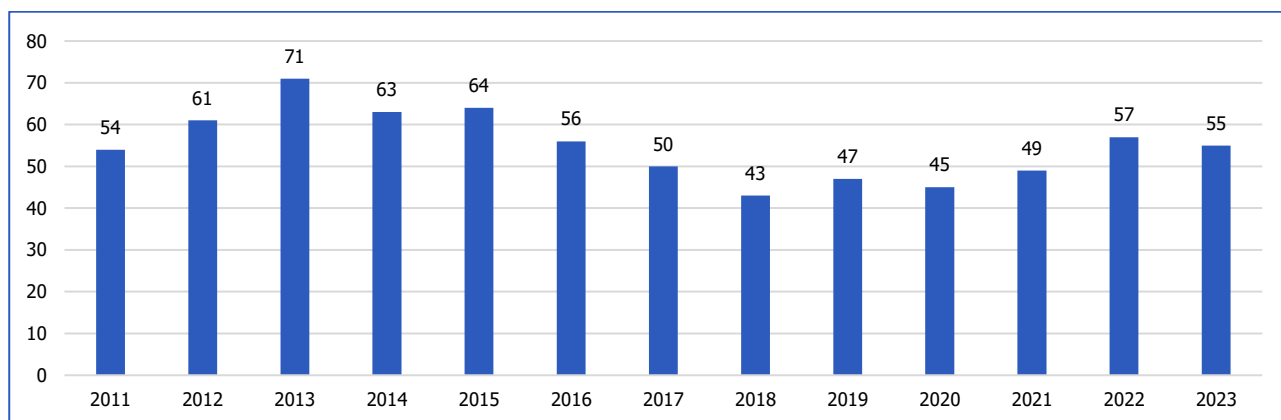
## RESULTS

According to the Global Innovation Index 2023 rankings, in 2021 Ukraine ranked 55th out of 132 studied countries and also entered the top three largest innovative economies by income groups (lower middle-income) (Table 3).

**Table 3. TOP-3 innovation economies by income group in 2023.** Notes: ↑↓ – indicates movement in ranking (up or down) within the top three, relative to 2022; \* – indicates a new entrant into the top three in 2023. (Source: Global Innovation Index Database, WIPO, 2023 [8])

Development level	High-income	Upper middle-income	Lower middle-income	Low-income
Performance above expectation for level of development	Switzerland (GII rank 1; Score 67.6)	China (GII rank 12; Score 55.3)	India (GII rank 40; Score 38.1)	Rwanda (GII rank 103; Score 20.68)
Performance in line with level of development	Sweden↑ (GII rank 2; Score 64.2)	Malaysia↑ (GII rank 36; Score 40.9)	Viet Nam (GII rank 46; Score 36.0)	Madagascar (GII rank 107; Score 19.1)
All other economies	United States↓ (GII rank 2; Score 63.5)	Bulgaria↓ (GII rank 38; Score 39.2)	Ukraine* (GII rank 55; Score 32.8)	Togo* (GII rank 114; Score 16.9)

While considering the dynamics of Ukraine's rating according to this Index, it should be noted that during the studied period of 2011-2023, it had amplitude fluctuations. The biggest outburst was observed in 2012-2015 when a number of legal acts were adopted regarding the digitalization of the Ukrainian economy. Despite COVID-19 and the protracted state of war, according to the Global Innovation Index, Ukraine is in a stable position for growth (Figure 1).

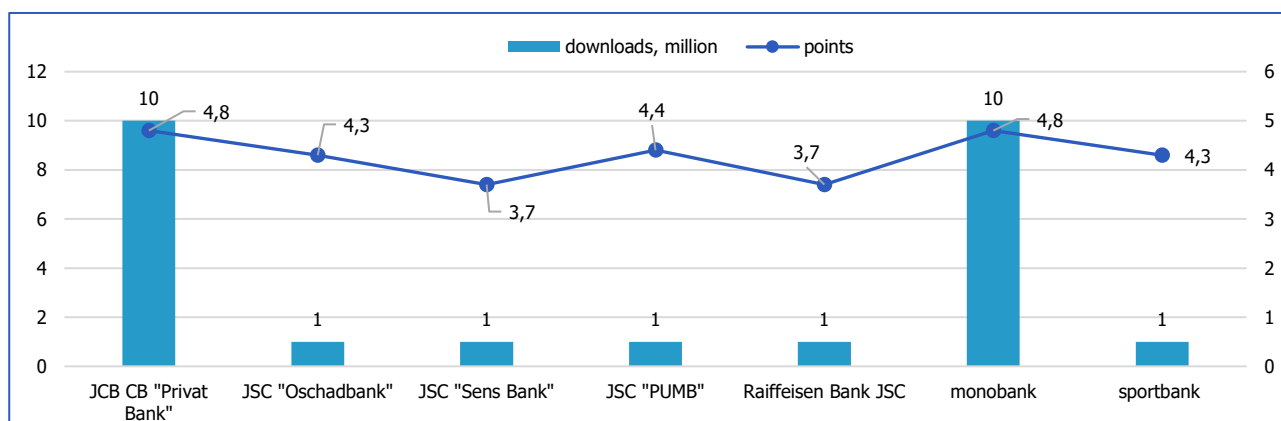


**Figure 1. Dynamics of the rating of Ukraine according to the Global Innovation Index for 2011-2023.** (Source: Global Innovation Index Database, WIPO, 2011-2023 [8])

The digital transformation of the banking business takes place in several directions, which should be considered.

**Mobile and Internet Banking:** The growing use of smartphones and tablets is driving the development of mobile banking and online platforms. An improvement of Internet banking is mobile banking due to the use of gadgets, which enables remote clients – individuals to execute various operations on Android or iOS platforms.

It is expedient to compare the level of usability of mobile applications of selected banks, such as JSC CB "Privat Bank", JSC "Oschadbank", JSC "Sens Bank", JSC "PUMB", JSC "Raiffeisen Bank", monobank and sportbank due to the estimations of Play Market application [9] (Figure 2).



**Figure 2. Comparison of indicators of mobile applications of selected banks as of November 1, 2023.** (Source: compiled by the authors based on [9])

From the data presented in Figure 2, it can be seen that the leaders in terms of loading and quality are JSC CB "Privat Bank" and monobank with scores of 4.8 in both, then JSC "Oschadbank", JSC "PUMB" and sportbank – with scores of 4.3, 4.4 and 4.3, respectively. The lowest points for using were of JSC "Sens Bank" and JSC "Raiffeisen Bank". Each bank's mobile application offers cashback for transactions, but different terms of their use apply.

In 2022, the Financial Club determined the winning banks in the "Mobile Banking" category (Table 4).

**Table 4. Winning banks in "Mobile banking" nomination in 2022. (Source: [25])**

Rating	mobile application	the possibility of creating virtual cards		the opportunity to invest in Ukrainian securities		the ability to connect the card to Apple Pay	the ability to connect the card to Android Pay
		IOC	Android	IOC	Android		
1	Monobank	+	+	+	+	+	+
2	Privat24	+	+	+	+	+	+
3	Sense Superapp	+	+	+	+	+	+
4	Raiffeisen online UA	+	+	+	+	+	+
5	Neobank to all	+	+	-	-	+	+

Currently, the latest banking technologies, which are already being implemented by banks, are actively developing, such as "blockchain technology", "cloud banking technology", "sharing technology", "crowdfunding technology", and "open banking technology" (Table 5).

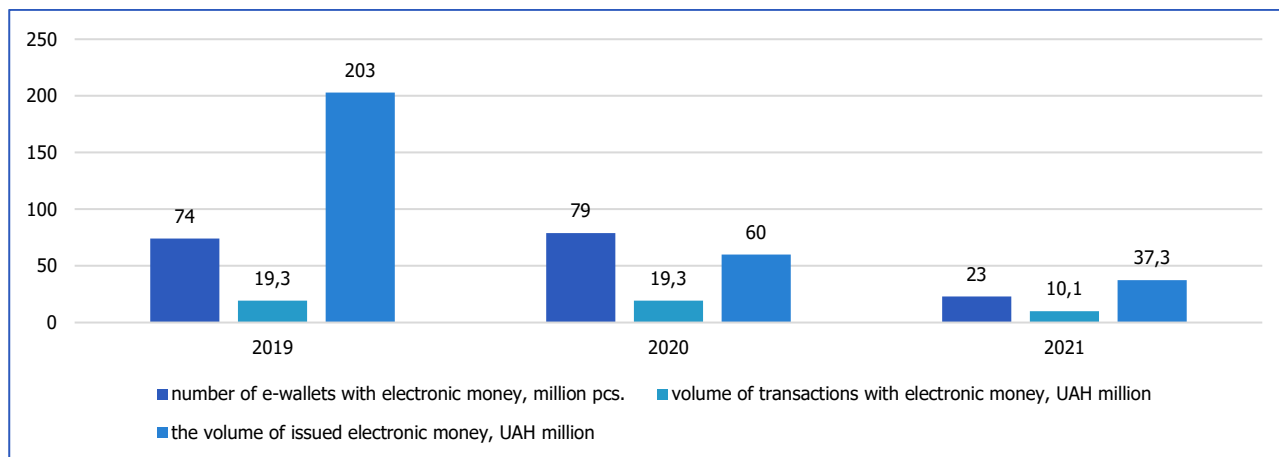
**Table 5: Banking technologies provided by banks in Ukraine. (Source: [27])**

Bank	Blockchain technology	Cloud banking technology	Schering technology	Crowdfunding technology, R2R
PrivatBank	+	+	+	+
Oschadbank	-	+	-	+
Raiffeisen Bank	+	+	-	+
Credit Agricole	+	+	-	+
Monobank	+	+	+	+
Unex Bank	+	+	-	+
Taskombank	+	+	-	+

**Electronic payments.** The growing popularity of electronic payments and transfers, including mobile money and other digital solutions, is driven by their convenience and affordability for consumers. Concerning the payment infrastructure in Ukraine, as of July 1, 2023, it is presented as follows (taking into account the growth in relation to January 1, 2023): Commercial POS terminals – 388.1 thnd pcs. (↑ 8.3%), including contactless POS terminals 96.4%; POS accept payment cards – 355.9 thnd pcs. (↑ 12.2%); ATMs – 15.8 thnd pcs. (↑ 1.2%), including deposit ATMs 16.5%. The total number of issued payment cards in circulation amounted to 110.3 mln pcs. (↑ 1%), in particular: active payment cards – 47.2 mln pcs. (↑ 3%); contactless payment cards – 27 mln pcs. (↑ 5%); tokenized payment cards – 9.7 mln pcs. (↑ 5%) [18].

For several years, the use of electronic money has been very convenient for the use of small amounts that do not exceed more than 1,000 hryvnias. Today, electronic money can be named a common service used by the population worldwide. The most popular services for using electronic money in Ukraine are Webmoney, Privat24, Monobank, LiqPay and others. At the beginning of 2023 6 banks in Ukraine issued electronic money, namely: JSC "Sens Bank" (Alfa-Money), JSC "Taskombank" (Maxi), JSC "Ukrgasbank", JSC "Bank Vostok" (Prostyr), JSC "Raiffeisen Bank" and JSC "MTB Bank" (XPAY). Unfortunately, there is no reporting for 2022 (Figure 3).





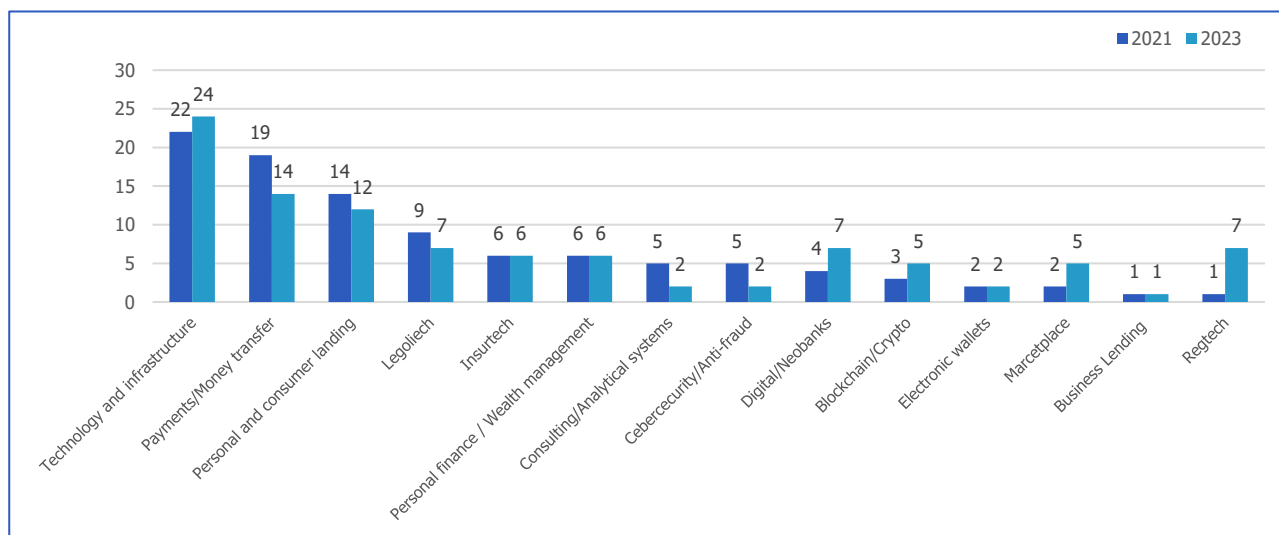
**Figure 3. Dynamics of the number of e-wallets with electronic money, the volume of transactions with electronic money and the volume of issued electronic money in 2019 – 2021.** (Source: compiled by the authors based on [18])

As can be seen from Figure 3, the greatest devotion of consumers to electronic money was observed in 2019, but in 2020 and 2021 there was a significant decrease in demand.

**FinTech and innovation.** The emergence of FinTech companies and startups created competition for traditional banks and forced them to introduce innovative development strategies. It is important for banks not only to provide basic services but also to quickly integrate new technologies and FinTech solutions.

It should be noted that the Ukrainian “outletless bank” – monobank, entered the TOP 200 best FinTech companies in the world in 2023 in the “neobanking” category, which included 19 other companies in the world, in particular: “Agi” (Campinas, Brazil), “Aspiration” (Marina Del Rey, USA), “Banco Inter” (Belo Horizonte, Brazil), “Banco Original” (Sao Paulo, Brazil), “Bank Zero” (Johannesburg, South Africa), “Bunq” (Amsterdam, Netherlands), “C6 Bank” (Sao Paulo, Brazil), “Chime” (San Francisco, USA), “Current” (New York, USA), and “Dave” (Los Angeles, USA) [5].

Considering the technological infrastructure of domestic FinTech companies, it can be presented as follows (Figure 4).



**Figure 4. Distribution by spheres of activity of FinTech technological infrastructure.** (Source: compiled by the authors based on [30])

As shown in Figure 4, technological infrastructure is leading in the spheres of activity of domestic startups during the analyzed period. In addition, the growth dynamics of its share can be traced: in 2023, the percentage of providers of this type of service was 24%, whereas in 2021 and 2020, it was 22% and 20%, respectively. The popularity of this area is caused by the growing trends of founding businesses online, which creates a demand for companies to offer IT solutions for financial intermediaries and banks, thereby helping them to start up or move into the digital space.

In second place there are payment services and transfers – 14%, which has significantly decreased compared to previous years. In 2020 and 2021, it was 20% and 19%, respectively. This was caused by a drop in economic activity in the first months of the introduction of martial law, numerous restrictions and limits on almost all monetary transactions.

Despite all the difficulties from 2021, the position of consumer lending continues to gain momentum. In 2023, this area accounts for 12%, in contrast to 14% in 2021 demand for loans remains subdued; lending standards will continue to tighten. A significant growth in the regulatory sphere should also be noted: from 1% in 2021 to 7% in 2023. Such spheres as crowdfunding, crowdlending, and services for comparing financial services remain the least developed spheres.

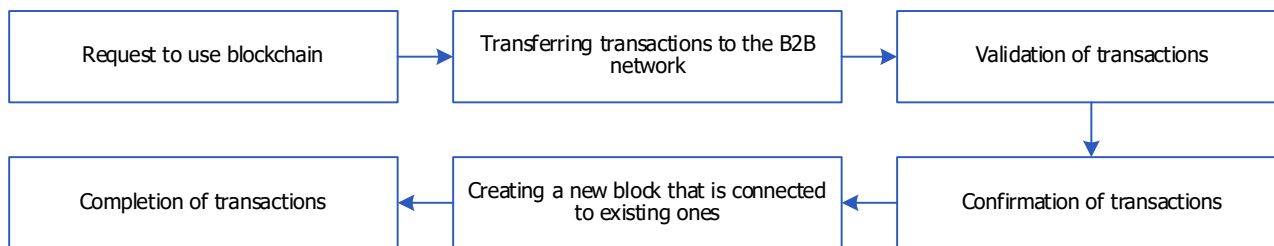
Over the past five years, the Ministry of Finance of Ukraine and Finance.ua have recognized the activities of financial companies in the following areas: “the best financial and investment products, client services, IT implementation, advertising projects of the financial services market” [6] (Table 6).

**Table 6. Nominations and winners of the FinAwards-2022 award.** (Source: analyzed by the authors based on [6])

Nomination	Features of the nomination	Bank
Financially stable bank	High financial indicators	JSC “Raiffeisen Bank”
People’s bank	The most popular	monobank
Best bank for SME clients	23 participant banks, conditions: comprehensive banking services for SME clients, in particular, sole proprietors and provision of services: settlement and cash services, lending for the development of SMEs, the possibility of using remote account management systems for conducting business activities	1st place – JSC “PUMB” 2nd place – JSC CB “Privat Bank” 3rd place – JSC AKB “Concord”
Best payment card	19 participating banks, conditions: advantages and unique offers	1st place – JSC “Sens Bank” (“Alfa Bank”), Saméléon card 2nd place – JSC “PUMB”, “Vse Mozhu” card 3rd place – JSC “A-Bank”, “Zelena” card
Best premium card	26 complex banking offers for VIP high-income clients and lifestyle support privileges, etc.: concierge service, airport services, luxury discount programs	1st place – platinum card from monobank 2nd place – “Graphit” card JSC “Cens Bank” (“Alfa-Bank”) 3rd place – “Exclusive” package from JSC “Raiffeisen Bank ”
Best remote service bank	18 participating banks, which provide customers with technologies and services that allow to perform basic financial transactions remotely, such as Internet banking, mobile banking, client banking for legal entities, chatbots in messengers, 24-hour contact centers, ATMs and self-service terminals	1st place – JSC “A-Bank” 2nd place – monobank 3rd place – JSC “Privat Bank”
Best mobile app	19 participating banks, which provide customers with technologies and services	1st place – monobank 2nd place – JSC “Sens Bank” (“Alfa-Bank”) 3rd place – sportbank
Leading technologies and innovations in banks	15 banks are participants which implemented/introduced new technologies to optimize processes and create additional value for customers (increased the quality of service, reducing the time of operations, gave access to new products and services, etc.)	1st place – JSC “Sens Bank” (“Alfa-Bank”) 2nd place – monobank 3rd place – JSC “Oschadbank” and JSC CB “Privat Bank”

**Blockchain and cryptocurrencies.** Banks around the world are exploring the use of blockchain technology and cryptocurrencies to improve the efficiency and security of financial transactions; Ukraine is no exception. The main trends in the development of the banking sector on the basis of blockchain are the use of modern payment services, artificial intelligence systems and innovative financial technologies.

Blockchain is a chain of transaction blocks built according to certain rules designed to guarantee the interaction of a large number of users without the need for an intermediary [28]. Blockchain technology in banking is schematically presented in Figure 5.



**Figure 5. The process of transaction execution via blockchain.**

The adoption of blockchain technologies by banks is of great importance for strengthening the effectiveness of the client-oriented approach.

The introduction of blockchain technology in the banking business reflects the great importance of ensuring the cyber security of banks, which is an integral element of digital transformation. The advantages of using blockchain technologies in cyber security systems are presented in Table 7.

**Table 7. Advantages of using blockchain technology in the cyber security systems of banks.** (Source: compiled by the authors based on [33, p. 209])

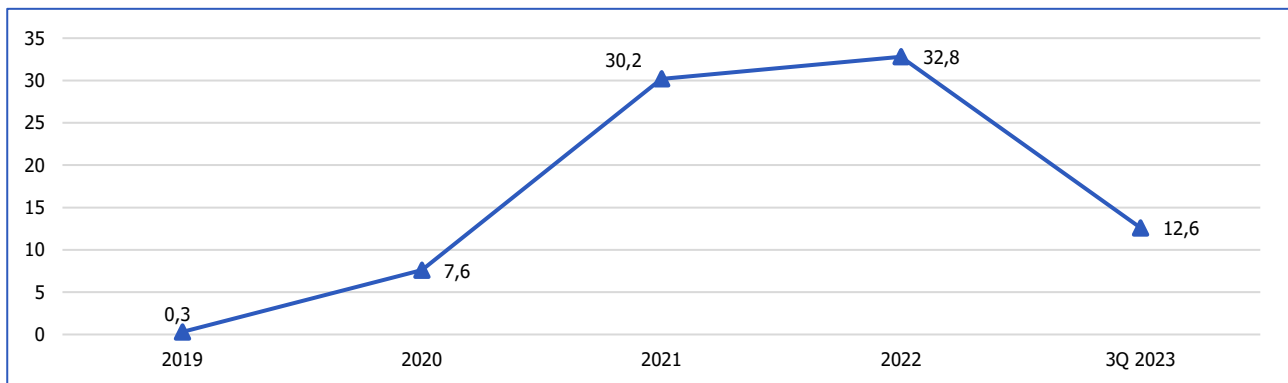
Advantage	The essence of superiority	Value of advantage for banks' cyber security systems
Decentralization	Lack of a single main data storage server; all records are stored with each member of the system, on each of its nodes	Cybersecurity systems of banks are centralized and have main data servers, which creates their main vulnerability. Blockchain technology will allow data to be saved on other nodes during an attack on one node
Full transparency of the system	All transactions that occur in the system can be tracked on all nodes of the system	Blockchain technology for banks will enable them to analyze all transactions on each individual node. Each subsequent transaction is checked by all nodes of the system before its execution, and cannot be executed if the slightest discrepancy with all previously executed transactions is detected
Security against unauthorized access	All data is stored in encrypted form. The user, while tracking all transactions, cannot recognize individual data about them, and a unique access key is required to carry out operations	The use of the blockchain will protect the personal data of customers and their bank accounts from external cybercriminals and insider employees, since, having the entire history of transactions, criminals will not be able to use it and identify the data
Protection against unauthorized access	Any attempt to make unauthorized changes is automatically rejected by the system due to inconsistency with multiple copies of data located on different nodes of the system	Criminals manipulate and falsify data in the bank's system, access to which is obtained in a roundabout way, using vulnerabilities in the system. If an attacker gets hold of the system's special unique code, which is unlikely, the system will always store information about each transaction. Any abuse of rights in the system will be known to all its other members, and the perpetrator will not have the opportunity to hide the traces of his own crime
Compromise	Compromise is implemented while pre-checking by each member of the system the data that is added to it. The decision to add a new block is made subject to the agreement of all participants. Achieving consensus is carried out in accordance with one consensus protocol, taking into account the peculiarities and specifics of the system	Performing the procedure of checking each transaction by other nodes of the system creates an additional barrier to the implementation of attacks. Any attempt to change data in one of the nodes of the system will be blocked by other nodes of the system, which have their own copies of all data in the system. This mechanism can protect the bank from such types of scams as changing credit history, and account details, fraud with bank statements, etc.

Regarding the use of cryptocurrencies, it is expedient to reflect the example of UNEX Bank, which issued the first crypto-card Weld card in Ukraine. Weld card is a regular credit card issued by Unex Bank in Hryvnia and has the option of linking its owner's crypto account on the side of the Weld Money partner. All Weld card calculations are executed in hryvnias, the exchange of virtual assets for regular (fiat) currency and subsequently for hryvnias is performed by the bank's partner on behalf of the client, with subsequent crediting of hryvnias to the Weld card account opened at Unex Bank. The daily settlement limit of UAH 10,000 enables connection to the Huobi and WhiteBit stock exchanges [31].

Electronic identification and document management. The implementation of electronic identification and document circulation systems is used to facilitate processes of interaction with clients and reduce bureaucracy.

The implementation of digital solutions in the banks of Ukraine requires strategic planning, investments, monitoring and performance evaluation with the participation of not only the owners and top managers of the banks, but also the state in general.

A decisive step towards an active transition to remote service was the NBU's decision to introduce the BankID System. The resolution came into effect on November 5, 2018, and has already been revised twice. The BankID system of the National Bank of Ukraine is considered a state system of remote identification that ensures the transfer of personal data of users from the bank where the account is opened to the entity that provides the service to the user [19]. The peculiarity of this Resolution is that it determines the conditions and procedure for connecting to the BankID system of the NBU, the procedure for using this system; the procedure for passing remote identification of natural persons; the procedure for transferring identification data in the system; requirements for information protection in the system [16]. At the beginning of 2023, 137 participants participated in the BankID System of the NBU – 41 banks – identifiers, 96 subscribers – service providers, and more than 99.8% of clients of Ukrainian banks were served (Figure 6).



**Figure 6. The number of identifications in 2019 – 3Q 2023, million pcs.** (Source: compiled by the authors based on [19])

The formation of a digital signature at the current stage makes it possible to sign various forms of documents with one's own digital signature both for non-financial corporations and for households, which in general has facilitated the formation of document flow in banks. Undoubtedly, such technology will give banks the opportunity to be even closer to their customers.

## DISCUSSION

The purpose of this study is to justify the need for digital transformation of the banking business, as well as to identify the threats it causes. Ensuring the cyber security of the banking business when making digital decisions currently remains a debatable issue. There is a critical need to ensure interoperability between FinTech companies and banks; and settlement of issues regarding the regulatory and legal support of the activities of these entities on the market, in particular regarding the activities of FinTech companies and such startups.

The Ukrainian banking system has achieved high results in the digitalization of business over the last period. However, a full-scale military invasion made some adjustments. This especially applies to the outflow of intellectual human capital abroad (no artificial intelligence can replace the physical relationship between bank managers and clients; the decrease in the level of financial literacy of the population regarding the use of digital products, which is caused by the growing number of bank overaged clients, again due to the departure of young people abroad. Mass closing of bank outlets led to the fact that some territorial communities of Ukraine, especially rural areas, generally lost contact with banks.

It is also expedient to consider factors that are not related to the banking business itself, but have a direct impact – that is the disconnection of the electricity supply, the access of the banking business to the temporarily occupied territories, the destruction of mortgaged property, the growing rates of unemployment, and others.

All these issues are debatable and relevant from the standpoint of maintaining stability and balance in the domestic banking services market, especially in the conditions of the bank's choice of an innovative business model for digitalization.

## CONCLUSIONS

The strategic evolution of contemporary banking necessitates the integration of digital technologies. Their application not only enhances the competitiveness of banks but also introduces new risks to their financial stability and resilience.

New players – FinTech companies and start-ups – have improved the coverage of transaction accounts and offer micro-loans and consumer credit. Competition, supported by modern regulatory approaches and regulatory sandbox programs, has reduced the cost and increased the speed of financial transfers.

It is noted the appearance of banks, which work only through mobile applications, and online payment service providers have expanded to offer consumer lending. Even an alternative to correspondent accounts, which is based on receiving liquidity on demand through liquid digital assets instead of prepaid accounts, is in its infancy. Instead, Ukraine still needs a retail payment system accessible through a smartphone app that would be inexpensive for users, particularly small merchants. Alternative cross-border payment channels are also underdeveloped in Ukraine.

The banking business is rapidly changing under the influence of new digital technologies. Access to information, speed of transactions, and security improves, which leads to the growth of the entire banking sector and, as a result, allows banks to invest more funds in various projects. Financing of new technologies allows for making innovative breakthroughs in all spheres of business.

The evolutionary directions of the digital transformation of the banking business are currently agreed upon in accordance with the formed regulatory framework for the regulation of this process. Adoption of relevant development strategies by the regulator, in particular the "Strategy for the development of FinTech in Ukraine until 2025" and the "Financial Fortress of Ukraine" Strategy. The main trends of the digital transformation of the banking business include mobile and Internet banking, electronic payments, FinTech and innovation, blockchain and cryptocurrencies, electronic identification and document flow, cyber security, regulation and standards, and interoperability.

With the development of technology, the expectations of customers regarding financial services are increasing. For example, more than 70% of bank customers use mobile applications every day and expect their transactions to be processed instantly. At the same time, these customers expect the highest level of security for their funds and transactions in accordance with anti-money laundering and anti-fraud regulations. That is why the role of cloud technologies in the banking sector is growing.

Subsequent digital transformations in the banking sector should be directed towards the objectives of enhancing the financial literacy of consumers of banking services, regulating the cryptocurrency market in Ukraine, and establishing unified standards for the regulation and oversight of banks and FinTech companies involved in the provision of digital financial services.

Optimization of internal processes of banks based on financial technologies should be performed in the following directions: transition to a digital format for more than 80% of bank operations, which will lead to an almost complete rejection of the use of paper documents; creation of a messenger and a digital assistant based on mobile banking; creation of a voice assistant and the use of chatbots to identify the level of customer satisfaction with the quality of banking services; putting 100% of financial and non-financial services online for representatives of small, medium and micro businesses; creation of a banking marketing automation platform with the aim of increasing the effectiveness of advertising campaigns, developing new digital channels of customer relations.

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## ADDITIONAL INFORMATION

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### AUTHOR CONTRIBUTIONS

**Conceptualization:** *Victoria Kovalenko, Sergii Sheludko*

**Data curation:** *Victoria Kovalenko*

**Formal Analysis:** *Victoria Kovalenko, Kateryna Cherkashyna*

**Methodology:** *Victoria Kovalenko, Sergii Sheludko*

**Software:** *Victoria Kovalenko, Sergii Sheludko*

**Resources:** *Victoria Kovalenko, Sergii Sheludko, Kateryna Cherkashyna*

**Supervision:** *Victoria Kovalenko, Kateryna Cherkashyna*

**Validation:** *Victoria Kovalenko, Kateryna Cherkashyna*

**Investigation:** Victoria Kovalenko, Sergii Sheludko, Kateryna Cherkashyna

**Visualization:** Victoria Kovalenko, Sergii Sheludko, Kateryna Cherkashyna

**Project administration:** Victoria Kovalenko

**Funding acquisition:** Victoria Kovalenko, Sergii Sheludko, Kateryna Cherkashyna

**Writing – review & editing:** Victoria Kovalenko, Sergii Sheludko, Kateryna Cherkashyna

**Writing – original draft:** Victoria Kovalenko, Sergii Sheludko, Kateryna Cherkashyna

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*Коваленко В., Шелудько С., Черкашина К.*

## **ЦИФРОВА ТРАНСФОРМАЦІЯ БАНКІВСЬКОГО БІЗНЕСУ: СЬОГОДЕННЯ ТА МАЙБУТНЄ**

Стаття присвячена особливостям розвитку цифрової трансформації банківського бізнесу, оскільки глобальна цифровізація економік світу суттєво вплинула на формування нової траєкторії щодо фінансових технологій та запровадження нових інноваційних банківських продуктів. Метою представленої роботи є обґрунтування сутності цифрової трансформації та визначення результативності її впливу на розвиток банківського бізнесу.

Цифровізація банківського бізнесу пов'язана з оцифруванням усіх бізнес-процесів та інформації, пов'язаної з банківською діяльністю. Тому запровадження цифрових технологій у банківському бізнесі вимагає врахування потреб трьох суб'єктів цього процесу – споживача, інвестора та самого банку. Авторами статті проаналізовано нормативно-правове поле, яке супроводжує процес цифрової трансформації банківського бізнесу. Зроблено висновок про те, що сучасна правова база, яка регламентує використання цифрових технологій у банківстві, наближається до сучасних світових тенденцій. Доведено, що цифрова трансформація банківського бізнесу відбувається за декількома напрямками, а саме: мобільність та інтернет-банкінг, електронні платежі, фінтех і інновації, блокчейн і криптовалюти, системи кібербезпеки, електронна ідентифікація та документообіг, а також інтероперабельність.

Установлено, що вітчизняна банківська система за останній період досягла високих результатів щодо цифровізації бізнесу. Проте повномасштабне вторгнення росії в Україну внесло певні корективи. Особливо це стосується відтоку інтелектуального людського капіталу за кордон; зниження рівня фінансової грамотності населення щодо користування цифровими продуктами в результаті міграції та зростання частки населення похилого віку. Масове закриття відділень банків призвело до того, що деякі територіальні громади України, особливо в сільській місцевості, загалом втратили зв'язок з банками.

Зроблено висновок, що подальші цифрові трансформаційні зміни банківського бізнесу повинні бути зосереджені за векторами підвищення фінансової грамотності споживачів банківських послуг, посилення інституту регулювання ринку криптовалюти в Україні, визначення єдиних стандартів регулювання та нагляду за банками й фінтех-компаніями в царині надання цифрових фінансових послуг.

**Ключові слова:** цифрова трансформація, банківський бізнес, фінансові технології, електронні банківські послуги, мобільний банкінг, інтернет-банкінг, електронні платежі, блокчейн, криптовалюта, кібербезпека, електронна ідентифікація, інтероперабельність

**JEL Класифікація:** G21, O31, G28