Theoretical Substantiation of Profit Sources and Assessment of the Banking System's Potential for Financing Digitalization in Ukraine

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Abstract: - This paper analyzes the phenomenon of digitalization as a key driver of progress, shaping a unified digital space and modernizing the fundamental paradigm of societal development. The theoretical underpinnings of value creation of digitalizing banking services are substantiated. An assessment of the potential of the domestic banking system is conducted based on the dynamics of LCR, return on equity, profitability, business efficiency, and capital adequacy ratios of Ukraine's systemically important banks. The analysis results confirm the accumulation of sufficient financial resources by the banking system to financially support processes aimed at developing the digitalization of financial relations in Ukraine. Modeling banks' ability to further accumulate financial potential, taking into account the business expectations index, changes in operating income, and cost regulation, and considering the need to comply with regulatory requirements, was carried out. This made it possible to assert a high level of such capacity in banks such as PrivatBank, Credit Agricole, and Ukrsibbank. The presence of a high potential for increasing the financial potential of the development of the digital space at the expense of banking capital is proven. To utilize it for digitalization in Ukraine, appropriate conditions must be formed, primarily, financial stability must be maintained and a system of state incentives and guarantees for investment during periods of high risks of wartime must be developed.

Key-Words: - financial-digital space, financial processes, digitalization, banking system, financial potential, Fintech, digital financial services, added value, digital transformation.

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1 Introduction

Key transformations of global economic systems, starting from the 20th century, are linked to the rapid development of globalization processes, and from the 21st century - to the concepts of digitalization. Their incredible impact on traditional markets, the dynamics and trajectory of economic processes, and the interconnections between individual countries served as a prerequisite and were accompanied by changes in the paradigmatic basis for ensuring socio-economic and societal development in general.

These changes were particularly evident in the financial sphere. Financial globalization, a process characterized by American economists [1] as the "financialization of the economy," radically changed the globalization trends of the development of global and national socio-economic systems. Under its influence, the overall development of financial relations underwent significant changes, the substantive content of financial policy and the financial system was transformed, as well as the structural and functional capabilities of the financial space, which also caused corresponding paradigmatic changes.

In the development of the digital economy, the financial sector, particularly the banking system, has taken the lead. The financial market and banks were the first to introduce digital technologies into their operations, followed by their spread to the insurance and investment segments. This also affected all other areas of finance, significantly expanding the range of states in which financial relations can develop. In general, the phenomenon of digitalization has become a key driver of economic progress, under the influence of which a single digital space is being formed and the fundamental paradigm of societal development is being modernized.

This is largely due to the powerful potential of digitalization to generate profits through technological changes. This has made it possible to call the spread of artificial intelligence a technological revolution. In the post-crisis period after the global crisis of 2008, the continued efforts of central banks to stimulate economic recovery through unprecedented monetary easing policies had moderate success. Only the emergence and rapid spread of digital technologies and startups, which demonstrated explosive growth, allowed for a revival of economic development.

Thus, the determinants of financialization and digitalization, in the context of their mutual coordination, have today become a resource for changing the paradigmatic basis, and in the spatial aspect - for the formation (within the framework of synchronization and balance of the financial and digital spaces) of a common financial and digital space as a source of modern opportunities for the development of financial relations and digitalization processes, which objectively influences the expansion of the horizon of their research.

The digital transformation of the banking system is occurring through two primary trends, [2]. Firstly, there is an acceleration in the process of changing the components of the financial and credit subsystem, driven by the fintech revolution. Fintech companies, cryptocurrency exchanges, NFT marketplaces, and other companies are offering alternative financial solutions for banking, investing, and accessing financial services. The flexibility and innovation of fintech companies provide them with a high level of competitiveness and high demand for their services and technologies, which intensifies competitive pressure on traditional credit institutions.

Secondly, traditional banking institutions are implementing innovative digital technologies and organizational and marketing innovations. One result of these trends is the convergence and interpenetration of traditional and digital methods of operation, the emergence of innovative tools for providing financial services, and methods of organizing the activities of financial institutions and companies. Banks are mastering digital technologies, fintech companies are obtaining banking licenses, and purely digital banks are emerging.

In general, the directions of digital transformation of the banking system reflect four main phenomena, often described by the term ABCD, where:

- A = Artificial Intelligence (AI), which allows the use of new machine methods for performing complex tasks and conducting analysis;
- B = Blockchain, which provides new methods of recording and accessing transactions and owning information;
- C = Cloud technologies, which provide access to software services and data hosted by third parties;
- D = Data (open databases), which reflects the increased ability of fintech technologies to obtain, store, and process large volumes of data and analyze information.

The increased competition in the capital and financial services markets between traditional institutions and fintech companies stimulates the innovation process, contributing to the emergence

of innovative organizational models in the financial market. In general, the coexistence of traditional and digital methods of providing financial services contributes to better and more comprehensive satisfaction of consumer needs and has a stimulating effect on economic growth.

Understanding how new platform-based digital business models influence its transformation in terms of changing the principles of operation of traditional financial and credit institutions and organizations, as well as capital markets, allows the use of a functional approach.

1.1 Literature Review

Given the theoretical and practical significance of the research problem, it has been the subject of study by many foreign and domestic scholars. In particular, globalization as a key vector of world economic development, a term introduced into scientific circulation in its various aspects, [3], [4], [5].

A comparative analysis of the financial market and banking system as sources of financing technological innovations in 32 developed and developing countries was conducted in the work, [6]. A study [7] of the impact on the financial development of banks with different levels of ownership showed that in countries where the share of state-owned banks is smaller, financial innovations are stimulated to a greater extent than in countries with a larger share of state-owned banks.

A group of scientists, based on a detailed analysis of the processes of digitalization of the banking system as a result of the pandemic, identified the advantages of digitalization for individuals and companies, which provided a solid foundation for determining measures and further steps to increase the level of digitalization of the banking sector, [8].

The impact of digitalization on deposit and credit markets and the structure of the banking sector was analyzed in [9]. The researcher concluded that digital banking intensifies competition and creates risks for financial stability.

The experience of digitalizing banking systems in individual countries is of interest. An analysis of the digital transformation of the banking sector in India was carried out in the work [10], in Italy for the period 2007-2018 is presented in the article, [11]. Based on the construction of a composite indicator that measures the supply of digital financial services, a trend of increasing digitalization is shown throughout the entire period with a clear acceleration since 2013. The introduction of digital technologies is not uniform across banks and, even more so, in business areas: digitalization began in payment services in the late 1990s and then spread to asset management, while the use of digital channels in lending is less common.

The processes of consolidation of the European banking system in the context of digitalization and its consequences for financial stability, solvency, efficiency, competition, consumer protection, digitalization, and systemic risk have been comprehensively studied in the work, [12]. From the perspective of financial stability and solvency, consolidation is viewed as a means of mitigating the shortcomings of some banks as a result of mergers, as well as gaining market access through increased size. However, it was established that further consolidation would not necessarily lead to a weakening of competition, which is especially relevant in the current context of digital transformation and disruption by financial technologies.

On a global scale, digital financial systems not only participate in payment transactions but also finance investments in the development of the digital space. The financial system must be reliable with greater transparency and a minimum number of errors, ensuring speed, accuracy of transactions, and minimal risk. With the advent of digital technologies over the past two decades, internal bank operations and customer service have undergone tremendous changes. The consequences of applying digital technologies for society as a whole are explored in the article, [13].

Research on the intersection of artificial intelligence, digital technologies, and finance was conducted in, [14]. The researchers concluded that (a) digital finance significantly increases the TFP of commercial banks; (b) risk-taking partially mediates the relationship between digital finance and TFP. Moreover, the implementation of diversification can strengthen the impact of digital finance on TFP.

The theoretical studies of digital banking transformation using bibliometric analysis and the multiple dimensions of the impact of technology in the banking sector, which includes customer, company, bank, regulation authority, and society were conducted in the work, [15].

It is shown that the digital transformation has opened up financial services markets to new providers, both emerging businesses known as fintechs and, more recently, large technology companies, [16]. The latter have great disruptive potential within the competitive landscape due to

their size and the characteristics of the digital ecosystems in which they integrate financial services.

The latter has great disruptive potential within the competitive landscape due to the financing of digitalization processes. Fintech companies emerged and actively developed in an era of low interest rates, but in recent years the monetary policy of central banks in leading countries has become tighter, and interest rates have risen to 5-6% to curb inflationary processes. This has made it difficult to finance rather risky startups and develop innovative technologies. At the same time, the digitalization of financial services has become a key condition for the competitiveness of financial institutions in the modern world. Therefore, the question of finding financial resources for the digitalization of the activities of financial institutions is becoming more acute.

The digitalization of the banking system has a crucial aspect: the transformation of human personnel. Digital technologies require employees to possess specific skills and undergo continuous training to enhance their ability to utilize digital systems and to recognize and counteract cyberattacks, [17].

The issue of human capital quality in the context of banking system digitalization, with a particular focus on global trends, strategies, and best practices for decent work in the financial sector, was also discussed at the International Labour Organization (ILO) forum, [18].

A study of technologies and practical steps in the digital transformation of banks, the challenges banks face during this process, and their solutions are presented in [19]. Among the developments of Ukrainian scientists attention deserve, where the trends in the formation of the digital economy, particularly its financial sector in Ukraine, are analyzed, [20], [21].

A thorough analysis of the peculiarities and directions of digitalization of the banking system was made in. In particular, it is given to answer the following research questions: 1. Does digital transformation affect the financial performance of Ukrainian banks in the short- and long-term? 2. Is the effect of digital transformation on profitability indicators negative in the short term and positive in the long term?

A comprehensive assessment of the banking competition that consists of structural and non-structural methods under the institutional changes' impact was made in. The paper presents how this influences the banking system of Ukraine through its reformation in the banking competition level and how it interacts with indicators of stability and efficiency of the banks.

2 Problem Formulation

Within the framework of this article, particular attention is paid to a certain disregard for the problem of the importance of financing digitalization processes. Fintech companies emerged and actively developed in an era of low interest rates, but in recent years the monetary policy of central banks in leading countries has become tighter, interest rates have risen to 5-6% to curb inflationary processes. This has made it difficult to finance rather risky startups and develop innovative technologies. At the same time, the digitalization of financial services has become a key condition for the competitiveness of financial institutions in the modern world. Therefore, the question of finding financial resources for the digitalization of the activities of financial institutions is becoming more acute.

However, a deep theoretical analysis of the banking system, both as a leading sector undergoing digitalization processes and as a tool for financing digital processes, has not been sufficiently explored. This is especially true in less developed countries or those in crisis, such as Ukraine, where financial inclusion processes are becoming particularly important. This has determined the choice of the article's topic, its relevance, and its purpose.

The purpose of the article: To provide a theoretical justification of the sources of value creation in the banking system driven by digitalization and an assessment of the Ukrainian banking system's ability to finance digitalization processes.

3 Problem Solution

The concept of a "financial-digital space" provides a theoretical foundation for addressing the given task. This space is defined as a multifaceted set of relationships, methods, and mechanisms related to the formation, use, regulation, distribution, and redistribution of financial resources, mediated and/or transformed by the use of digital tools, all aimed at ensuring financial stability as a basis for socio-economic development. This definition highlights the interconnectedness and role of digitalization in financial processes. As the world becomes increasingly digital, so too do financial systems. The convergence of the financial and

digital spheres offers new opportunities and also requires significant investment. To effectively address this, it is crucial to focus on integrating digital technologies into financial relationships within a unified financial-digital space.

By combining financial and digital elements, we can create a system that supports innovation, improves efficiency, and enhances financial stability. This approach involves coordinating financial resources and digital technologies to drive reforms and create a more favorable environment for both business and society. By jointly forming a unified financial-digital space, as a result of the implementation of objective interconnections and interactions between financialization and digitalization, it becomes possible to effectively develop both processes within this space. This can be seen as a response to the challenges of modern realities and the opening up of new approaches to utilizing the potential of financial relations and digitalization to improve societal processes. Such an approach implies a spatially coordinated set of methods and mechanisms for, on the one hand, the financial provision of reforms in various spheres of activity, including the sphere of digitalization, and on the other hand, the creation of favorable conditions based on digital technologies for the organization and implementation of these reforms.

Therefore, it is not just the formation of a digital space, that opens up new opportunities for timely technical and technological updates, but also its organic integration with the financial space, the role of which for the effective functioning and development of the economy has already been noted, that forms new challenges for the methodology of understanding social relations embodied in their various forms of manifestation, and constitutes the basis for the realization of the deep essence and key features and trends of the modern financial world today.

A distinctive feature of the transformations taking place in the banking system, in addition to the implementation of innovative achievements, is their multiplicative synergistic effect, when the development of new digital technologies leads to a change in the models of interaction between subjects of financial relations and the formation of innovative ways of creating value, and new consumer needs and approaches to financing generate demand for digital technologies. This, in turn, leads to a change in financial relations, which transforms the structure and role of the banking system in the financial digital space. This is particularly evident from the perspective of the digital transformation of the banking system through the prism of its technological, organizational, and marketing aspects, as presented in Table 1 (Appendix).

Regarding the technological aspect, the mentioned transformation of the banking system manifests itself in the following, [22]:

1. Virtualization of financial organizations - the transfer of financial assets and business processes into a digital form. Bank branches are replaced by websites and mobile applications, and financial instruments acquire electronic forms (electronic cash, cryptocurrency, tokens). As a result, interaction with clients and counterparties is transferred to the information and digital space.
2. Automation - the replacement of employees of financial organizations with virtual assistants and robots capable of interacting with partners and clients and, if necessary, making independent financial decisions based on predetermined algorithms (robo-investing). Automation is also facilitated by the use of artificial intelligence, machine learning, and the collection, processing, and systematization of large amounts of information about participants in the financial services market.
3. Widespread adoption of blockchain technologies - a tool that enables remote and/or decentralized interaction between participants in financial relations. For example, technologies for remote authentication or distributed ledgers, [23].

The organizational aspect of the transformation of the banking system is manifested in re-coordination - a reformatting of the models of interaction between participants in financial activities and the system of relationships between them, creating new ways to align the interests of financial entities. An example of re-coordination is decentralization, as implemented in the model of creating, distributing, and using cryptocurrencies. Another example is the type of network relationships that form between participants in a digital platform, [24], [25], [26]. This also includes new methods of creating distribution channels for financial products, in particular, through digital applications, "embedding" them in other products of ecosystem partners, [27].

The marketing aspect of the banking system's transformation is defined by changes in the spheres and mechanisms of creating added value and the specific nature of the demand for financial services, which is manifested in the following:

New digital financial instruments and services are capable of more effectively meeting even the smallest needs of participants in financial relations - consumers of financial services, which forms a

source of additional value. For example, blockchain-based tokens allow for the implementation of smart contracts, [28]. Their value can be realized both for existing participants and for new ones, currently attracting them to the value creation system, which forms an "explosive" effect of platform expansion. Additional value can be created through the convergence of the characteristics of different financial products through organizational and/or marketing tools. Different areas where additional value can be formed during the digital transformation of the financial and credit subsystem are presented in Table 2 (Appendix).

In the financial digital space, companies can increase their profits by enhancing the value of financial products through changes in their characteristics (typically by adding features or services, as in Table 1, Appendix). Or, they can do so by expanding their product range through the development and implementation of additional products and services, which occurs during the financialization of non-financial companies and the universalization of financial organizations. According to the bipolarity of the digital transformation processes in the banking system, universalization is implemented in two directions: on the one hand, financial organizations expand their range of financial services, entering the market

Universalization is the diversification of the range of products and financial services, carried out both independently and with the involvement of external partners (within the framework of an ecosystem), [29].

The goal and method of generating profits for banks and financial companies in the financial digital space is to satisfy as many customer needs as possible by offering them the maximum number of various products and financial services. Maximizing the coverage of consumer needs is achieved by analyzing a large amount of data about consumers from all available sources (including social networks), which allows for identifying and predicting the maximum number of customer needs with the highest possible probability and offering the most acceptable way to meet them.

An important value characteristic of modern digital financial services is convenience and accessibility, which becomes a significant advantage when consumers choose them. Therefore, the goal of digital financial companies is to make financial services and products as accessible and convenient as possible for consumers, who can use them with minimal effort and cost.

For instance, this is particularly evident in digital payment services, whose accessibility makes them comparable to traditional cash, which requires no special training, additional interaction with a financial institution, or additional operations (unlike bank transfers that involve lengthy form filling and bank cards with PIN codes). Digital payment services now offer a high level of convenience: to make a payment, it is sufficient to hold a smartphone up to a terminal or enter the recipient's phone number. Moreover, in some cases, these services can be even more convenient than cash, as the payment can be automatically debited from the customer's account after identification at the payment point.

Increasing the creation of added value is the basis for expanded reproduction and a source of economic development for the country. Therefore, in this case, digitalization serves as a tool that ensures better performance of the banking system's production and redistribution functions. In fact, banks are transforming towards minimizing the time and effort required for customers to acquire and use financial products in the financial-digital space, which increases the profits of institutions and organizations not only by reducing transaction costs and increasing sales volumes but also through financial inclusion and the digitization of the smallest financial services, as well as through a significant acceleration of transaction processing and capital turnover. The striving for maximum convenience and accessibility of products determines the main directions of further modernization of financial services and methods of their provision, as well as the mechanisms for conducting operations in capital markets.

The trend of universalization requires the growth of a cloud of related services around the financial institution, re-coordination requires the improvement of the management of the interaction of participants in financial relations in capital markets, and comprehensiveness and virtualization as a specificity of the network economy for creating additional value creates the need to attract new participants. Therefore, in the conditions of the financial-digital space, the business models of financial institutions often evolve into platforms (platforms for the interaction of participants in capital markets) and ecosystems (clouds of related services around the base company). In fact, an ecosystem is a type of platform, since it provides interaction between users, on the one hand, and providers of related services, on the other hand, and

this interaction is coordinated by the company - the owner of the platform or a specific product. The FinTech ecosystem consists of startups, financial institutions, investors, and state enterprises. For example, the partnership between Bank of America and the Zelle money transfer program has made it easier for bank customers to send and receive money from relatives, friends, and acquaintances.

An example of ecosystem formation is the issuance of installment credit cards, around which a kind of ecosystem is formed, consisting of a network of merchants connected to this service who provide interaction between the owners of these cards and providers of certain goods and services. Consumer choice in favor of such cards will largely be determined by the quality of this ecosystem. Such an ecosystem is currently being formed, for example, by Oschadbank. Moreover, its ecosystem goes far beyond financial services - it covers a number of non-financial services, such as access to a platform for conducting tenders for the procurement of goods and services for state and municipal needs, services of its own telecom operator, etc. This is how the trend towards the universalization of the activities of banks and financial institutions manifests itself in the modern financial-digital space.

To assess the further development of digitalization processes and the possibility of their impact on increasing the potential of financial relations, it is necessary to assess the state of financial support for these processes. The potential for increased added value that digitalization brings to the banking system makes digital financial technologies quite attractive areas for investment and lending. However, the high interest rates of the current stage of economic development are hindering this process. If the potential of the banking system is insufficient to finance digitalization, this may actualize the search for other sources of financing.

Materials and Methods For this research, we utilized a comprehensive array of sources. Our study was grounded in monographic research and the scholarly contributions of leading domestic and international experts on the challenges of scientific databases like Web of Science, Scopus, and Google Scholar. Additionally, we incorporated the results of our own research into the digitalization of the financial and banking sector.

To achieve our research objectives, we employed a combination of general scientific and specific methods and approaches, including abstract-logical methods (such as analysis, synthesis, induction, and deduction) to formulate our research goals and objectives; analytical-monographic methods to review information sources, clarify key concepts and categories, and examine domestic and foreign experiences; and systems analysis to holistically understand the research object and comprehensively analyze the relationships between elements within a specific problem. To determine the potential for Ukrainian banks to increase their capacity to finance the development of the digital space, we used analytical methods and causal relationship analysis. By employing modeling, comprehensive analysis, and generalizing the results of scientific research and practical experience, we drew conclusions about the prospects for further increasing this potential.

Ukraine was selected as our research focus due to its unique position of facing a military conflict with Russia while simultaneously demonstrating high rates of digitalization, ranking among the top five countries with the most advanced digital technologies. The use of digital communication tools has become a catalyst for the development of its banking sector, as consumers of banking services often have limited access to physical bank branches. The information basis for our calculations was data on the overall state of the banking system obtained from the official website of the National Bank of Ukraine, as well as publicly available data from the websites of individual banks such as Credit Agricole, Ukrsib, PrivatBank, Oschadbank, and PUMB.

In Ukraine, it is challenging to determine the exact amount of funds allocated to the digitalization of financial relations due to the absence of specific expenditure items in statistical data on capital investments. Therefore, for our analysis, we selected two capital investment expenditure items that could potentially finance the FinTech sector: 1) "Computer programming and provision of other financial services"; and 2) "Financial and insurance activities". The correlation coefficient between these two items was 0.87.

In the course of researching the components of successful FinTech sector development, we utilized EY's framework, specifically the 'Classic' assessment methodology, which is based on a combination of the following components: talent, capital, government policy, and demand. Research results led us to conclude that the lion's share of financing for the digitalization of the financial sector comes from loans and credits. Based on this conclusion, this article also focuses on assessing the potential of the domestic banking system to finance digitalization processes."

"When assessing the banking system's potential to provide investment and develop a digital space within financial relations, we used specific indicators of the banking system's financial stability as a basis for these calculations: liquidity, profitability, and capital adequacy. These indicators characterize the ability to ensure the efficient functioning of the banking system and allow us to assess its financial potential. For example, liquidity reflects the ability of banks to fully and timely fulfill their obligations to depositors and creditors. The main liquidity indicators are the liquidity coverage ratio in all currencies (LCRвв) and in foreign currencies (LCRів), which, according to the NBU's requirements since 2019, must be 100%. The indicator "profitability" assesses the banks' ability to generate net profit. The capital adequacy ratio indicates the margin of financial strength of the banking system. The potential of the banking system to finance is also influenced by the efficiency of business operations, which is characterized by the CIR (%) indicator - the ratio of operating expenses to operating income for the reporting period. If the CIR is more than 100%, it indicates a loss-making operation. An acceptable value in the banking sector is considered to be up to 50%.

To assess banks' capacity to accumulate financial potential that can be directed towards investing in the digitalization of financial relations, a model was proposed where the target indicator is the CIR. The target value of CIR was determined based on a positive change in the business activity index. The model's parameters included certain conditions and constraints (Table 3, Appendix).

$$f(cir) = \frac{\sum_i^m OI}{\sum_i^m OE}$$

As $\sum_i^m OI$ – perating income by activity type for a specific period; $\sum_i^m OE$ – Operating expenses by category and item for a specific period.

The analysis using Excel's Solver function (Figure 1) revealed that some major Ukrainian banks, such as Credit Agricole, PUMB, and Oschadbank, may face challenges in meeting the model's requirements, [30]. This suggests that these banks may need to improve their financial performance or adjust their investment strategies to allocate more resources to digitalization.

Digital transformation is one of the EU's top priorities. The European Parliament is helping to shape policies that will strengthen Europe's potential for new digital technologies, create new business opportunities, deliver the European Green Deal and achieve climate neutrality by 2050, promote the development of digital skills among citizens, and help digitize public services while ensuring respect for fundamental rights and values. The main measures of this policy are outlined in the EU's Digital Europe Programme (2021-2027), which aims to shape the digital transformation of European society and economy, benefiting everyone - from individuals to businesses, organizations, and public institutions. The program covers five specific objectives.

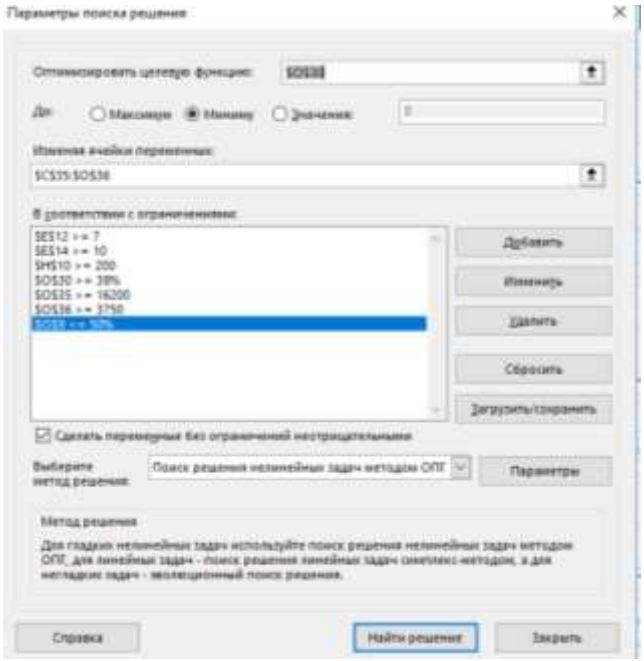

Fig. 1: CIR modeling with the help of the “Solution Finder” application (fragment)

The financial package for the implementation of the program for the period from 1 January 2021 to 31 December 2027 will amount to €7,588,000,000. The Digital Europe Programme, in addressing these challenges, co-funds the implementation of other EU programs, such as the Horizon Europe program for research and innovation, [31].

In foreign countries, the dominant share of financing the digitization of the financial sector is through loans and credits, and in such countries as Germany, Hong Kong, Singapore, and the city of New York (USA), credits are generally decisive (Figure 2, Appendix).

It has been established that by 2020, the growth of capital investments in computer programming and financial activities was observed in Ukraine. At the same time, compared to global sectors, total investment amounted to 213.38 million pounds in

2015 (National Bank of Ukraine (NBU) exchange rate on 12.31.2015 - 35.533), which was 7.7% higher than in Australia and 45% lower than Germany, [32]. As can be seen from the given graph (Figure 3, Appendix), the last 2 years have seen a decrease in the pace of domestic financing, which is due to the fact that most fintech companies worked for foreign customers.

In terms of the financing structure, the introduction of the digital space into financial relations differs significantly from foreign practices (Figure 4, Appendix): the main source of financing is own funds, while credits and loans account for 0.1% (in 2021, due to military actions, the data are not made public).

The declining trend and limited availability of internal sources of financing for capital investments highlight the need to study the potential of the financial and credit subsystem in terms of providing investment and developing a digital space in financial relations.

Research into the liquidity trends of Ukraine's banking system, based on an analysis of the overall level of liquidity in the banking system and individual banks (five leading banks with different ownership structures were analyzed), has demonstrated a high level of liquidity. In recent years, LCR ratios have significantly exceeded the regulatory threshold, and the share of highly liquid assets accounts for almost 46% of net assets, indicating sufficient accumulated financial resources in the banking system, [32].

The analysis results indicate that the LCR ratios in all the analyzed banks exceed the regulatory requirement by a factor of two to three. State-owned banks (Oschadbank in 2022 and Privatbank in 2023), [32] demonstrate a high level of accumulation of liquid assets in all currencies. Banks with foreign capital (Credit Agricole and Ukrsibbank), [33] have smaller pools of liquid assets in Ukraine, but there is a tendency for them to increase. Private PUMBs have a sufficient level of highly liquid assets, but they are more concentrated in foreign currencies, [32]. It is important to note that the tendency to focus on foreign currency liquid assets is observed in all banks, regardless of ownership structure. The high level of liquidity of the banking system indicates the availability of resources for financing the development of the digital space and its implementation in financial relations.

The effectiveness of banks' use of available resources is reflected in their profitability, as evidenced by ROE (Return on Equity). Data shows that during the recent period of martial law, state-owned banks (PrivatBank, Oschadbank) have demonstrated a decrease in profitability, both in terms of individual bank dynamics and in comparison with the average indicators for the Ukrainian banking system. The reason lies in the increase in the negative amount of accumulated profit. Other analyzed banks have a margin of almost three times (PUMB, Ukrsibbank) and 9.8 times (Credit Agricole) higher than the sector's average ROE (Figure 5, Appendix). This indicates a sufficiently high ability of banks to generate net profit and, accordingly, improve the financial support for the processes of digitalizing financial relations.

Thanks to high profits in 2023, banks have been increasing their capital, as a result of which the regulatory capital adequacy ratio for the studied banks exceeds the regulatory values by 2-10 times, [32]. According to the NBU, the weighted average ratio of core capital adequacy in 2023 amounted to almost 15%, and regulatory capital adequacy - more than 25%. The core capital adequacy ratios of financial institutions, which own more than two-thirds of the sector's assets, exceed 12% (regulatory value - 7%). This also indicates a high capacity of the banking sector to increase the potential of financial relations. Banks with foreign capital (Credit Agricole, Ukrsibbank) have a particularly significant margin of financial strength, while state-owned banks have the lowest financial strength and a negative trend of decreasing corresponding indicators.

According to the results, banks with foreign capital, particularly PrivatBank, exhibit the best performance in terms of business efficiency (CIR). Overall, the dynamics of CIR are quite volatile only for Oschadbank, while other banks demonstrate a practically stable efficiency trend of up to 50%, which positively impacts the growth of the banking system's financial potential.

Modeling results using Excel's "Solver" function have shown that, in order to achieve the target business efficiency indicator while meeting all conditions and constraints, banks need to increase their operating income by 1.5 to 2 times while simultaneously restraining costs (Figure 6, Appendix).

However, in reality, all the analyzed banks currently demonstrate a sufficient level of operational efficiency for further increasing their financial potential.

Thus, the analysis of liquidity indicators, profitability, compliance with capital adequacy standards, and business efficiency of Ukrainian banks indicates a sufficiently stable state of their

financial provision, primarily for private banks and banks with foreign capital. The accumulated financial potential, with the preservation of positive trends towards its increase and limited profitability of investment directions (except for the government securities market), can be invested in the digitalization of financial relations, which, on the one hand, corresponds to the general logic of the development of the financial and digital space, and on the other hand, requires appropriate incentives and risk reduction in Ukraine.

4 Conclusion

The key role of innovations at all levels and aspects of the digital transformation of the banking system creates a powerful synergistic impulse that becomes the basis for strengthening its stimulating role in economic development. The source of added value in the process of digitalizing banking services is the combination of several financial services within a combined financial product, supplementing a financial product/service with a tool from another (non-financial or non-economic) industry. The goal and method of generating profits for a bank in the financial and digital space is to satisfy as many customer needs as possible by offering them the maximum number of various products and financial services. Maximizing the coverage of consumer needs is achieved through the analysis of a large amount of consumer data from all available sources, which allows for identifying and predicting the maximum number of customer needs. An important value characteristic of modern digital financial services is convenience and accessibility. Therefore, the goal of digital financial companies is to make financial services and products as accessible and convenient as possible for consumers, who can use them with minimal effort and cost.

The trend towards universalization requires banks to build up a cloud of related services around them, and re-coordination requires improved management of the bank's interaction with these services. Therefore, in the context of the financial and digital space, bank business models often evolve into platforms and ecosystems.

Combining traditional forms and methods of providing financial services with digital ones ensures financial inclusion and provides additional sources of value creation for extended reproduction and accelerated economic growth.

To fully utilize this stimulating potential, a corresponding adjustment is needed for such a component of the financial system as financial policy in terms of updating the forms and methods adequate to the specifics of fintech companies' activities and new methods of providing digital financial products and services. This will allow for the expansion of the financial foundation of economic development by more fully satisfying the needs of economic entities in financial resources.

An assessment of the state of the domestic banking system's potential has shown that the latter has accumulated financial resources and sufficient financial potential to ensure the processes aimed at developing the digitalization of financial relations in Ukraine. This is evidenced by the dynamics of LCR (The liquidity coverage ratio is the ratio of high-quality liquid assets of the bank to the amount needed to cover the increased outflow of funds from the bank within 30 days) indicators, return on equity, profitability, business efficiency, and compliance with capital adequacy standards of the studied system-forming banks.

The conducted modeling regarding the ability of banks to further accumulate financial potential, taking into account the business expectations index, changes in operating income and expense regulation, and considering the need to comply with regulations, confirmed a high level of such capacity, particularly in such banks as the system-forming PrivatBank, Credit Agricole, and Ukrsibbank. Thus, Ukraine has prospects for increasing the financial potential for the development of the digital space through bank capital. To use it for digitalization purposes, appropriate conditions need to be formed, primarily maintaining financial stability and developing a system of state incentives and guarantees for investment during periods of high wartime risks.

In our opinion, the key directions for further scientific and practical research and research in the research area are 1) the development of methods for managing financial risks and their formalization in the bank’s internal documents. This will require the creation of strategic risk maps that will ensure that the interests of providers of banking services and output information are balanced; 2) research and recommendations to maximize the use of digitalization opportunities by banking institutions, for the creation of “near field” banking services for residents. This will allow the expansion of flows and increase the efficiency of banking products.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work the authors used the Gemini 2.0 Flash service to improve the language level of the article and to check grammar to increase the readability of the text and simplify complex scientific expressions. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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APPENDIX

Table 1. Aspects of Digital Transformation of the Banking System

Technological Aspect	Organizational Aspect	Marketing Aspect
Virtualization of financial organizations Intelligent automation, Distributed ledger technology	Re-coordination	Additional utility. Universalization. Ubiquity. Usability

Source: [22]

Table 2. Areas of Additional Value Creation in the Banking System in the Financial-Digital Space

Area	**Essence of the Mechanism**	**Example**
Additional utility within the financial sphere	Supplementing a financial product/service with another financial product/service (i.e., combining several financial services within a combined financial product)	Credit cards that serve simultaneously as a payment instrument and a credit instrument
Additional utility within economic relations	Supplementing a financial product/service with a tool from another (non-financial) sphere of economic relations	Crowdfunding, which, depending on its implementation model, can be not only a tool for attracting financing but also a tool for market analysis, pre-sales of a product, product promotion, etc.; installment cards that can be used as loyalty cards
Additional utility beyond economic relations	Supplementing a financial product/service with a tool from another (non-economic) sphere of social interactions	Ethereum tokens, which are not only a cryptocurrency but also the basis for "smart" contracts

Source [28]

Table 3. Specific Indicators and Conditions for Their Use in Modeling the Ability to Accumulate Banking Financial Potential

No.	Model Indicator	Condition of Use
1	CIR*,%	Not more than the average value for the last 12 months
2	Operating income, mln UAH	Not less than the maximum value for the last 12 months
3	Operating expenses, mln	Not less than the average value for the last 12 months
4	ROE,%	Not less than the January 2024 indicator (minimum compared to 2022-2023)
5	Minimum capital adequacy ratios: H1, млн. UAH	200
6	Minimum capital adequacy ratios: H2, млн.грн	10
7	Minimum capital adequacy ratios: H3, млн.грн	7

** CIR - the ratio of operating expenses to operating profits for the reporting period.*
Source, [30]

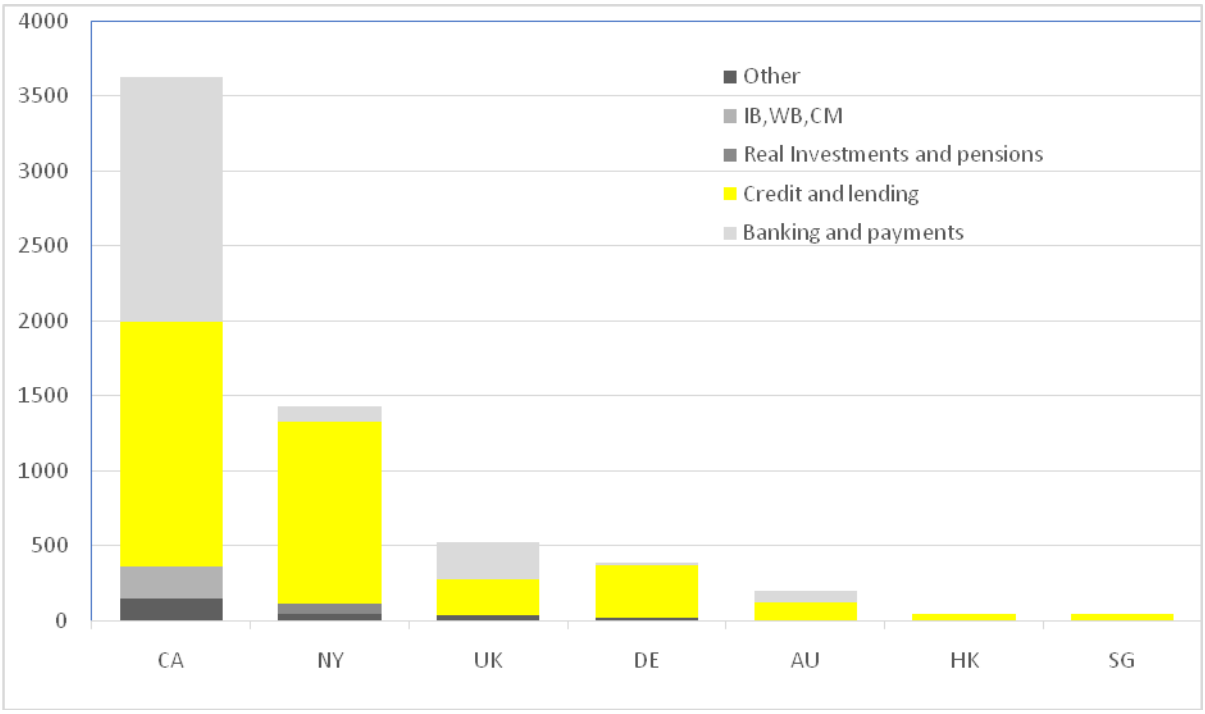

Fig. 2: FinTech funding structure by global region, million pounds sterling, 2015
Source: Eurostat, [31]

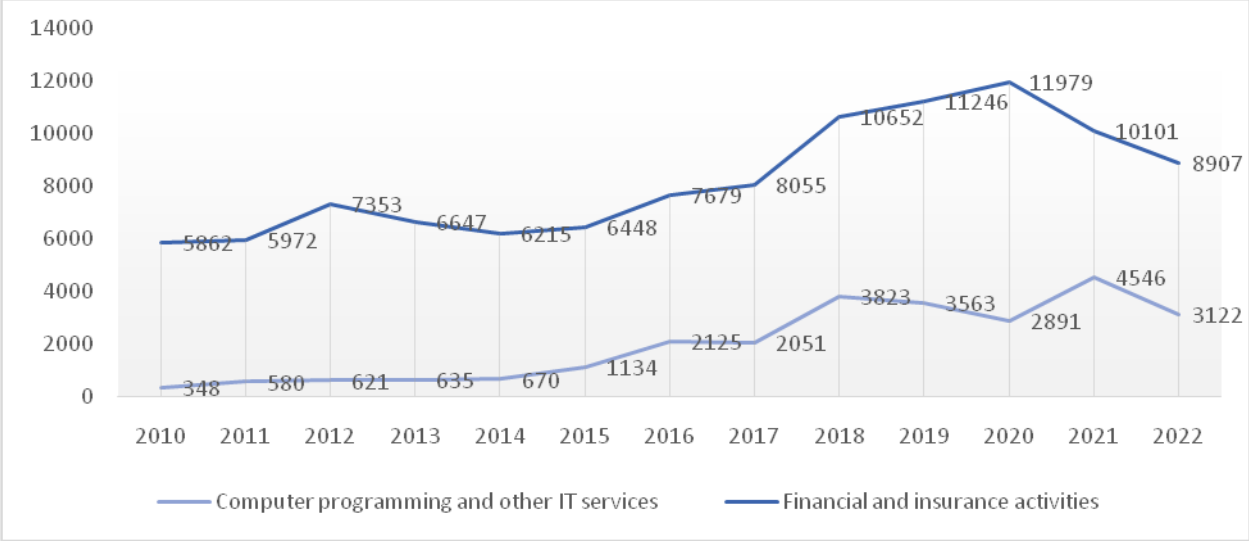

Fig. 3: Dynamics of capital investments by types of economic activity in Ukraine (excluding the occupied territories), UAH million
Source: official websites of National Bank of Ukraine, [32]

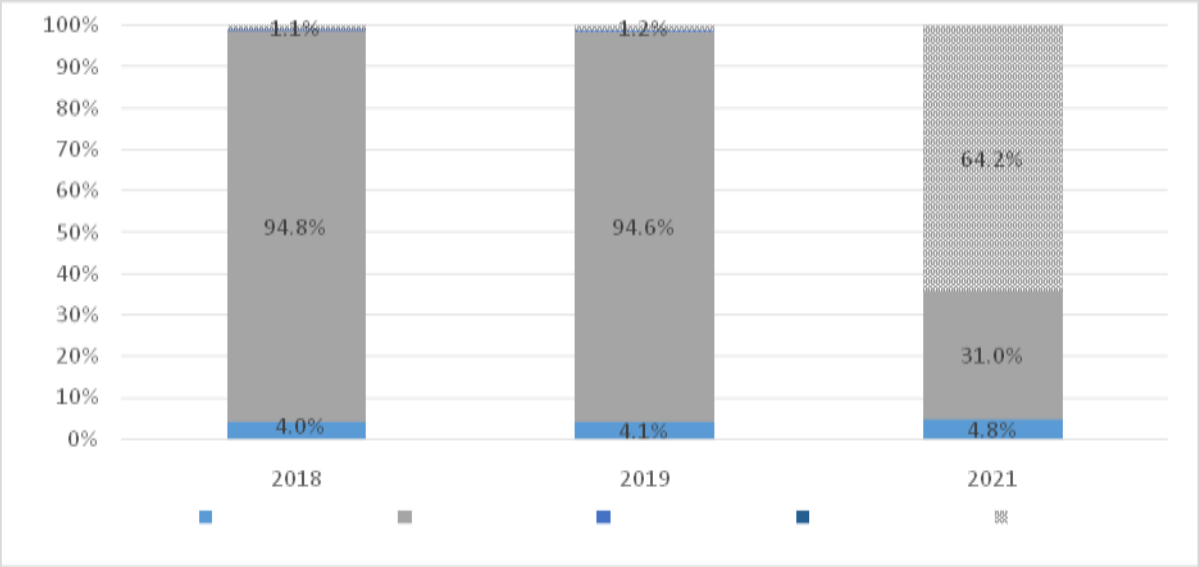

Fig. 4: Dynamics of the structure of financing the introduction of digital space in the financial relations of Ukraine (excluding the occupied territories)
Source: official websites of National Bank of Ukraine, [32]

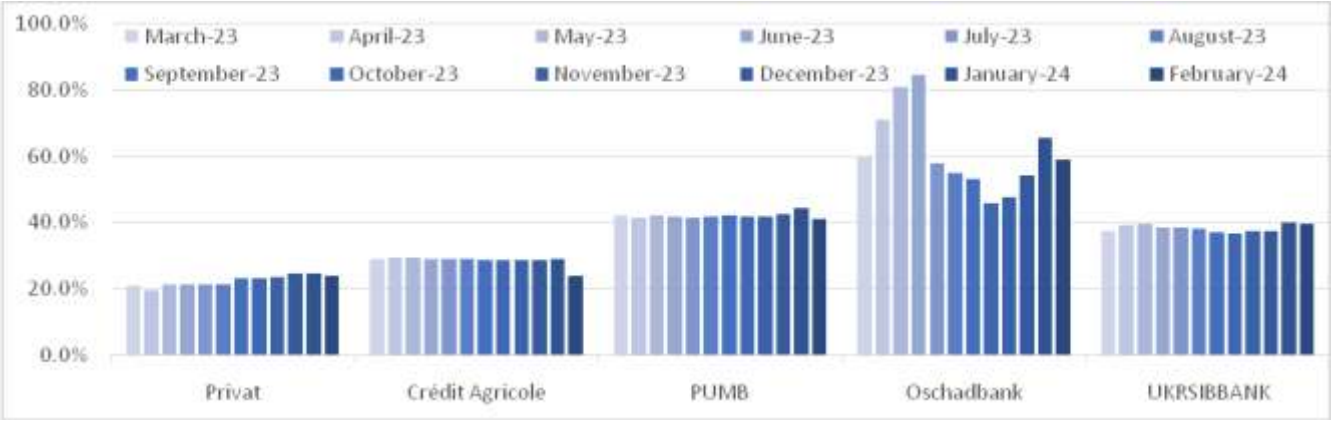

Fig. 5: Dynamics of business efficiency (CIR) by individual systemic banks
Source: official websites of National Bank of Ukraine, [32]

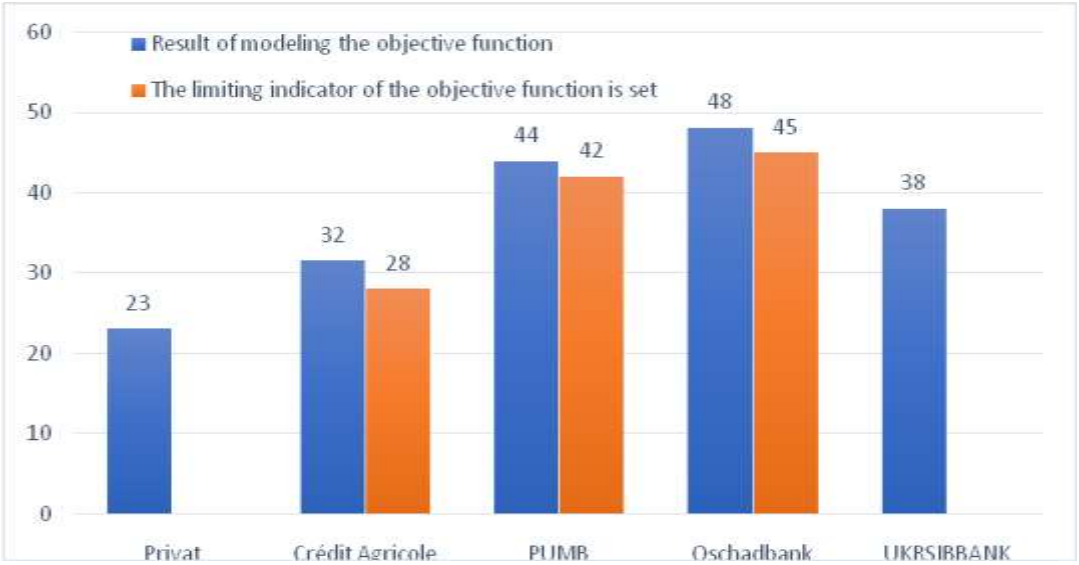

Fig. 6: Comparison of modeling results of the CIR,% indicator with its limiting target value for individual systemic banks
Source: official websites of National Bank of Ukraine, [32]

Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

The authors equally contributed in the present research, at all stages from the formulation of the problem to the final findings and solution.

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Conflict of Interest

The authors have no conflicts of interest to declare.