Odesa Polytechnic National University
University of Portsmouth
UK-Ukraine Twinning Grants Scheme

Project UUT23

«Fintech as a fence for the shock and fuel for the recovery? Lessons from the war.»

ANALYTICAL RESEARCH

DEVELOPMENT OF "EMBEDDED BANKING FINANCIAL TECHNOLOGIES" (DIGITAL FINTECH)

Odesa, 2023

Національний університет «Одеська політехніка»
Університет Портсмута
Грантова ініціатива заради партнерства між Великою Британією та Україною

Проєкт UUT23

«Фінтех як призма для оцінки шоку або паливо для відновлення? Висновки впливу війни»

АНАЛІТИЧНЕ ДОСЛІДЖЕННЯ

РОЗВИТОК "ВБУДОВАНИХ БАНКІВСЬКИХ ФІНАНСОВИХ ТЕХНОЛОГІЙ" (DIGITAL FINTECH)

м. Одеса, 2023 р.

Olena Kovalova, Svitlana Filyppova, Oleksandr Malin, Jianan Lu, Alexis Stenfors, Konstantinos Vergos, Michail Filippidis, Jocelyn Zhang (2023). Development of "embedded banking financial technologies" (DIGITAL FinTech) : Analytical research. Odesa-Portsmouth: Odesa Polytechnic; University of Portsmouth, 25 p.

Olena Kovalova
Associate Professor, PhD in Economics, postdoctoral fellow
Odesa Polytechnic National University, Odesa, Ukraine
Institute of Economics and Management,
Department of Accounting, Analysis and Audit
E-mail: o.m.kovalova@op.edu.ua
ORCID: 0000-0002-2080-1150

Svitlana Filyppova
Professor, DEcon,
Odesa Polytechnic National University, Odesa, Ukraine
Director of Institute of Economics and Management
E-mail: s.filyppova@op.edu.ua
ORCID: 0000-0001-9618-1640

Oleksandr Malin
Professor, DEcon,
Odesa Polytechnic National University, Odesa, Ukraine
Institute of Economics and Management,
Department of Accounting, Analysis and Audit
E-mail: malin.o.l@op.edu.ua
ORCID: 0000-0003-2113-6014

Jianan Lu
Research Fellow, School of Accounting,
Economics & Finance/ Faculty of Business & Law,
University of Portsmouth, Portsmouth, the UK
Email: jianan.lu@port.ac.uk
ORCID: 0000-0001-5708-0628

Alexis Stenfors
Reader, School of Accounting,
Economics & Finance/ Faculty of Business & Law,
University of Portsmouth, Portsmouth, the UK
Email: alexis.stenfors@port.ac.uk
ORCID: 0000-0002-1266-7051

Konstantinos Vergos
Senior Lecturer, School of Accounting,
Economics & Finance/ Faculty of Business & Law,
University of Portsmouth, Portsmouth, the UK
Email: konstantinos.vergos@port.ac.uk
ORCID: 0000-0002-2498-0379

Michail Filippidis
Lecturer, School of Accounting,
Economics & Finance/ Faculty of Business & Law,
University of Portsmouth, Portsmouth, the UK
Email: michail.filippidis@port.ac.uk
ORCID: 0000-0002-4747-564X

Jocelyn Zhang
Senior Teaching Fellow, School of Accounting,
Economics & Finance/ Faculty of Business & Law,
University of Portsmouth, Portsmouth, the UK
Email: jocelyn.zhang@port.ac.uk
ORCID: 0000-0001-6346-4513

Acknowledgement:

This project was made possible through the UK-Ukraine R&I twinning grants scheme, funded by Research England with the support of Universities UK International and UK Research and Innovation

Олена Ковальова, Світлана Філиппова, Олександр Малін, Джіанан Лу, Стенфорс Алексіс, Вергос Константінос, Міхаіл Філіппідіс, Джослін Чанг. Розвиток "вбудованих банківських фінансових технологій" (DIGITAL FinTech) : Аналітичне дослідження. Одеса-Портсмут: Одеська політехніка; Університет Портсмуту, 2023. 25 с.

Олена Ковальова
доцент, кандидат економічних наук, докторант
Національний університет «Одеська політехніка», Одеса, Україна
Інститут економіки та менеджменту, кафедра обліку, аналізу і аудиту
E-mail адеса: o.m.kovalova@op.edu.ua
ORCID: 0000-0002-2080-1150

Світлана Філиппова
професор, доктор економічних наук
Національний університет «Одеська політехніка», Одеса, Україна
Директор Інституту економіки та менеджменту
E-mail адеса: s.filyppova@op.edu.ua
ORCID: 0000-0001-9618-1640

Олександр Малін
професор, доктор економічних наук
Національний університет «Одеська політехніка», Одеса, Україна
Інститут економіки та менеджменту, кафедра обліку, аналізу і аудиту
E-mail адеса: malin.o.l@op.edu.ua
ORCID: 0000-0003-2113-6014

Джіанан Лу
Науковий співробітник, Школа Обліку, Економіки & Фінансів/ Факультет Бізнесу та Права, Університет Портсмута,
Портсмут, Велика Британія
Email: jianan.lu@port.ac.uk
ORCID 0000-0001-5708-0628

Стенфорс Алексіс
Лектор Школи Обліку, Економіки & Фінансів/ Факультет Бізнесу та Права, Університет Портсмута,
Портсмут, Велика Британія
Email: alexis.stenfors@port.ac.uk
ORCID: 0000-0002-1266-7051

Вергос Константінос
Старший викладач Школи Обліку, Економіки & Фінансів/ Факультет Бізнесу та Права, Університет Портсмута,
Портсмут, Велика Британія
Email: konstantinos.vergos@port.ac.uk
ORCID: 0000-0002-2498-0379

Міхаіл Філіппідіс
Викладач Школи Обліку, Економіки & Фінансів/ Факультет Бізнесу та Права,
Університет Портсмута,
Портсмут, Велика Британія
Email: michail.filippidis@port.ac.uk
ORCID: 0000-0002-4747-564X

Джослін Чанг
Старший науковий співробітник Школи Обліку, Економіки & Фінансів/
Факультет Бізнесу та Права, Університет Портсмута,
Портсмут, Велика Британія
Email: jocelyn.zhang@port.ac.uk
ORCID: 0000-0001-6346-4513

Визнання:

Цей проєкт був здійснений завдяки програмі грантів для партнерства між Великою Британією та Україною у сфері наукових досліджень і розвитку, що фінансується Research England за підтримки Universities UK International та UK Research and Innovation.

Introduction

Innovative development is one of the key conditions for the competitiveness of any business. Banking activity requires prompt investments in R&D for maintaining a competitive position among various financial service providers. That is why the task of winning and retaining customers by offering innovative financial products and services is becoming a priority in the context of the transformation of economic processes and approaches for doing business in line with the demands of the economic environment.

Financial technologies are fundamentally changing the financial services market as a result of the innovative impact of digitalisation. Digitalisation has set a precedent not only for improving the procedure for providing financial services, but also for creating new products and business niches for both traditional financial services intermediaries and FinTech companies, which are rapidly gaining popularity by developing easy and affordable solutions to relevant problems in real and financial sectors of the national economy.

Based on the active introduction of innovative financial technologies in the banking segment, it is necessary to consider the peculiarities of integrating financial products and services into the client offers of non-financial companies, which take the form of embedded banking financial technologies.

Problem statement

The Covid-19 pandemic was one of the drivers of the active transition to using non-cash payments and the solution of most tasks in a remote format, which became possible with the use of embedded financial technologies. The banking segment of services was no exception, as most consumers of financial products pursued to use of services that allowed them to solve the following tasks:

- make contactless payments, which reduced cash turnover and minimised contact with payment terminals;
- receive remote support from a banking institution under quarantine restrictions;
- use banking mobile applications that solve a wide range of issues without the need to physically visit a commercial bank branch.

For their part, commercial banks have been able to use embedded financial technologies to optimise and automate payment processing, risk analysis, and other operations. However, the transition to remote banking has also increased the risk of disruption due to the growing number of cyberattacks and fraud, which has challenged the stable functioning of the banking system and necessitated the development of new data and information security protocols in a turbulent economic environment.

The introduction of martial law in Ukraine on 24 February 2022 posed a new challenge both for the economy as a whole and for the resilience of the banking system. The continuous development of financial technologies, despite the impact of the war, allowed the financial system to reach the below goals:

- to test the use of embedded banking services for the category of Ukrainians who were forced to leave their place of residence due to the military conflict by using the Diia platform to receive financial support from the state in organisational and technical partnerships with a number of commercial banks;

- to establish remote service processes for Ukrainians who have left Ukraine due to the spread of the military conflict and the danger even in large cities due to constant rocket attacks and blackouts in the energy system in the autumn and winter months;

- to find new niches for integration of embedded banking financial services for maximising the profitability of banking system players and maintaining the competitive position in the financial services market.

Given the situation for the development of embedded banking financial technologies in Ukraine, it is necessary to study in more detail the peculiarities of the functioning of providers in the market environment for clarifying the range of current problems of the subjects and develop recommendations for their elimination in order to maximise the positive effect of the use of FinTech for the national economic system.

Analysis of recent research and publications

At the legislative level, promising areas of development and indicators for achieving a set of goals in the FinTech sector were outlined in the Strategy for the Development of FinTech in Ukraine until 2025, which was approved by the National Bank in July 2020 [1]. This document contains a detailed description of the prerequisites, goals, steps, and expected results of the implementation of measures focused on a developed cashless economy, high level of digital and financial literacy, and the formation of a sustainable FinTech ecosystem. Along with identifying the range of tasks in the area of financial technology development, the regulator approved the Strategy for the Development of the Financial Sector of Ukraine until 2025, which contains directions for improving the service delivery environment – the financial sector of Ukraine and a vision of the transformation of key players in the financial ecosystem [2].

An overview of the leading trends in FinTech, including embedded banking financial technologies, was conducted in the works of domestic scientists [3, 4, 5, 6, 7, 8, 9, 10, 11], that allowed to clarify the essence and specifics of these categories. The peculiarities of FinTech development under martial law were studied in articles [12, 13], that created a platform for assessing the practice of introducing innovative financial technologies into banking during a full-scale war.

The issues of development and implementation of FinTech in the banking segment of the financial services market are considered in the articles of foreign economists: [14, 15, 16], that created the basis for comparing the patterns of development of the digital economic environment in Ukraine and the world.

During the study, attention was paid to several analytical reports from the National Bank of Ukraine [17], Capgemini and Efma [18], and KPMG [19], which made it possible to structure promising areas for the development of embedded banking financial technologies in Ukraine.

The analysis of scientific papers and analytical materials shows that it is expedient to study the peculiarities of the development of embedded banking financial technologies in Ukraine under martial law, given the radical change in business processes and the outlook of the population, as well as the digitalisation of the financial services market.

Identification of previously unresolved parts of the overall problem

This study focuses on clarifying the peculiarities of the development of embedded banking financial technologies under martial law. It is necessary to investigate what key obstacles commercial banks face in the process of innovative renewal of financial services in the FinTech space. This can serve as the basis for creating vectors for the development of embedded banking financial technologies and gaining potential competitive advantages from improving certain processes by all sides of economic relations: customers, businesses, and financial service providers.

The main part

The development of innovative FinTech products is rapidly spreading among economic entities operating in the financial and non-financial sectors. The main drivers of growth in innovative financial technologies investment include:

- the growing pace of digitalisation in all niches of the market economy;
- expansion of Internet coverage and high-speed access to the Internet;
- increased competition for consumers of financial services;
- increasing consumer requirements for the convenience of using and conducting financial transactions through mobile and internet banking applications;
- growing consumer demands for the level of available services in the financial services market;
- the growing need for the availability of transparent information in the financial services market regarding providers and financial products;
- the need for advanced financial services, which is due to the transformation of the economic system under the influence of current market challenges;
- the rapid adaptation of technological giants to consumer demands, which encourages them to transfer capital to related sectors of the economy to maximise profits, in particular, e-commerce;
- the intensive development of e-commerce platforms, which has been reinforced by quarantine restrictions since 2019 and the spread of the remote work trend among businesses of different types and sizes.

The intensification of FinTech development in Ukraine is confirmed by reports from the monetary market regulator, which monitors the growth of benchmarks in a number of areas in 2022 compared to 2021:

- the number of banking system clients serviced exclusively remotely, which indicates the effectiveness of established processes and protocols for online interaction with financial services consumers;
- the number of accounts opened in the banking system by both business entities and individuals;
- an increase in the amount of card-to-card transfers between individuals;
- the number of points of sale and service provisions that accept payment cards, including on the Internet;
- the number of contactless active payment cards;
- share of tokenised active payment cards;
- share of non-cash payments in the retail network;
- an increase in the average amount of one transaction in Ukraine both in the retail network and for payments for goods and services on the Internet;
- the number and amount of transactions using payment cards issued by Ukrainian banks;
- growth in the number and amount of non-cash transactions in Ukraine and abroad;
- an increase in the share of non-cash transactions using payment cards in Ukraine.

The identified trends are confirmed by the following analysis of the National Bank of Ukraine for 2021-2022, which is summarised in Table 1.

Table 1 – Benchmarks for enhancing FinTech development in the Ukrainian banking sector [20]

Benchmarks for assessing trends in FinTech development	2021	2022
1	2	3
1. Number of clients of the banking system, million people	72,2	79,4
1.1 Number of individual customers, million people – Number of individual customers that are exclusively on remote services, million people	69,3 44,2	76,3 51,7
1.2 Number of clients – business entities (including individual entrepreneurs), million entities – exclusively on remote services, million entities	2,9 (1,8) 2,3	3 (2) 2,4
2. Number of accounts in commercial banks, million accounts	142	160,2
2.1 Number of individual accounts, mln. – current accounts, mln. – deposit accounts, mln.	136,3 119,9 16,4	154,2 138,6 15,6
2.2 Number of accounts of business entities, mln. – current accounts, mln. – deposit accounts, mln.	5,6 5,5 0,07	6 5,9 0,05
3. Statistics on transactions using payment cards		
3.1 Number of transactions using payment cards, million transactions	5521,89	5599,2
3.2 Total amount of payment card transactions, bln UAH	3600,14	5058,2

Continuation of Table 1

1	2	3
4. Statistics on non-cash transactions in Ukraine and abroad		
4.1 Number of non-cash transactions in Ukraine and abroad, million transactions	4989,82	5194,4
4.2 Amount of non-cash transactions in Ukraine and abroad, bln UAH	2194,96	3443,9
5. Statistics on non-cash transactions with payment by cards		
5.1 Share of non-cash transactions with payment by cards in the total amount of transactions with payment cards in Ukraine, %.	60	69
5.2 Share of non-cash transactions with payment by cards in the number of all transactions with payment cards in Ukraine, %.	90	93
6. Share of non-cash payments in the retail network, %	6,3	19,1
7. Average transaction amount with cards in Ukraine: retail networks, transfers, and online payments		
7.1 Average amount per transaction in Ukraine in the retail network, UAH	231	290
7.2 Average amount of one card-to-card transaction in Ukraine, UAH	1552	2448
7.3 Average amount per transaction in Ukraine for payment for goods and services on the Internet, UAH	359	379
8. Number of points of sale and services that accept payment by card, including on the Internet, thousand points of sale	314,1	316,2
9. Statistics on active payment cards		
9.1 Number of contactless active payment cards, million cards	20,3	26,1
9.2 Share of tokenised active payment cards, %	16,3	17,1

The analysis presented in Table 1 allows us to conclude that the banking system has been able to withstand the challenges posed by the impact of martial law on the national economic system. This was made possible, firstly, by commercial banks' compliance with prudential standards set by the regulator; secondly, by an increase in the number and amount of transactions within the banking system. This thesis is confirmed by the reduction in the total number of operating commercial banks in 2022 by only 4 entities due to the exit from the market of both participants with Russian state capital and non-systemic banks that do not meet the current requirements of the regulatory framework (Table 2).

The above-mentioned players' withdrawal did not affect the change in the market structure by the defined groups of commercial banks in accordance with their ownership, which underlines the effectiveness of the current approaches to the stress resistance of the Ukrainian banking system.

Thus, the downward trend in the number of banking institutions shown in Table 2 is explained by the tightening of prudential requirements for professional market participants implemented by the NBU to ensure the financial stability of the national

economic system in the long term perspective. The requirements to increase capitalisation and clear the market of illiquid financial institutions helped to maintain the stability of the monetary segment of the financial market in the face of military aggression and financial system turbulence.

Table 2 – Analysis of the number of participants in the Ukrainian banking system in 2019-2022 [20]

Groups of banks	31.12. 2019	31.12. 2020	31.12. 2021	31.03. 2022	30.06. 2022	30.09. 2022	31.12. 2022
Solvent banks	75	73	71	69	68	67	67
- change	*-2*	*-2*	*-2*	*-2*	*-1*	*-1*	*0*
State-owned, including PrivatBank	5	5	4	4	4	4	4
- change	*0*	*0*	*-1*	*0*	*0*	*0*	*0*
Foreign	20	20	20	16	16	16	16
- change	*-1*	*0*	*0*	*-4*	*0*	*0*	*0*
Private	50	48	47	49	48	47	47
- change	*-1*	*-2*	*-1*	*+2*	*-1*	*-1*	*0*

Another important indicator of the banking system's resilience is the share of non-profitable loans in banks' portfolios that is a benchmark of stability in the economic system (Figure 1). The largest share of NPLs in the loan portfolios of Ukrainian banks is 42.9 % in the business lending segment as of 31.12.2022, which demonstrates insufficiently effective approaches to the valuation of loan assets and credit risk management. The average NPL ratio in the retail lending segment is 30.4%. Overall, in 2022, the share of NPLs in the banking system increased by 8.1 pp to 38.1%, including interbank loans.

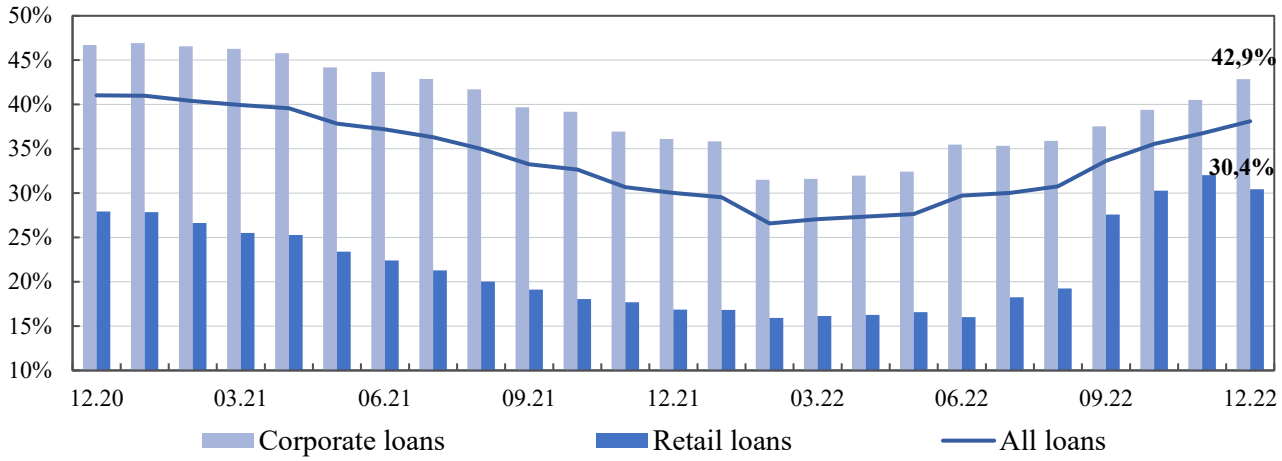

Figure 1 – Share of NPLs in bank portfolios [20]

Thus, the analysis illustrates an upward trend in the share of NPL loans in the loan portfolio structure, which exacerbates the issue of provisioning for non-performing assets.

Analysis of the share of NPLs by groups of commercial banks is presented in Figure 2. The maximum value was recorded among state-owned banks, in particular, at JSC CB PrivatBank.

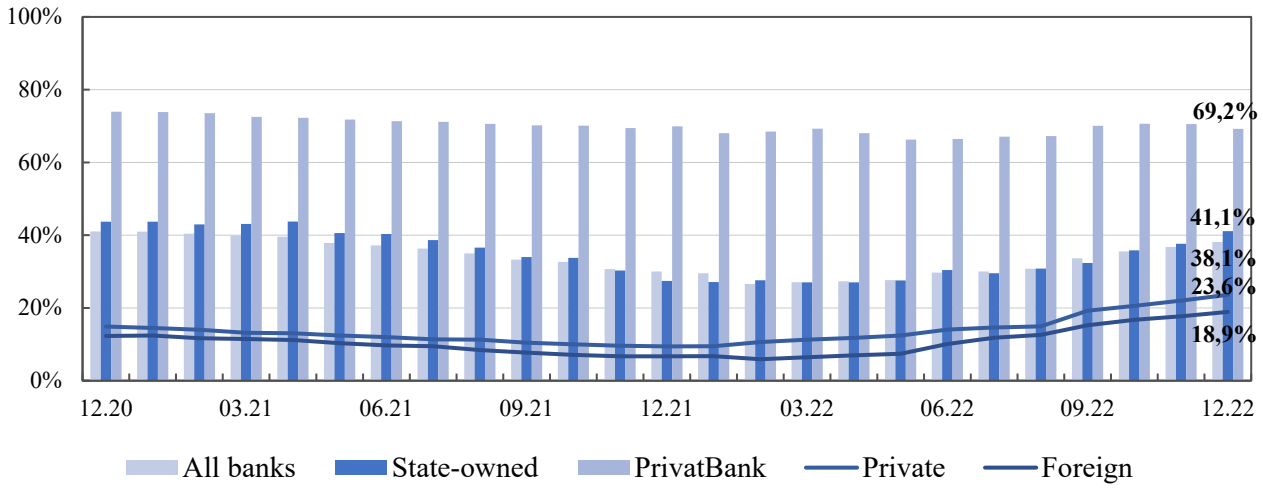

Figure 2 – NPL ratio across groups of banks [20]

In 2022, the share of NPLs increased significantly in state-owned banks (excluding PrivatBank) and foreign banks – by 14.2% pp and 13.7% pp, respectively.

However, despite the growing level of risks, which are mainly in the area of borrowers' loss of solvency and loan defaults, the volume and amount of settlements for other transactions of banking services consumers, including non-cash transactions, are gradually increasing. This is evidenced by the results of the regulator's study of the payment infrastructure and monitoring of the number of customers and bank accounts.

In search of new niches to generate profits and expand the range of services available, leading market players are increasing their investments in banking innovations.

The Law of Ukraine "On Innovative Activities" defines innovations as newly created (applied) and/or improved competitive technologies, products or services, organisational and technical solutions of a production, administrative, commercial or other nature that significantly improve the structure and quality of production or the social sphere [21].

Scholars propose to define the category of "banking innovations" as the end result of innovation in the banking sector, embodied in the form of a qualitative new or improved product or service sold on the market, or a new improved technological process used in practical banking activities, which increases the level of customer satisfaction, increases competitiveness and efficiency of activities from the point of view of "profit-liquidity-risk" and innovation development. Banking innovations are focused on creating a close connection between the bank and the consumer of financial services, quick access to products and services, which should affect the rapid growth of the number of services and customers, protection of information and data, and risk reduction [9, p.60].

The main directions of banking innovations include increasing automation of processes, deepening of bank-client relationships, and integration into new areas of

customer life in recent years [4, p.7]. The segment of embedded banking financial technologies (Embedded Finance) is located at the intersection of the presented vectors of banking innovation development.

Embedded finance can be defined as the integration of a financial service or product into the platform of a non-financial company, organisation or institution [14].

The Embedded Finance toolkit enables the integration of payments, payment cards, lending services, insurance services and platforms for the implementation of investment solutions in businesses engaged in financial and economic activities in both the real and financial sectors of the economy, including the active use of mobile applications and websites. In the narrow sense of this category, Embedded Finance can be viewed through the prism of cashless payments directly on the website of an online store or an electronic trading platform. One of the key advantages of embedded finance for consumers is the ability to make money transactions, receive products or services on a Buy-Now-Pay-Later (BNPL) basis, obtain insurance services, and build an investment portfolio through defined online applications and social networks that are separated from financial service providers. This direction of offering financial services to consumers creates a platform for maximising profits for commercial banks and financial companies, which is explained by low additional and related costs for promoting their products and creating their corporate and unique style. In fact, this eliminates a certain share of the costs of maintaining proprietary applications and apps, which optimises the costs of the financial services provider. Thus, the timely implementation of financial technologies that meet the challenges of time and the requirements of financial services consumers creates competitive advantages for players.

Leaders of banking system innovations have identified the development of financial technologies and embedded finance in their strategic documents for the near future. Thus, in accordance with the development strategy of JSC CB "Privatbank" that is a leader in the retail segment, it is planned to balance physical and digital services for retail and business customers: maximising customer engagement through the availability and convenience of financial technologies until 2024 [23, p.15]. The strategy envisages updating the user interface and its functionality, covering a range of tasks:

- focus on investments in digital innovations;
- simplification and improvement of UI/UX in the Privat24 app;
- development of embedded finance, which involves improving the LiqPay service to meet the expected growth in market demand for these services, using scaling to add new relevant and up-to-date services. Improving the Embedded Finance creates the basis for a refocus on an efficient and effective omnichannel distribution approach, which requires the growth of mobile and digital offers while reducing the influence of branches in the sales of financial services. This approach requires a client service model that focuses on product promotion and cross-selling to the existing customer base.

The development of embedded finance toolkit may inherently include a wide range of non-banking services to increase the profitability of a banking intermediary. This takes a commercial bank out of the traditional business and into the format of a financial supermarket. Although there is no legislative definition of a financial

supermarket, attention should be paid to clarifying the content of this category in the scientific literature. A financial supermarket should be considered as a way of providing various financial services to customers, taking into account their needs, through a single channel, under one brand by banking, insurance and investment companies in order to expand the range of services and gain a number of competitive advantages [10].

Financial supermarket can be seen as a financial services market provider that combines in the most effective way sale of various financial products from the banking and non-banking economic environment using innovative financial technologies. As the embedded finance toolkit is wider than the traditional monetary market, a financial supermarket is an example of a provider on the embedded finance market.

In addition to JSC CB PrivatBank, a model of a financial and technical supermarket is used by Monobank (a retail product of JSC Universal Bank), OTP Bank, Ukrsibbank, and Oschadbank.

An example of the embedded finance toolkit is a service offered by Monobank that allows you to purchase goods by instalments, paying in parts for them. This embedded finance service from Monobank offers the user to receive goods on a free instalment plan, which allows the purchase to be divided into a convenient number of payments with a maximum loan term of up to 24 months. The minimum instalment period is 2 months. The purchase amount that can be split into separate instalments under the instalment purchase service can range from UAH 500 to UAH 200,000.

It is worth noting the element of emotional connection and gamification of Monobank's financial products in this online and offline instalment purchase service, which is expressed in the special signs of partner stores, including: Rozetka, COMFY, ALLO, CITRUS, YABKO, Epicentr K, FOXTROT, MOYO, Sport Life, Eldorado, COMPX, Stylus, etc.

The algorithm for using this embedded finance toolkit is as accessible and understandable as possible for the customer:

a) the client chooses a product online or offline in one of the Monobank partner stores participating in the instalment purchase programme;

b) the customer chooses the payment method "Purchase by instalments from Monobank";

c) the client confirms the purchase in the Monobank mobile application;

d) the customer can prolong the purchase payments for up to 2 years, which involves a monthly payment.

Customers are also unlimited in the number of goods that can be purchased in the instalment format.

An absolute advantage of this instrument of embedded finance is the absence of the need to provide documents to the seller for the registration of goods purchased in instalments from Monobank. This option became possible with the adoption of the Law of Ukraine "On Payment Services" [24], which was introduced into the legal framework for the integration of the EU Directive into Ukrainian banking legislation to implement Open Banking. This legislative innovation provided real-time access to consolidated information on one or more accounts opened in the name of a user with one or more payment service providers upon request of third-party companies to

commercial banks. It should be noted that the information may be disclosed to third-party companies with the consent of the consumer of financial services and only to entities that have the right to do so.

Table 3 summarises the benefits of embedded finance for consumers/customers and businesses.

Table 3 – Advantages of embedded finance for consumers/customers and businesses

Advantages for business	Advantages for consumers/customers
– Maximising the company's profit; – obtaining new sales channels; – expanding the range of goods/services, creating a comprehensive product; – access to control over customer payments; – accumulation of information on the peculiarities of behavioural finance, customer purchasing preferences, and the peculiarities of payments: on credit terms, cash or non-cash payments; – availability of alternative payment methods; – improving strategic management tools and implementing innovative approaches in the business process; – reducing costs and speeding up calculations; – additional direction of positive cash flow generation (interest on loans to consumers).	– Simplifying and accelerating the process of purchasing goods or services; – new positive consumer experience for customers; – a high level of customer service; – integration of market providers into the customer's lifestyle; – individual selection of offers for each customer based on their own purchase history and personal experience; – competitive price offers for a range of goods/services/financial products as a part of the embedded finance ecosystem; – lower commission fees in the process of purchasing goods/services/financial products; – creating an emotional connection and receiving rewards in the process of purchasing goods/services/financial products.

The implementation of embedded finance tools is a digitalisation of the company's sales processes. That is why the new capabilities of Embedded Finance were first used by companies from the technology and digital segment, which, in particular, operate on the e-commerce platform, creating their own approaches to the formation of the ecosystem. Undoubtedly, the introduction of embedded finance tools has become a key advantage for them among market players.

There are several examples of major players in the global market that are actively implementing embedded finance innovations in their operations, including: Samsung, Google, Huawei, Amazon, Apple, Uber, Tencent, etc. Their main motivation for investing in embedded finance was to reduce maintenance costs and keep customers focused on their services. Having gained positive experience in testing these services in developed economies, this practice has gradually spread to other markets. However, the Ukrainian experience of developing embedded financial instruments faces a number of challenges. As the results of the study show, the main obstacles faced by users on the way to the effective use of FinTech services are:

a) security and privacy issues;

b) technical and system failures;
c) insufficient protection of consumer rights and interests;
d) the complexity of the algorithms used;
e) lack of human interaction;
f) limited customer support (Fig. 3).

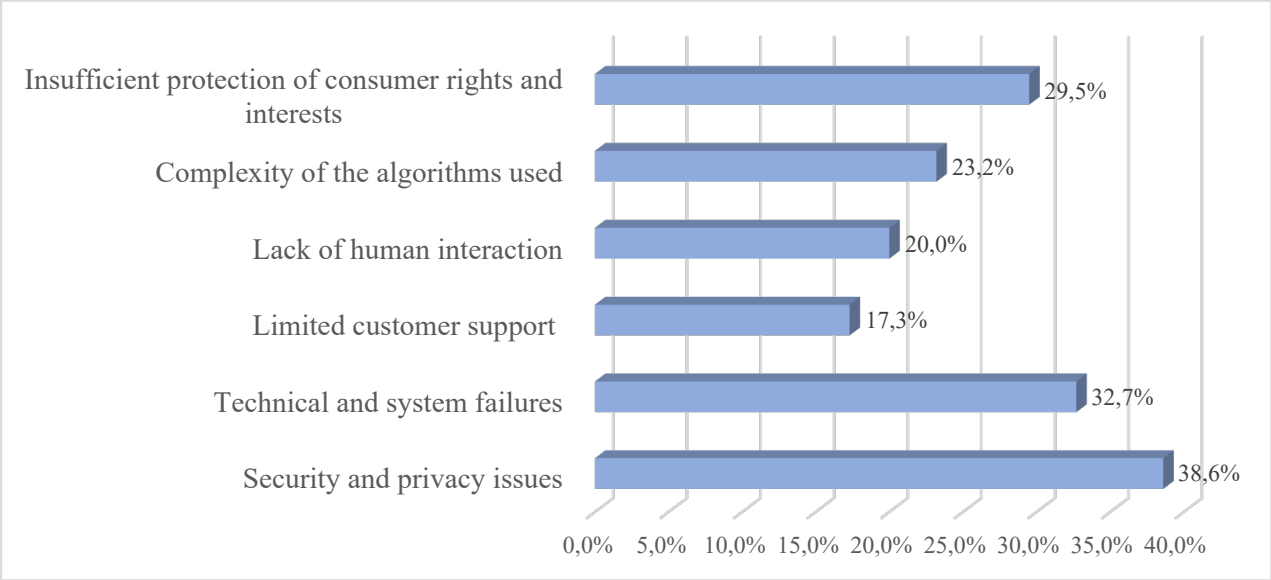

Figure 3 – Key disadvantages of using FinTech services for households

The presented analytical data demonstrate the key areas that require improvement of financial technologies by both financial service providers and financial market regulators to develop embedded finance within the national economic system. Thus, an appropriate algorithm for FinTech development steps at the macro- and micro-levels needs to be developed.

The key advantages of developing embedded finance for banks and non-bank financial institutions are shown in Table 4.

Table 4 – Advantages of developing embedded finance for banks and FinTech companies

Advantages for banks	Advantages for FinTech companies
– Significant information base for the development of personalised solutions in the embedded finance segment; – customer trust based on a long period of interaction; – greater opportunities for banks, whose activities are gradually transforming into a financial supermarket, due to the ability to provide both traditional and modern financial services to customers as a part of embedded finance; – financially sustainable position in the financial services market.	– Flexibility of solutions in terms of using data analysis tools and developing customised solutions; – high adaptability to market needs; – concentration exclusively on embedded finance integration activities; – competitive low fees and high speed of decision-making; – building an emotional connection with the client through the use of gamification elements and a detailed study of user experience; – easy-to-use services.

Commercial banks in Ukraine face a number of challenges that need to be addressed in order to realise all the available advantages offered by the embedded finance market:

a) increasing investment in management systems, artificial intelligence and machine learning tools for better identification of customer motivations and building a system of sustainable customer relationships, maximising customer value;

b) optimising the combination of financial and non-financial offers in a way that is beneficial for both the financial institution and the client;

c) development of new benchmarks for assessing the effectiveness of financial services through embedded finance platforms;

d) improving business models aimed at increasing customer loyalty and attracting new customers;

e) introducing easy and user-friendly embedded finance tools to minimise the number of times a customer faces complex algorithms;

f) moving away from outdated and inefficient methods in data analysis and away from irrelevant data management tools;

g) building an emotional connection with the client and integrating embedded finance into the life of the consumer, both financial and non-financial products, through gamification and human interaction tools, in particular, on social media platforms. This task is of particular importance in the context of the study of gaps experienced by customers in their interaction with banking institutions, according to the World Retail Banking Report 2022 [18]. More than half of the respondents felt that the process of interacting with banking institutions was not fun and satisfying (Fig. 4).

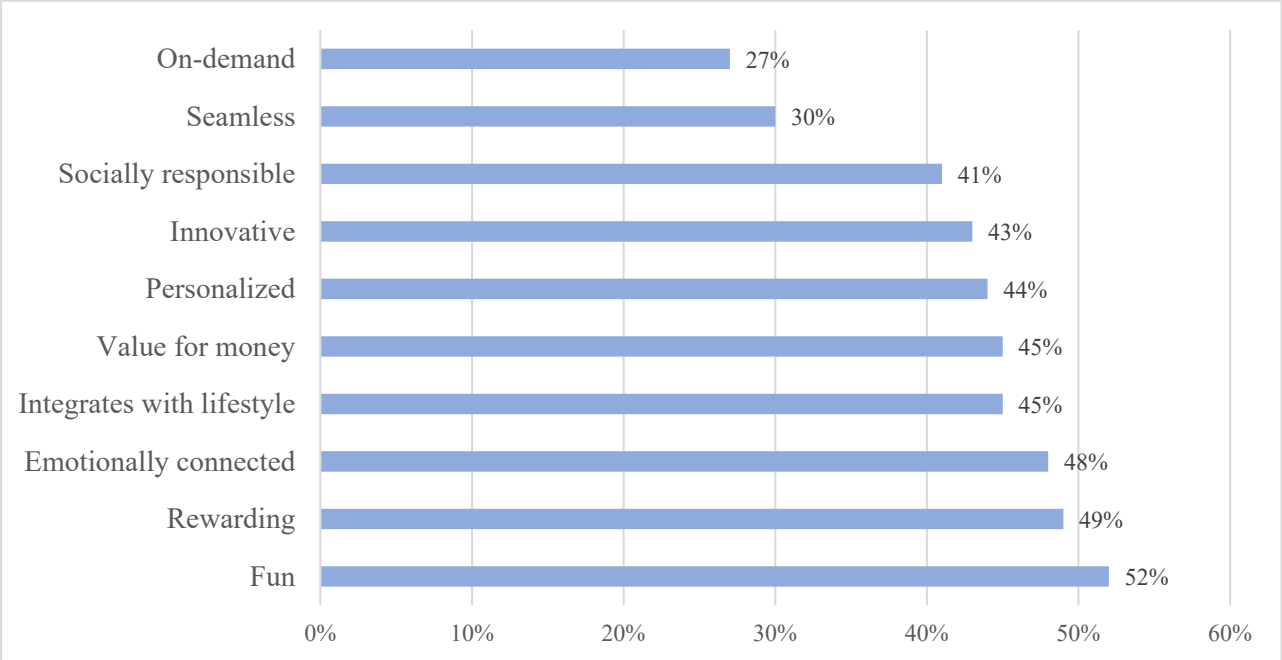

Figure 4 – Overview of key gaps in the interaction between a commercial bank and a client according to the World Retail Banking Report 2022 [18]

In addition, it is advisable to pay attention to the lack of personalisation of customer offers, the lack of integration into lifestyles and the lack of on-demand

services. A number of these problems can be solved through a more detailed analysis of data, information, and behavioural strategies of each customer.

Effective lifestyle integration implies that the financial services of commercial banks should be integrated into the daily activities of fulfilling personal and financial obligations of the client. It is worth noting the expediency of implementing individual offers based on the study of several parameters: providing access to personal data; understanding the limits of confidentiality of personal information that will be publicly available to the provider; and the level of financial literacy of the financial services consumer. Based on the combination of these parameters, the provider will offer the appropriate practice of using embedded finance tools.

h) studying consumer requests and the latest trends in financial technologies in the embedded finance market. According to the report THE FUTURE OF DIGITAL BANKING, compiled by KPMG, the key technologies that will be more deeply integrated into FinTech are: Artificial Intelligence, Blockchain, Biometrics, 5G, Cloud computing, Internet of Things, AR/VR and Quantum computing [19]. The use of these technologies will allow rethinking of both the nature of financial services and the way they are provided and consumed by customers;

i) optimisation of growth strategies focused on data and customer experience, based on customer lifecycle research. According to the World Retail Banking Report 2022, commercial banks face a number of challenges, which are mainly due to the traditional nature and lack of adaptability of the models they use (Fig. 5).

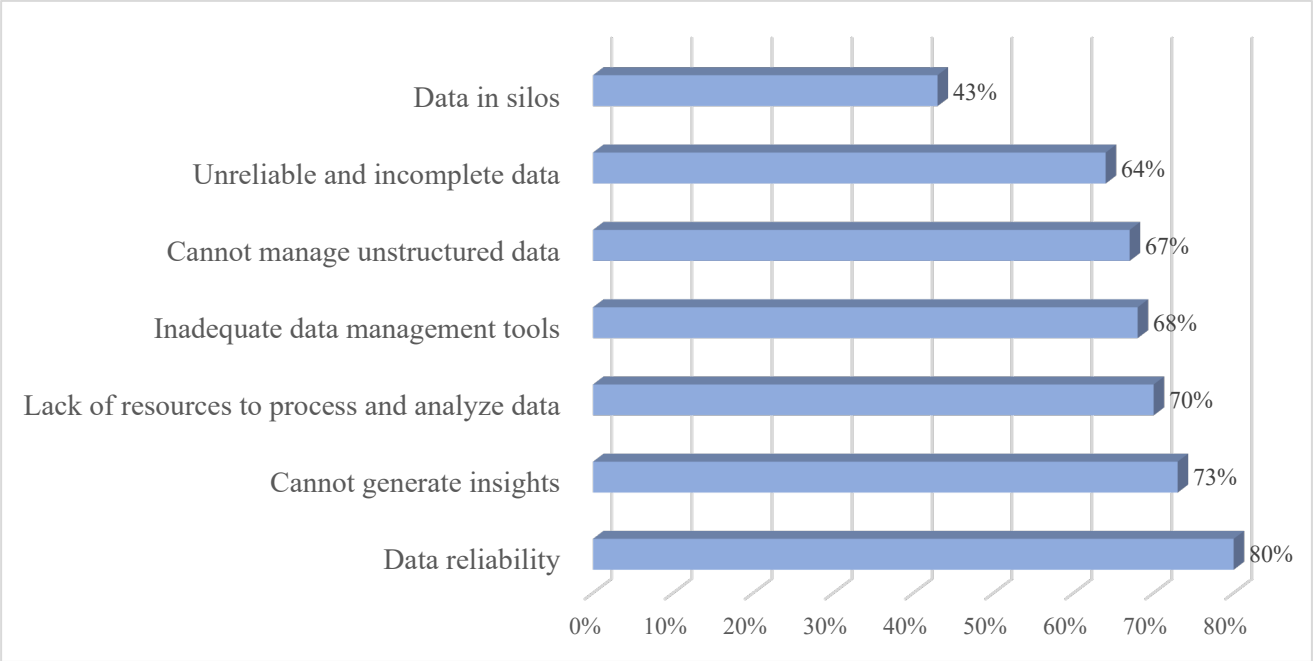

Figure 5 – Challenges of commercial banks in data management [18]

The issue of data and information security is one of the main challenges that is identified by the banking community on the way to effective information management for generation new directions for the development of banking activities. An analysis of global practice in this area has shown that market players are actively seeking ways to improve these processes. For example, according to the results of the BAI Global

Innovation Awards 2022 [25], the winner of innovations in digital security was Bank of America (USA). It is a centralized, client-friendly solution that provides security and authentication settings in one place. This innovation creates the basis for raising the standards of personal and financial information security. It allows to distribute responsibility for the security and reliability of the client's account.

The practice of implementing FinTech innovations in the Ukrainian market can be examined on the basis of a study of startups that received grant funding from the Ukrainian Startup Fund (Table 5).

Table 5 – FinTech startups that received grant funding from the Ukrainian Startup Fund in 2021 [26]

Startup	Features	Grant amount	Field of activity
IDvizer	An AI-based identity verification mechanism. A built-in security tool developed on the order of your business model.	$25 000	FinTech/ Legaltech, AI
Fintellect	A financial supertool for small creative and IT agencies.	$25 000	FinTech/ Legaltech
Meteocontrol AI	A platform for farmers' insurance based on satellite data and proprietary algorithms.	$50 000	FinTech/ Legaltech, Big data, Agricultural technologies
elKYC	B2b SaaS that helps to verify and engage customers in minutes.	$25 000	FinTech/ Legaltech
SPOKK	"Insurance in a smartphone" with affordable microinsurance products and a full range of online services. Users can purchase a policy in a few clicks, file a claim online, find out the decision on the insured event almost instantly and receive compensation directly to their payment card.	$75 000	FinTech / Legaltech
Checki	A smart electronic receipt service. Customers can forget about receipt tape at the checkout or keeping it in pockets. Businesses reduce the cost of paper and fiscal registrars by getting an additional marketing tool.	$25 000	Retail, Artificial intelligence, FinTech / Legaltech
Chargeback Optimizer	Platform for automated processing of problematic transactions with payment cards for banks, payment providers, trading enterprises, and services. The platform allows reducing the cost and shortening the time for reviewing claims and refunding customers.	$25 000	FinTech/ Legaltech

It should be noted that the development of embedded financial instruments is quite active among FinTech companies in Ukraine, due to the flexibility of these entities within the national economic system. This pattern can be explained by several factors:

a) the trend of disintermediation in the financial services market, which in the broad definition of the category is explained by the reduced role of banking institutions in the redistribution of financial resources and the departure from the leading role of banks in the exchange of financial assets and the provision of financial services;

b) a wide range of standards that commercial banks must comply with, including the allocation of a share of resources to form reserves to ensure a financially healthy position in the monetary market;

c) competitive price offers for financial services from FinTech companies;

d) the rapid development of innovative products and new segments of the financial services market involving FinTech companies;

e) increased inclusiveness and accessibility of financial services for different customer groups with an increase in the share of FinTech companies in the financial services market. This was made possible by excluding certain categories of financial services consumers from the focus of commercial banks due to their failure to meet a set of criteria for obtaining credit, investment and other services. At the same time, FinTech companies are removing technological and documentary barriers to opening access to financial products for customers who do not meet the strict criteria of traditional banking [11, p.175].

The most significant innovative product in the FinTech segment in Ukraine is the Diia app [27]. This portal was created in cooperation with the Ministry of Digital Transformation with the support of the USAID/UK aid Transparency and Accountability in Public Administration and Services (TAPAS) project, the EGAP Programme funded by the Swiss Agency for Development and Cooperation and implemented by the Eastern Europe Foundation and Innovabridge, the USAID Support for Accountability and Collaboration (SACCI) project, and the EGOV4UKRAINE project. This service focuses on the digitalisation of internal government processes using information technology.

In the FinTech sector, a number of commercial banks have introduced the ability to provide a full range of services using the Diia mobile app, including identification and sharing of digital documents with signatures using Diia.Signature in branches, remote account opening, and issuing a digital card using the bank's mobile app.

According to publicly available data, 18.5 million people used the Diia app as of January 2023, and 22 million people used the portal.

During the martial law, the Diia platform introduced the eRestoration programme, which allows people to receive funds for the repair of housing damaged by military operations. As of June 2023, 17687 applications have been submitted for consideration. Diia cooperates with 8 commercial banks that provide an opportunity to open an account to receive funds for the purchase of construction materials and order repair services under this programme. The banking system entities that have joined this initiative include: JSC A-Bank, Izibank (JSC TASKOMBANK), monobank (retail

product of JSC Universal Bank), JSC CB PrivatBank, JSC Raiffeisen Bank, JSC Sens Bank.

To support businesses during the war, payments were initiated to affected businesses and individuals who lost their jobs through the ePromotion tool. This service was transformed to provide financial assistance to IDPs through Diia, which remains one of the most popular and innovative products.

Involvement of commercial banks in Diia portal projects is an example of digitalisation of economic processes and integration of FinTech tools to support citizens and businesses in times of the war.

Conclusions

The study has revealed the specifics of the development of embedded banking financial technologies within the national economic system.

The main drivers of growth in investment in innovative financial technologies are highlighted. The article emphasises the growth of benchmarks that characterise the dynamic of FinTech development in Ukraine such as: the increase in the share of non-cash payments, the number of clients and accounts, the volume of financial transactions, etc.

The analysis of the key indicators characterising the state of the banking system allows us to conclude that financial service providers are sufficiently resilient to the emerging risks and challenges caused by the impact of martial law on the national economic system as a whole.

A review of the strategic documents of the leaders of banking system innovations allowed us to see the fixed tasks for the development of financial technologies and embedded finance in the near future. Examples of the use of embedded banking financial technologies and vectors of their development are systematised on the basis of information from key innovative players in the banking segment – JSC CB PrivatBank, monobank (a retail product of JSC Universal Bank).

The regulatory framework for the introduction of embedded finance in banking in Ukraine is analysed.

The benefits of embedded finance for ordinary consumers/customers and businesses are summarised. The main problems faced by users of financial services are outlined.

A set of recommendations and measures that should be implemented by commercial banks to improve the processes of embedded banking financial technologies is formed. The key benefits of embedded finance development for banks and non-bank financial institutions are systematised.

Attention is paid to the practice of implementing FinTech innovations in the Ukrainian market based on a study of startups that have received grant funding according to the Ukrainian Startup Fund. The peculiarities of using and transforming the Diia platform under martial law, which is the most significant innovative product in the FinTech segment in Ukraine, are investigated.

The presented results analysing the peculiarities of the development of "embedded banking financial technologies" (DIGITAL FinTech) are a logical continuation of the prior study on the specifics of the fintech ecosystem's growth, which summarised best practices from European countries for Ukraine in the paper [28]. The current research also delves deeper into the subject matter of scientific article [29], highlighting key benchmarks for measuring growth in fintech innovation investments.

For a comprehensive analysis of the topic concerning the development of "embedded banking financial technologies" (DIGITAL FinTech), relevant scientific publications from the project “Fintech as a Prism for Shock Assessment or Fuel for Recovery? Conclusions on the Impact of War” are available on the Economic Science Portal of the National University "Odessa Polytechnic" [30].

List of references:

1. Strategy for the development of FinTech in Ukraine until 2025. URL: https://bank.gov.ua/ua/about/develop-strategy/FinTech2025

2. Strategy for the development of the financial sector of Ukraine until 2025. URL: https://bank.gov.ua/admin_uploads/article/Strategy_FS_2025.pdf?v=4

3 Banking management: innovative concepts and models: monograph; edited by Prof. L.O. Prymostka. KYIV: KNEU. 2017. 384 p.

4. Bondarenko L., Politylo M. Banking innovations as effective functioning of the bank market need. Investytsiyi: praktyka ta dosvid. 2018. № 3. 5-8.

5. Viblyi P., Kondratiuk M. Development of financial technologies in Ukraine under war conditions. Galician Economic Bulletin. 2022. №3 (76). 67-73.

6. Yesina O.G. Development of digital financial technologies in the banking sector. Money, finance and credit. 2023. № 7. URL: https://reicst.com.ua/pmt/article/view/2023-7-08-01/2023-7-08-01

7. Krasnova I., Shchehliuk M., Tur G. FinTech та digital transformations in the financial market. Electronic scientific journal "Efektyvna ekonomika". 2023. № 4. URL: http://doi.org/10.32702/2307-2105.2023.4.15

8. Kraus K., Kraus H., Pochenchuk H. Institutional aspects and digitalization of financial inclusion in the national economy. Innovation and Sustainability. 2022. №2. 18–28.

9. Krykhovetska Z.M., Levandivskyi O.T. The essence and directions of the development of banking innovations. Ekonomika ta derzhava. 2022. № 8. 56-61.

10. Lapishko, Z., Yevtukh, L. Prospects of financial supermarkets activity in the context of digital transformation in Ukraine. Economy and Society. 2022. №40. URL: https://economyandsociety.in.ua/index.php/journal/article/view/1510/1453

11. Semenog A.Yu. Fintech Development: The Treds and Consequences for the Financial Services Market. Business Inform. 2021. №8. 173–183.

12. Hryhorash, O., Voloshyn, I. Financial technologies development trends under the influence of the pandemic and war. Economy and Society. 2023. № 47. URL: https://economyandsociety.in.ua/index.php/journal/article/view/2176

13. Kravchuk N., Lutsyshyn O. Global finance and fintech: challenges, trends and system determinants of development. World of Finance. 2022. 2(71). 22-42.

14. Peterson K. Ozili Embedded finance: assessing the benefits, use case, challenges and interest over time. Journal of Internet and Digital Economics, Forthcoming. 2022. URL: https://ssrn.com/abstract=4235674

15. Wullweber J. Embedded finance: the shadow banking system, sovereign power, and a new state–market hybridity. Journal of Cultural Economy. 2020. Volume 13. Issue 5. URL: https://www.tandfonline.com/doi/abs/10.1080/17530350.2020.1741015?journalCode=rjce20

16. Telukdarie Kayser K., Telukdarie A. Digital Ecosystems in Financial Services driven by Embedded Finance Platforms in South Africa (November 23, 2022). URL: https://ssrn.com/abstract=4331766

17. Review of the banking sector, February 2023. Official website of the National Bank of Ukraine. URL: https://bank.gov.ua/ua/news/all/oglyad-bankivskogo-sektoru-lyutiy-2023-roku

18. World Retail Banking Report. 2022. URL: https://www.capgemini.com/wp-content/uploads/2023/04/WRBR-2022-Report_web.pdf

19. THE FUTURE OF DIGITAL BANKING. KPMG. 2019. https://assets.kpmg.com/content/dam/kpmg/ua/pdf/2019/09/future-of-digital-banking-in-2030-cba.pd.pdf

20. Media space of the National Bank of Ukraine. URL: https://bank.gov.ua/ua/news/all

21. On innovation activity: Law of Ukraine of 4.07.2002 № 40-IV. Date of update: 16.10.2012. URL: https://zakon.rada.gov.ua/laws/show/40-15

22. Official website of monobank (JSC Universal Bank). URL: https://www.monobank.ua/

23. Development Strategy of JSC CB "PrivatBank" until 2024. Official website of JSC CB Privatbank. URL: https://static.privatbank.ua/files/02022022_strategy_summary_2024.pdf

24. On Payment Services: Law of Ukraine of 30.06.2021 № 1591-IX. URL: https://zakon.rada.gov.ua/laws/show/1591-20#Text

25. Global Innovation Awards Winners. URL: https://www.bai.org/global-innovation-awards/global-innovation-awards-winners/

26. Startups. Ukrainian Startup Fund. URL: https://usf.com.ua/projects_catalog/

27. Diia: Public services online. URL: https://diia.go28. Fedyshyn M., Abramova A., Morozova L., Lavrov R., Kovalova O., Malin O. (2022). Development Fintech Ecosystem: Evidence of European Countries for Ukraine. International Journal of Computer Science and Network Security, Vol.22, No 2, 29-38. URL: http://paper.ijcsns.org/07_book/202202/20220205.pdf

29. Filyppova S.V., Kovalova O.M. Research of influence of the qualifying factors on the investment and innovation processes in the conditions of modern challenges. Економіка: реалії часу. 2022. № 6 (64). 47-54. URL: https://economics.net.ua/files/archive/2022/No6/47.pdf

30. Fintech as a fence for the shock and fuel for the recovery? Lessons from the war. International cooperation project. Economic scientific portal: website. 2023. URL: https://economics.net.ua/en/uut23

Грантова ініціатива заради партнерства між Великою Британією та Україною

Дослідження виконано в рамках проєкту UUT23 (НДР №1877-01/23)

«Фінтех як призма для оцінки шоку або паливо для відновлення? Висновки впливу війни»

АНАЛІТИЧНЕ ДОСЛІДЖЕННЯ

«ФІНТЕХ ЯК ПРИЗМА ДЛЯ ОЦІНКИ ШОКУ АБО ПАЛИВО ДЛЯ ВІДНОВЛЕННЯ? ВИСНОВКИ ВПЛИВУ ВІЙНИ»

© Національний університет «Одеська політехніка», 2023

З метою реалізації проєктів та принципів партнерства між Національним університетом «Одеська політехніка» та Університетом Портсмут згідно Меморандуму про взаєморозуміння та в рамках укладеної Угоди між університетами, а також в межах ініціативи UK-Ukraine Twinning Grants Scheme, для координації міжнародної проєктної діяльності працівників та підрозділів університету проєкт UUT23 «Фінтех як призма для оцінки шоку або паливо для відновлення? Висновки впливу війни» та склад його виконавців затверджено наказом Ректора Національного університету «Одеська політехніка» № 43а від 23.03.2023 року.

Електронний варіант доступний на Економічному Науковому Порталі Національного університету «Одеська політехніка» за адресою: https://www.economics.net.ua/analytics