

THE INFLUENCE OF THE INFORMATION ECONOMY ON THE ACTIVITIES OF BANKS

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Abstract. The banking system ensures the smooth functioning of the country's economy by servicing cash and non-cash payments, holding funds of legal entities and individuals, providing them with credit resources and many other types of operations. Banking activity is characterized by a high degree of risk, as banks operate under the constant threat of losing money and bankruptcy. Therefore, the fight against risk is an important task of the entire banking system, and ensuring banking safety becomes the cornerstone of the mechanism of financial security of the state. The existing problems in the banking system in modern conditions are exacerbated by the rapid development of the information economy, which is radically changing the payment landscape of entire countries and threatens the existence of the banking system as such in the usual sense. *The aim* of the study is a theoretical and analytical coverage of the problems and risks of banking security of the state in the development of the information economy. *The subject* of the study are the theoretical aspects of banking security of Ukraine in the development of information economy. The article used such methods of research as: the method of scientific knowledge (due to the purpose and objectives of the study); analysis and synthesis (to study the impact of the development of the information economy on the banking security of the state); comparative analysis (for the process of analyzing the existing methodological approaches to assessing the level of banking security of the state); statistical analysis, comparison and graphical *methods* (to assess the state of the main effects of the information economy on the banking system); systematization and statistical analysis (to determine changes in the operational component of banking activity under the influence of the information economy). It was also analyzed e-money transfer services and what e-money was issued by banks in 2020. Data on information security and cybersecurity of Ukrainian banks were provided. According to the *results* of the study, conclusions were made about the impact on the development of the information economy of the risks arising in banking operations. The prospects for further research in the field of improving the methods of security in the informatization of banking services are outlined.

Key words: economic security of the state, banking security of the state, information economy, bank, banking system, non-cash payments, cryptocurrency, electronic credit platform, risk, threat.

JEL Classification: G21, C80, O32

1. Introduction

The problems of the functioning of the banking system in the context of the rapid development of the information economy are currently studied only fragmentarily. A number of issues related to the emergence of new risks and opportunities to strengthen the banking security of Ukraine in the development of the information economy, has been insufficiently studied.

The need to study the impact of digitalization on banking activities has been studied by Ukrainian and foreign scientists. The works of the following foreign scientists deserve special attention: D. Zimmerman,

S. Carbo-Valverde, D. Cliff, D. Rose, and others. Among Ukrainian scientists the works of such scientists are of special scientific value: S.A. Sheludko, P.P. Bratkevich, A.Yu. Semenog, S.V. Tsirulyk, G.B. Sokolova, S.M. Veretyuk, V.V. Pilinsky, S.V. Kolyadenko etc.

The study aims to cover the concepts associated with the informatization of banking operations, as well as an analysis of the current situation in the banking market.

Digitalization is an important direction of development of all spheres of Ukraine's economy, including the banking sector. Digitalization in banking is a complex of modern economic, organizational, management and institutional innovations in any sphere of bank activities (Kljoba, 2018).

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The bank's economic information is organized into various IS used in banking under the general name "Automated Banking Information Systems". There is no generally accepted classification of IS, so they can be classified on various grounds.

The basic IS of banking include (Varnaliy, Onyschenko, 2016):

- a) external IS: system of legislative and regulatory documents; information system based on new information technologies (SWIFT, Reuters, Internet, etc.);
- b) internal IS: the system of internal regulatory documents of the bank; accounting and reporting system; automated banking system; system of economic security of the bank; intrabank risk management system, including credit risk management; system of evaluation of the bank's activities; marketing information and other internal IS.

2. Risks and threats to the functioning and development of the banking system

The impact of the information economy on the prospects for the development of the country's banking system is twofold: on the one hand, it contains favorable opportunities for such development, and on the other hand, it leads to risks and threats to the functioning and development of the banking system. This influence can be characterized as direct and indirect.

Instead, the introduction of the digital economy and e-commerce, from the point of view of the World Bank, carries a number of risks, including: the risk of cyber threats associated with the problem of protecting personal data; Digital "slavery," or the use of the personal data of millions of consumers to control and/or manipulate their behavior; rising unemployment due to the disappearance of certain professions and even industries due to the continued spread of information technology and products, including stores with electronic cash registers, customer service bots, driverless cars, etc.

In particular, a number of experts believe that the banking system may disappear in the next ten years; the digital "gap" in education due to different conditions of access to digital services and products and, consequently, the gap in the level of consumption of people in the same country or in different countries (Gladkikh, 2018).

Another classification of risks to the state and society associated with the development of the digital economy identifies the following major groups of risks (Gladkikh, 2018): sovereignty risks (penetration of "foreign" IT-technologies in all aspects of life and activities of the country, which significantly increases its vulnerability; creating national cybersecurity threats in finance, transportation and energy infrastructure, social engineering, and modeling; risks

to society (the robotization of production and services increases unemployment and the disappearance of certain professions, exacerbating social disharmony); impoverishment of human resources; risks to the individual (computerization from an early age leads to the development of "machine" or "clip" thinking in children due to the loss of systemic thinking (so there is a gradual process of losing one's own identity, instead the development of innovative breakthrough ideas, which are usually at the intersection of different fields of knowledge, requires a non-linear logic from the individual)).

3. The impact of the development of the information economy on the banking system

Next, consider the impact of the development of the information economy directly on the banking system through the prism of "benefits-risks".

Figure 1. contains information describing the main effects of the information economy on the banking system of Ukraine in comparison with similar trends observed in the world.

In the face of intensifying competition with decentralized cryptocurrencies, the central banks of a number of countries are preparing to issue their own centralized digital currencies, which will be at the same time a convenient, fast, reliable, secure and cheap tool for payments and savings. Instead, the main risks of digital currencies issued by central banks are technological risks, monetary policy implementation risks, financial stability risks, and reputational risks. However, the key risk of issuing digital currencies is considered to be cyber risk, the value of which in 2018 for the global economy as a whole is about \$600 billion. In 2018, the global economy as a whole is worth about \$600 billion, or 0.8% of global GDP (Semenogh, Cyrulyk, 2018).

Influenced by the development of the information economy, central banks in many countries are also paying attention to financial inclusion, because, according to the World Bank, at the end of 2017, about 1.7 billion adults (31% of the population) did not have a bank account (in Ukraine their share was even higher and amounted to 37%). At the same time, more than 100 countries around the world have already developed a national financial inclusion strategy or have built financial inclusion components into other national strategies (National Bank of Ukraine, 2020).

Increased financial inclusion creates new opportunities for central banks and the state as a whole, as it attracts all segments of the population, which stimulates economic growth by mobilizing the savings of individuals, further investing in economic development, and diversifying the financial system; for financial service providers (primarily

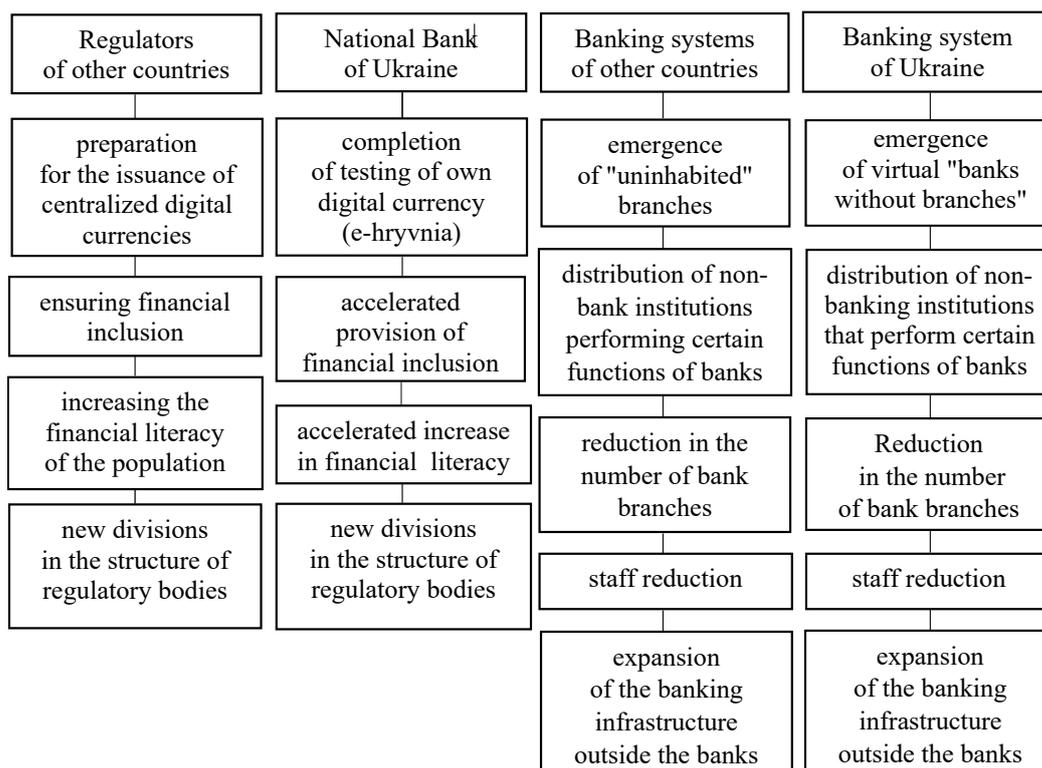


Figure 1. The main effects of the information economy on the banking system

Source: (Sheludjko, Bratkevych, 2019)

banks) – by increasing the number of clients and revenues; for consumers – by more convenient and efficient use of modern financial services, which increases their personal well-being. Financial inclusion is directly linked to the financial literacy of the population. Therefore, the best practices of improving financial literacy in the leading countries of the world are united under the auspices of international organizations: World Bank, OECD, USAID and others. According to the World Bank, 44 countries have already approved financial literacy strategies, and 27 countries are in the process of developing such documents. At the same time, the function of improving financial literacy is also mainly performed by central banks (The official site of National Bank of Ukraine, 2019).

Changes in the structure of the banking system of Ukraine and the nature of the regulator's activities under the influence of the information economy, in line with global trends, manifested, in particular, in (The official site of National Bank of Ukraine, 2020):

- successful completion of testing of own digital currency. As part of testing the experience of other Central Banks during 2016-2018, the NBU piloted the digital electronic hryvnia, which is seen as an alternative to existing payment instruments (cash, payment cards and electronic money). The advantages of electronic hryvnia are: ease of use, accessibility, security (due to NBU guarantees) and speed of payments. Instead, the main risk for Ukrainian banks from full implementation

- of e-hryvnia is the likelihood that the new product will absorb existing e-money services issued by commercial banks, resulting in loss of previous costs of implementing these products by reorienting customers to the more reliable instrument offered by the NBU;

- accelerated financial inclusion, which is one of the strategic objectives of the NBU. Among the regulator's achievements in this area, as reflected in the NBU's 2018 Report, are an increase of one-third per year in transactions using payment cards and an increase in the share of non-cash transactions among all transactions using payment cards to 45%;

- intensification of the regulator's efforts aimed at improving financial literacy, which is one of the key areas of financial inclusion.

- reduction in the number of operating bank branches due to the automation of banking operations and the spread of online sales of banking products, which allows banks to optimize the network and reduce the "traditional" banking personnel (cashiers, operators, credit inspectors, collectors, security guards, etc.);

- the emergence of virtual "banks without branches". These include the entry of a new structure "Monobank" to the banking market at the end of 2017. At the same time, this institution does not have a license of the NBU to carry out banking activities, the statements "bank" is not published by the NBU, its assets and liabilities are recorded on the balance sheet of JSC "Universal Bank". Monobank offers its customers

consumer credit services, and the issue, maintenance and reissuance of the card in case of loss is free;

- expanding the presence on the Ukrainian banking market of new entities that are not banks, but perform the "traditional" functions of banks related to money transfers, currency sales and lending (non-bank payment systems that transfer funds: GlobalMoney, City24, Ukrcard, etc.; microfinance organizations that provide online loans: moneyveo.ua, moneyboom.com.ua, online-groshi.com, etc.; P2P-lending services, in particular, "Loan", finhub.ua, taplend.com; crypto currency sales services: Tyme and IBox terminals, specialized cryptocurrencies, online exchange offices, in particular, Bitcoin24, which works with the help of Privat24, or other online exchanges kuna.io and btc. trade);
- active expansion of the bank payment infrastructure (ATMs, payment and POS-terminals) outside banks and bank branches, which actualizes the risks associated with physical security and cybersecurity.

4. Analysis of changes in the operational component of banking activity under the influence of the information economy

Changes in the operational component of banking under the influence of the information economy form, in particular, the following trends.

During 2020, money transfer services were actually provided by 37 money transfer systems, of which (National Bank of Ukraine, 2020):

- 30 systems created by residents;
- 7 systems created by non-residents.

Using both resident and non-resident fund transfer systems, there were (total) transfers in 2020:

- within Ukraine – 255.2 billion UAH. (\$9,489.6 million in U.S. equivalent);
- to Ukraine – \$2,697.4 million. In U.S. equivalent;
- outside Ukraine – \$556.2 million. In U.S. equivalent.

As of January 1, 2021, Ukrainian banks served 64 million customers, including:

- business entities – 2.7 million customers, of which 1.7 million customers are individual entrepreneurs;
- individuals – 61.3 million customers.

124.6 million accounts were opened for bank clients.

5.3 million accounts were opened for business entities, including 5.2 million current accounts and 0.1 million deposit accounts. More than 4 million businesses are serviced remotely, which allows the bank's client to promptly track funds in the account and conduct operations on it.

For individuals, 119.3 million accounts were opened, including: 102.9 million current accounts and 16.4 million deposit accounts. More than 55 million individuals are serviced remotely.

Also, as of 01.01.2021, 436 escrow accounts were opened for business entities and 328 accounts for

individuals of the following types: banks – 73, clients – 64 million people, accounts – 124.6 million, business entities – 2.7 million (including 1.7 million – individual entrepreneurs), individuals – 61.3 million (National Bank of Ukraine, 2020).

In 2020, there is a tendency for the number of accounts opened by businesses to increase by 12.8%, and accounts of individuals to increase by 4.3%.

In 2020, banks are issuing and other operations with the following electronic money (National Bank of Ukraine, 2020): "Maxi" (JSC "TASCOMBANK"); "XPAY" (JSC "BANK SICH"); "FORPOST" (JSC "ALFA-BANK"); GlobalMoney (JSC BANK ALLIANCE); "ELECTRUM" (JSB "UKRGASBANK"); "ALFA-MONEY" (JSC "ALFA-BANK"); MasterCard (PJSC "VOSTOK" BANK, PJSC "ALFA-BANK", JSC "TASCOMBANK", PJSC CB "PRIVATBANK", JSC "FUIB", JSC "CRYSTALBANK", JSC "OSHAD-BANK"); Visa (JSC "OSHADBANK", PJSC "FUIB", PJSC CB "PRIVATBANK", JSCB "INDUSTRIAL-BANK", JSC JSCB "CONCORD", JSC "MEGABANK", JSC "RAIFFEISEN BANK"); "SPACE" (JSB "UKRGASBANK", JSC "ALFA-BANK", JSC "UNEX BANK", JSC "BANK VOSTOK").

In 2020, the following indicators increased at the issuing banks compared to 2019:

- the volume of transactions with electronic money increased by 2 590 million UAH (by 15%, from 16 714 million UAH to 19 004 million UAH);
- the number of "electronic wallets" increased by 5 million pcs. (by 7%), from 74 million pcs. to 79 million pcs.

At the same time, the volume of issued electronic money decreased by 143 million UAH (almost 3.4 times, from 203 million UAH to 60 million UAH). This is due to the fact that several large participants left the market in the second half of 2020 (Figure 2, Figure 3).

In particular, "ALPHA BANK" JSC stopped issuing "FORPOST" and "SPACE" electronic money.

At the same time, the analysis of e-money market for the period from 2014 to 2020 shows that despite the reduction in the volume of e-money issued by banks in 2020, consumer demand for this product to pay for goods and services in Ukraine continues to grow.

The National Bank Cybersecurity Center continued to build its cybersecurity capabilities in 2020.

The NBU has focused on improving the ability of the Cyber Security Incident Response Team (CSIRT-NBU) to detect, respond to and neutralize cyber attacks and cyber incidents, as well as expanding the range of sources of information on current cyber threats.

Improving tools for sharing information about current cyber threats and cyber threat indicators, CSIRT-NBU deployed and maintained the Malware Information Sharing Platform & Threat Sharing (MISP-NBU). This platform allows users to quickly receive information

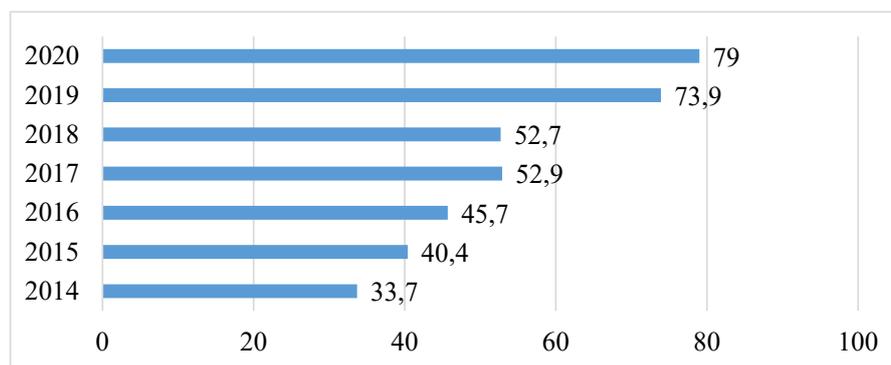


Figure 2. Total number of "e-wallets", million pcs.

Source: National Bank of Ukraine, 2020

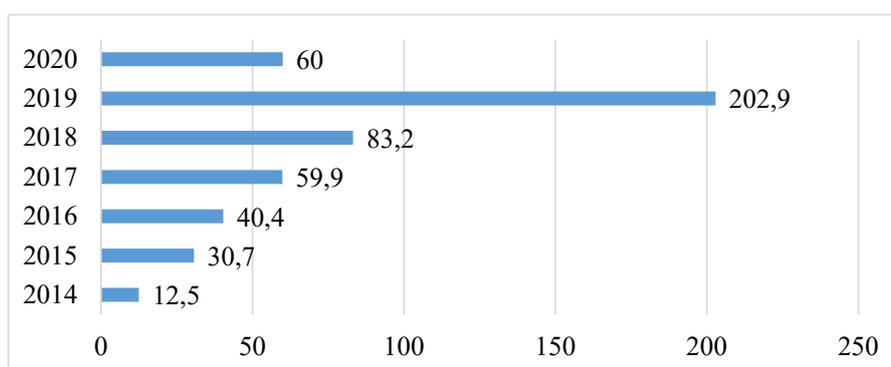


Figure 3. Volume of e-money issued, UAH million

Source: National Bank of Ukraine, 2020

about current cyber threats and cyber threat indicators. MISIP-NBU accumulates information received from CSIRT-NBU, similar platforms (MISP) CERT-UA, the SSU Cyber Security Situation Centre and the National Cyber Security Coordination Centre under the National Security and Defense Council of Ukraine.

During 2020, CSIRT-NBU studied about 2,500 samples of malicious software, provided Ukrainian banks with information about identified cybersecurity incidents and recorded attempts to commit cyber-attacks (National Bank of Ukraine, 2020).

The Cyber Security Center of the National Bank continued to cooperate with the entities of the national cyber security system of Ukraine, other state and commercial institutions working in the field of cyber security and cyber protection. In addition, international cooperation in the field of cybersecurity developed.

Also, in 2020, in order to fulfill the powers under the Law of Ukraine "On the National Bank of Ukraine", the NBU regulated the definition of critical infrastructure facilities and critical information infrastructure facilities in the banking system of Ukraine. This is reflected in the Regulation on the definition of critical infrastructure in the banking system of Ukraine.

Despite the growing number and variety of cyber threats, thanks to the implementation of new security

technologies, effective use of protection systems and complexes, improvement of mechanisms for sharing information about cyber attacks and cyber incidents, the NBU ensured timely detection, assessment and effective response to cyber threats in 2020.

Assessment of the real state of security of information network resources and its ability to withstand external and internal cyber threats according to the results of an external audit of information security in 2020 showed that the NBU has provided a high level of effective and targeted information protection in the information infrastructure of the National Bank. Law of Ukraine "On the National Bank of Ukraine" (The official site of National Bank of Ukraine, 2017).

In 2020, the NBU upgraded the cryptographic protection system of the National Bank, improved the reliability and fail-safety of the system of data collection and storage of registrars of payment transactions recorders.

The NBU worked with payment market participants to improve the efficiency of document reconciliation processes. In particular, in order to harmonize the conditions of their activities in terms of information protection and the use of electronic money, the NBU developed recommendations, defined standard

comments and descriptions and posted them on the official website.

In addition, the NBU took care of the spread of electronic trust services in the banking system, helped expand the range of services for remote customer service, provided an opportunity to improve safety, quality, convenience and speed of banking services to its customers.

Thus, in 2021, four providers of electronic trust services of the banking system received the status of qualified providers based on the decision of the certification center:

- National Bank of Ukraine – Qualified electronic trust service provider "Accredited Key Certification Center of the National Bank of Ukraine";
- Joint Stock Company Commercial Bank "PrivatBank"
- Qualified provider of electronic trust services of JSC CB "PRIVATBANK";
- Joint Stock Company "State Savings Bank of Ukraine"
- Qualified provider of electronic trust services – the key certification center of Joint Stock Company "OSHADBANK";
- Joint Stock Company UKRSIBANK – Qualified provider of electronic trust services of JSC "UKRSIBANK".

The Certification Authority has generated qualified public key certificates for these providers using (Bukhtiarova, Ghushha, 2019):

- state algorithm of electronic signature National Standards of Ukraine (DSTU -4145), 6 certificates;
- international electronic signature algorithm ECDSA, 2 certificates;
- international electronic signature algorithm RSA, 2 certificates.

NBU took another step to regulate the process of monitoring of cybersecurity, information security and provision of electronic trust services in the banking system of Ukraine. To improve the organization of banks in the face of modern cyber threats, the NBU has developed rules to monitor banks' compliance with legislation on information security, cybersecurity and electronic trust services.

According to the World Economic Forum, in 2020, cyberattacks ranked eighth in the risk ranking in terms of impact and were among the top 10 most likely risks. Therefore, strengthening control over the implementation of cybersecurity and information security measures by banks, the introduction of a new type of control over banks in the form of on-site inspections and off-site supervision, as well as self-assessment of information security and cybersecurity will help banks to resist cyber threats. In addition, it will allow the NBU as the regulator to evaluate:

- the effectiveness of the bank's information security management system;
- completeness of the bank's compliance with the requirements of regulations of the National Bank on information security and cybersecurity;
- the level of information security and cyber risk management by the bank.

5. Conclusions

New opportunities and risks have been identified that allow banks to embrace changes in the external and internal environment. New opportunities for banks to develop the information economy include increasing the efficiency of their activities (by expanding the customer base and increasing sales of services, conquering new market segments without the need to open new "sales outlets", increasing revenue, reducing operating costs, rental and maintenance of premises, optimization of staff and payroll costs, increasing the level of process automation, speeding up the processing of information). Fundamentally new banking risks associated with the rapid development of the information economy include: risks associated with the development of non-cash payments (increased competition with non-bank institutions, loss of commission income, increased vulnerability of digital infrastructure of banks due to the expansion of equipment network, the risk of fraud with payment cards, which in general directly affects the level of banking security of the state); the risks associated with the spread of cryptocurrencies (high volatility of the exchange rate, which can provoke significant losses, potential loss of customers, cash flows, interest income, assets and liabilities, liquidity risk, reduced balances due to loss of customers, risk of cryptocurrency fraud, undermining monetary state monopolies, reduced central bank revenue, reduced demand for the national currency, causing its depreciation and rate change, inability to conduct effective monetary policy, destabilization of the financial market as a whole due to the fall of the cryptocurrency market); risks associated with the spread of electronic credit platforms (increased competition with non-banking institutions, potential loss of customers, cash flows, interest income, assets and liabilities, lack of reporting and regulation by the NBU, lack of state deposit guarantees for depositors, liquidity risk can provoke bankruptcy of banks, which in general negatively affects the level of state banking security).

For further disclosure of this issue, the following study will reflect the methods of improving the security of banking services informatization

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