

18. Yatsyshyn H.V. (2017). Investytsiina pryvablyvist ahrarnoho sektoru ekonomiky Ukrainy [Investment attractiveness of the agrarian sector of the Ukrainian economy]. Modern Economics. Elektronne naukove vydannia z ekonomichnykh nauk – *Modern Economics. An electronic scientific publication on economic sciences*, 3, 114-119 [in Ukrainian].

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**FUNCTIONING AND DEVELOPMENT OF
PAYMENT SYSTEMS IN THE
CONDITIONS OF DIGITAL
TRANSFORMATIONS[©]**

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The article considers and analyzes the current state and main tendencies of development of payment systems in the conditions of digitalization.

The essence is disclosed of such definition as: "payment system". Approaches to defining the classification features of payment systems and the key elements of functioning payment systems are considered. It is indicated that the National Bank of Ukraine is the national regulator of payment and settlement systems in Ukraine. The National Bank of Ukraine is a payment organization and a settlement bank for two state payment systems: the electronic payment system and the National Payment System "Ukrainian Payment Space". To increase the reliability and efficiency of payment systems, the NBU distinguishes them by the level of importance.

Current payment systems in Ukraine are analyzed. It is determined that there are 46 Ukrainian and international payment systems in Ukraine, owned by banking and non-banking organizations, residents and non-residents of Ukraine, among them one systemically important payment system of the NBU SEP, six socially important payment systems, five important payment systems. Among the card payment systems, there are two Ukrainian and four international.

Positive dynamics of growth in the volume of non-cash transactions, including contactless payments, which corresponds to global trends, are revealed.

Innovative payment systems using mobile applications and API-access to payment services are considered, electronic means of access such as mobile devices, mPOS-terminal, biometric data, contactless technologies – NFC-technologies, QR-technology, NS-technologies are investigated.

The factors that influence the functioning of the national payment system are identified.

Measures are proposed for the development of payment systems, which will contribute to the development of the economy as a result.

Key words: payment system, electronic payment system, payment infrastructure, money transfer system, NFC-technologies, API-access, non-bank payment systems, payment innovations.

Tab.: 2. Fig.: 2. Lit.: 17.

ФУНКЦІОНУВАННЯ І РОЗВИТОК ПЛАТІЖНИХ СИСТЕМ В УМОВАХ ЦИФРОВИХ ТРАНСФОРМАЦІЙ

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У статті розглянуто та проаналізовано сучасний стан та основні тенденції розвитку платіжних систем в умовах цифровізації.

Розкрито сутність дефініції “платіжна система”. Розглянуто підходи до визначення класифікаційних ознак платіжних систем і ключові елементи функціонуючих платіжних систем. Означено, що національним регулятором платіжних систем та систем розрахунків в Україні є Національний банк України. Національний банк України є платіжною організацією і розрахунковим банком для двох державних платіжних систем: системи електронних платежів і Національної платіжної системи “Український платіжний простір”. Для зростання надійності та ефективності платіжних систем НБУ розрізняє їх за рівнем важливості.

Проаналізовано діючі в Україні платіжні системи. Визначено, що в Україні діють 46 внутрішньодержавних і міжнародних платіжних систем, власниками яких є банківські і небанківські організації, резиденти і нерезиденти України, серед них одна системно важлива платіжна система СЕП НБУ, шість соціально важливих платіжних систем, п'ять важливих платіжних систем. Серед карткових платіжних системи, функціонують дві внутрішньодержавні і чотири міжнародні.

Виявлено позитивну динаміку зростання обсягу безготівкових операцій, в тому числі безконтактних платежів, що відповідає глобальним трендам.

Розглянуто інноваційні платіжні системи з використанням мобільних додатків та API-доступу до платіжних послуг, досліджено такі засоби електронного доступу, як мобільні пристрої, mPOS-термінал, біометричні дані, безконтактні технології – NFC-технології, QR-технологія, NS-технології.

Визначено фактори, що впливають на функціонування національної платіжної системи.

Запропоновано заходи для розвитку платіжних систем, що як результат сприятиме розвитку економіки.

Ключові слова: платіжна система, електронна платіжна система, платіжна інфраструктура, система переказу коштів, NFC-технології, API-доступ, небанківські платіжні системи, платіжні інновації.

Табл.: 2. Рис.: 2. Літ.: 17.

ФУНКЦИОНИРОВАНИЕ И РАЗВИТИЕ ПЛАТЕЖНЫХ СИСТЕМ В УСЛОВИЯХ ЦИФРОВЫХ ТРАНСФОРМАЦИЙ

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В статье рассмотрены и проанализированы современное состояние и основные тенденции развития платежных систем в условиях цифровизации.

Раскрыта сущность дефиниции “платежная система”. Рассмотрены подходы к определению классификационных признаков платежных систем и ключевые элементы функционирующих платежных систем. Отмечено, что национальным регулятором платежных систем и систем расчетов в Украине Национальный банк Украины. Национальный банк Украины является платежной организацией и расчетным банком для двух государственных платежных систем: системы электронных платежей и Национальной платежной системы “Украинский платежный пространство”. Для роста надежности и эффективности платежных систем НБУ различает их по степени важности.

Проанализированы действующие в Украине платежные системы. Определено, что в Украине действуют 46 внутригосударственных и международных платежных систем, владельцами которых являются банковские и небанковские организации, резиденты и нерезиденты Украины, среди них одна системно важна платежная система СЭП НБУ, шесть социально важных платежных систем, пять важных платежных систем. Среди карточных платежных систем, функционируют две внутригосударственные и четыре международных.

Выявлено положительную динамику роста объема безналичных операций, в том числе бесконтактных платежей, соответствует глобальным трендам.

Рассмотрены инновационные платежные системы с использованием мобильных приложений и АРЕ-доступа к платежным услуг, исследованы такие средства электронного доступа, как мобильные устройства, тPOS-терминал, биометрические данные, бесконтактные технологии - NFC-технологии, QR-технология, NS-технологии.

Определены факторы, влияющие на функционирование национальной платежной системы.

Предложены меры по развитию платежных систем, как результат способствовать развитию экономики.

Ключевые слова: платежная система, электронная платежная система, платежная инфраструктура, система перевода средств, NFC-технологии, АРЕ-доступ, небанковские платежные системы, платежные инновации.

Табл.: 2. Рис.: 2. Лит.: 13.

Problem statement. The rapid dynamics of modern life creates new problems, activates methodological searches, forms new paradigms for studying economic processes [1]. With the digital economy emerging, special attention is needed to create an effective and stable system of payment instruments.

Formation of payment systems has historically been linked to the emergence of money, but the dynamic introduction of innovations into the financial sector has displaced cash payments.

The development of digital technologies, e-commerce, the Internet of Things has led to the emergence of a variety of payment systems, which are constantly changing and complicated functionally.

The effective functioning of payment systems in Ukraine in the conditions of continuous introduction of innovative technologies is reflected in the Concept of development of digital economy and society of Ukraine for 2018-2020, which aims to remove barriers to the digital transformation of Ukraine in the most promising areas, in particular and to create conditions for the development of payment systems and non-cash payments [2].

Payment systems, as a tool for financial infrastructure, contribute to the efficient allocation of resources in the economy, the implementation of national monetary policy.

Analysis of recent research and publications. Issues of formation, development, functioning of payment systems are the subject of research of many Ukrainian and foreign scientists, among which are the following: Azarova A. [3], Bortnik N. [4], Esimov S. [4], Kesci-Harmath E., Kokkola T., Nazarenko V. [5], Sammers B., Teslyuk O. [3], Friedman Ch., Hiroya M., Tsiganov S., Chernomor V. [6] and others.

Bondarenko L.P., Yaroshevich N.B., Tarabinovich A.B. [7] investigated the current state of contactless payments in Ukraine and the financial sector's willingness to implement other innovative contactless payment systems. Analysis of the current state of introduction of world innovations in the banking system of Ukraine implemented in the work of Melnik O.I. and Bodnar O.A. [8].

At the same time, recent trends in the field of payment systems require additional research in this area.

Goals setting. The purpose of the article is to investigate the current state and main trends of payment systems development in terms of digitization.

Presentation of the main material of the research. One of the prerequisites for the effective functioning of the financial market is a functioning national payment system. The payment system must meet such requirements as promptness of payments, level of digitalization of the system, reliability of the system of payments, level of protection, flexibility, risk management.

The Law of Ukraine “About Payment Systems and Funds Transfer in Ukraine” states that the payment system is a payment organization, members of the payment system and the totality of relationships that arise between them when transferring funds. Funds transfer is a mandatory feature of the payment system [9].

According to V. Nazarenko [5], the payment system can be considered in a broad (payment system of the economy of the state as a whole) and narrow (separate payment system) sense. In the narrow sense, the payment system is a set of institutional legal and infrastructural elements, payment instruments, contractual relations and legislative norms, the main purpose of which is to realize the interests of economic and civil entities by ensuring the organization and implementation of payment services through the prism. performing such functions as: 1) formation of conditions for carrying out money transfer operations; 2) creation of conditions for payment systems and other activities within payment systems to be performed by the participants of payment systems; 3) meeting the needs of payment system users in the provision and implementation of appropriate payment services. In a broad sense, the payment system is one of the constituent parts of the financial and credit system of the state, which is an orderly, legally regulated set of separate payment systems, organizations that provide a constant flow of funds and promote the goals of the monetary policy of the central bank.

In most developed countries, the payment system consists of several separate systems, each of which meets the requirements of a particular payment area. Based on the role played by payment systems according to the nature of the payments made, there are:

- systems of interbank payments, which are intended for execution of payment transactions between banks, conditional on the payment of their customers or their own obligations to one bank to another;
- intra-bank payment systems are created to provide the most favorable conditions for payments between institutions belonging to one group;
- client-bank systems are used by banks that offer payment services to their customers based on modern technologies. For today home banking is becoming more widespread;
- mass payment systems that are widely used in developed countries. Despite the fact that traditional non-cash payment instruments (checks, payment orders, etc.) are quite widespread, the system of mass (consumer) payments with the use of plastic cards is becoming more and more widespread.

The process of providing payment services involves the involvement of different levels of the national payment system.

At the first level of the elements of the payment system can be distinguished National Bank of Ukraine. In the article 7 of the Law of Ukraine “About the National Bank of Ukraine” [10] it is determined that the National Bank of Ukraine is the national regulator of payment and settlement systems in Ukraine.

Among the payment systems operating within the national payment system of Ukraine, a special place is occupied by the payment system of the National Bank of Ukraine and the national system of payment cards. Due to the specific nature of their tasks and the importance of their functions in the national payment system, these payment systems have some specific legal regulation.

The aggregate of elements combined by the direct provision of payment services form the second level of the national payment system.

The third tier of the national payment system consists of elements that combine to be involved in organizing interaction in the provision of payment services between all stakeholders. This circle includes the elements that make up the infrastructure of the national payment system. Generally speaking, infrastructure can be defined as a set of interconnected organizations that provide the basis for the functioning of any system.

The necessary elements of a functioning payment system are:

- the regulatory framework governing payment relations should create favorable conditions for ensuring the needs of the normal functioning of the payment system;
- protection of information as a set of software, regulatory, administrative and organizational tools [1].

The development of payment systems in Ukraine is characterized by an inseparable link with the banking system, as most payment systems, even non-banking ones, provide their services to end users through banking institutions, which is related to the specificities of the Ukrainian legislation and the extensive network of banking branches. This allows payment systems to cover a large part of the country. It should be noted that this feature is characteristic of most European countries, whereas in Asia, mobile operators have a much larger role in the market and specialized non-banking institutions in the US [6].

According to the Law of Ukraine “About Payment Systems and Funds Transfer in Ukraine” [9], activities in Ukraine of national and international payment systems are provided:

Ukrainian payment system is a payment system in which the payment organization is a resident and which carries out its activity and ensures the transfer of funds exclusively within Ukraine.

International payment system is a payment system in which a payment organization can be a resident or a non-resident, which operates in the territory of two or more countries and ensures the transfer of funds within this payment system, including from one country to another.

In the article 9 of the Law of Ukraine “About Payment Systems and Funds Transfer in Ukraine” [9] states that payment system organizations, payment system participants and payment infrastructure service providers have the right to operate in Ukraine only after their registration by entering information about them into State Registry. The procedure for such registration is determined by the Regulation on the procedure for registration of payment systems, participants of payment systems and operators of payment infrastructure services, approved by the resolution of the Board of the National Bank of Ukraine dated February 4, 2014 № 43.

The entities providing payment services include: money transfer operators (including electronic money operators); bank payment agents (subagents), payment agents; arranging for postal services when providing payment services.

The elements of the national payment system whose activities are aimed at providing payment services include payment systems of various types. The payment system is not subject to the national payment system because it does not have the status of a legal entity.

The payment system is an artificial entity. This is the set of organizations that cooperate under the rules of the payment system for the purpose of transferring funds. However, the purpose of creating a payment system, regardless of its type, is to make a transfer of funds, which makes it possible to transfer the payment system to the elements of the national payment system.

The national payment system infrastructure is a link between payment service providers and end users of these services. The organizations forming this group of elements of the national payment system do not directly provide payment services, but without them it would not be possible to implement them. The whole set of elements that make up the national payment system infrastructure is aimed at creating the possibility of building relationships between other elements of the national payment system and between them and the end users of payment services. In addition, the infrastructure of the national payment system is designed to ensure the interoperability of all elements of the national payment system [4].

Today, the National Bank of Ukraine is a payment organization and a settlement bank for two state payment systems: the Electronic Payment System (EPS) and the National Payment System “Ukrainian Payment Space” (PROSTIR).

The National Bank's Electronic Banking System (EPS) is a state-owned bank payment system that provides for interbank transfers through accounts opened with the National Bank of Ukraine.

The EPS provides for settlements within Ukraine between banks on the instructions of bank clients and on the obligations of banks and other system participants.

The EPS belongs to the real-time gross settlement system (by international classification - RTGS) and allows you to send payments in one of two real-time and file modes.

In real time, funds are credited to the payee's bank instantly; in file mode, it takes an average of 10 to 20 minutes for the payment process to go from the sender to the recipient bank.

The EPS members are the National Bank, banks of Ukraine and the State Treasury Service of Ukraine [11].

The PROSTIR National Payment System is a retail payment system in which payments for goods and services, cash and other national currency transactions are made by electronic means of payment, namely PROSTIR payment cards.

Prior to the rebranding in 2016, the PROSTIR payment system was called the National System of Mass Electronic Payments (NSMEP) [12].

At present, 52 Ukrainian banks and 16 non-banking institutions are members of the PROSTIR - system.

To increase the reliability and efficiency of payment systems, the NBU distinguishes them by their level of importance (Table 1).

The National Bank of Ukraine applies to the activity of payment systems that fall into one of the categories of importance, the requirements, which are based on the international standards of oversight, of these payment systems.

In addition, information on the distribution of payment systems by category of importance is used by the National Bank of Ukraine to determine the object of comprehensive assessment for compliance with international PFMI standards, as well as to plan the on-site inspections of oversight facilities.

Table 1

Classification of payment systems by level of importance

Category	Criteria
Systemically important	- more than 10% of inter-bank transfers in the country; - transfers on transactions with government securities on the open market; - ensure the settlement of obligations of participants arising in other payment systems.
Socially important	- more than 10% of national and cross-border transfers; - more than 10% of transactions using electronic means of payment.
Important	- 5 - 10% of interbank transfers; - 5 - 10% of national and cross-border transfers; - 5 - 10% of transactions using electronic means of payment; - more than 5% of national transfers; - more than 5% of cross-border transfers are unique in the market by type of services.

Source: Based on data [11]

The criteria for assigning a payment system to a certain category are the volume of transactions and types of services provided by the system [11].

In the table 2 presents payment systems that are registered with the NBU and operate on the territory of Ukraine.

Table 2

Payment systems registered and operating in Ukraine

№	The name of the payment system	The name of payment organization	The type of payment system	The sign of payment system
1	2	3	4	5
Systemically important payment systems				
1	Electronic Payment System (EPS)	National Bank of Ukraine (SEP Payment Council)	interbank payment system	National
Socially important payment systems				
1	Mail order	AT "Ukrposhta"	system of funds transfer	National
2	FORPOST	TOV "POST FINANS"	system of funds transfer	National
4	MasterCard	Mastercard International Incorporated	card payment system	International
5	Visa	Visa International Service Association	card payment system	International
6	Western Union	Western Union Financial Services, Inc./ Western Union Network (France), SAS	system of funds transfer	International
7	InterPayService	PrAT "Zaporizhzhviazokservis"	system of funds transfer	National
Important payment systems				
8	The financial world	TOV "Ukrainska platizhna sistema"	system of funds transfer	National
9	City24	TOV "FK "FENIKS"	system of funds transfer	National
10	MoneyGram	MoneyGram Payment Systems, Inc.	system of funds transfer	International
11	INTELEXPRESS	AT Mikrofinansova orhanizatsiia "INTELEKSPRES"	system of funds transfer	International
12	RIA	CONTINENTAL EXCHANGE SOLUTIONS, INC.	system of funds transfer	International
Other payment systems				
13	American Express	American Express Limited	card payment system	International
14	National Payment System "Ukrainian Payment Space"	National Bank of Ukraine	system of retail payments	National

1	2	3	4	5
15	Settlement Stock System	PAT "FK "SUCHASNI KREDYJNI TEKHOLOGII"	Securities settlement system	National
16	MOSST Payments	TOV "FK "VAP - KAPITAL"("MOSST", "MOSST Payments", "MOSST Cash", "MOSST Reader")	system of funds transfer	International
17	PAYPONG	TOV "EVROPEISKA PLATIZHNA SYSTEMA"	system of funds transfer	National
18	ELEKTRUM	TOV "ELEKTRUM PEIMENT SISTEM"	system of funds transfer	National
19	LEO	TOV "FK LEOHEIMINH PEI"	system of funds transfer	International
20	Uapay	TOV "FK YuAPEI" (uapay.in.ua)	system of funds transfer	National
21	UKRKART	AT "UKRKART"	card payment system	National
22	AVERS №1	AT "FK "AVERS №1"	system of funds transfer	International
23	Globalmoney	TOV "HLOBALMANI" (Global 24, Global Pay, gm.ua, global24.ua, globalpay.ua)	system of funds transfer	International
24	LIME MONEY	TOV "SMART FINEKSPERT"	system of funds transfer	National
25	Platyservis	TOV "PLATYSERVIS" ("PS")	system of funds transfer	National
26	MEEST	MEEST Corporation Inc.	system of funds transfer	International
27	KhAZRY	VAT "Kapytal Bank"	system of funds transfer	International
28	Sigue Money Transfer	SGS Corporation	system of funds transfer	International
29	EximCash	AT "Ukreksimbank"	system of funds transfer	National
30	Unite Express	PAT "IuNEKS BANK"	system of funds transfer	National
31	AKORDBANK-EXPRESS	PuAT "KB "AKORDBANK"	system of funds transfer	National
32	Hroshi blyskavkoiu	PAT "KREDOBANK"	system of funds transfer	National
33	Metalcard	AT "MetaBank"	system of funds transfer	National
34	Za myt	AT "UKRSYBBANK"	system of funds transfer	National
35	FREESSEND	PAT "BANK KREDYT DNIPRO"	system of funds transfer	National
36	Aval- Express	AT "Raiffaizen Bank Aval"	system of funds transfer	National
37	InNovaPay.UA	AT "BANK SICH"	system of funds transfer	National
38	Myttievyi perekaz	AKB "INDUSTRIALBANK"	system of funds transfer	National
39	Welsend	AB "Ukrhazbank"	system of funds transfer	International
40	TELEGRAF	AT "PRAVEKS-BANK"	system of funds transfer	International
41	PrivatMoney	AT KB "PRYVATBANK"	system of funds transfer	International

1	2	3	4	5
42	Express Transfer System “Shvydka kopiika”	AT “Oshchadbank”	system of funds transfer	National
43	FLASHPAY	PrAT “BANK FAMILNYI”	system of funds transfer	National
44	IBOX MONEY TRANSFER	AT “Aiboks Bank”	system of funds transfer	International
45	HLOBUS	AT “KB “HLOBUS”	system of funds transfer	International
46	UnionPay International	UnionPay International Co., Ltd	card payment system	International

Source: Based on data [11]

The only systemically important payment system in Ukraine remains the NBU EPS, providing 97% of interbank transfers in national currency within Ukraine.

There are 6 socially important payment systems, including two international card payment systems (MasterCard, Visa) and four funds transfer systems: international - Western Union and national - Postal transfer, FORPOST, InterPayService.

There are six card payment systems in Ukraine, two of which are national (PROSTIR, UKRKART) and four international (MasterCard, Visa, American Express, UnionPay International).

There are 5 important payment systems operating on the Ukrainian market, which are funds transfer systems: 2 national - Financial world, City24, 3 - international MoneyGram, INTELEXPRESS, RIA.

A payment organization may be a bank, seven payment systems are registered, and sixteen non-banking institutions are registered in Ukraine.

Among the national funds transfer systems there are 10 intra-bank: EximCash (AT “Ukrexsimbank”), Unite Express (PAT “IuNEKS BANK”), ACORDBANK-EXPRESS (PuAT “KB “AKORDBANK”), Hroshi blyskavkoiu (PAT “KREDOBANK”), Metacard (AT “MetaBank”), Za myt (AT “UKRSYBBANK”), FREESSEND (PAT “BANK KREDYT DNIPRO”), Aval-Express (AT “Raiffaizen Bank Aval”), InNovaPay.UA (AT “BANK SICH”), Myttievyi perekaz (AKB “INDUSTRIALBANK”).

Ukraine is a transboundary recipient country, which is illustrated in Fig. 1.

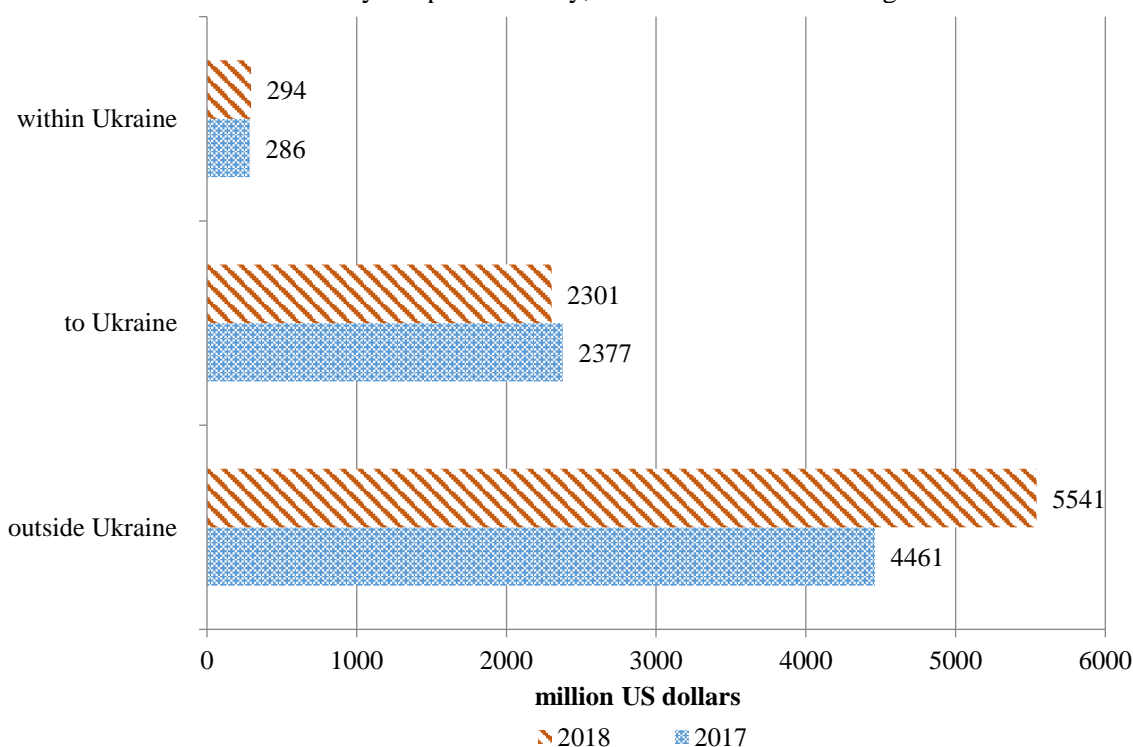


Fig. 1. Transfers which were made through funds transfer systems in 2017-2018, million USD. US (eq.)

Source: Based on data [11]

In 2018, the amount of funds received to Ukraine is 7.8 times higher than the amount of money sent from Ukraine. Although the amount of funds received to Ukraine in 2018 decreased by 3.2% compared to 2017. Within Ukraine, the volume of transfers for the specified period increased by 24.2% and from Ukraine by 2.9%

In 2018, transfers to Ukraine were made by the funds transfer system from the USA (17%), Israel (13%), Russia (9%), Italy (8%), Poland (7%), and other countries - 46%. From Ukraine through the system of funds transfers, transfers were made to Russia (36%), Georgia (10%), China (6%), Azerbaijan (6%), Uzbekistan (4%), and other countries - 38%.

Ukrainians, following global trends, are increasing their volume of non-cash transactions.

Overall, the results of the first quarter of 2019 demonstrated a positive trend in the development of cashless payments, which has become commonplace for Ukrainians. So, for today 8 out of 10 payment card transactions in Ukraine are cashless.

There is a growing demand of Ukrainians for innovative payment services, which adds to the popularity of contactless payments using smartphones and other NFC-devices.

Paying with your mobile phone and other devices today is an easy, fast, convenient and secure way to pay for goods / services. Tokenization services make it possible to use payment card details (in particular, solely with magnetic stripe) for contactless payments using NFC-technology.

Increasing the demand of Ukrainians for cashless transactions and promotion of innovative payment services stimulate further expansion of payment infrastructure [11].

Payment infrastructure for non-cash transactions is expanding (Fig. 2).

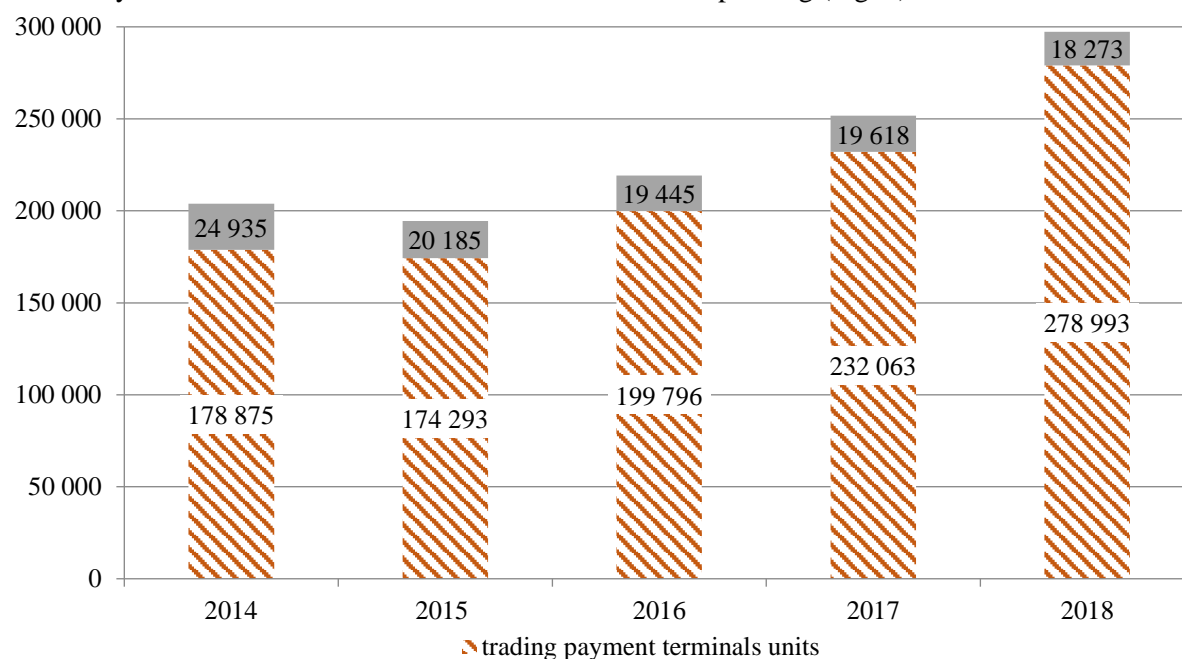


Fig. 2. Dynamics of the number of payment terminals in Ukraine in 2014-2018

Source: Based on data [11]

For 2018, the network of commercial payment terminals increased by 20.2% to 278993 units (as of January 1, 2019). The contactless payment infrastructure has continued to expand throughout the past year. This was promoted by the promotion of innovative services such as Apple Pay and Google Pay, which started their operations in Ukraine. At the beginning of 2019, almost 79.4% of commercial POS terminals in Ukraine provided the possibility of contactless payment (at the beginning of 2018 - 70.2%).

According to experts, Ukraine is ranked 4th in the world in contactless payments, which shows the considerable potential for the development of digital technologies, in particular in the financial and banking sphere.

The innovations introduced in the banking business environment have several features. First, banking institutions are under the influence of regulatory and supervisory systems, what may limit the innovation process. Second, much of banking innovation is solutions that are borrowed from other areas of social production, or driven by changes in customer requests. Third, not the patent protection but the know-how and copyright is the main tool for protecting the intellectual property of the bank's innovative assets. And lastly, banking innovation is based on applied rather than basic scientific research, which significantly reduces the cost of innovation for banks [13].

From the point of view of electronic access systems, it has become traditional to use payment cards adapted for Internet payments, SMS, remote banking, Internet applications, electronic checks. ATMs, PESS, terminals, and personal computers are the traditional means of electronic access.

Innovative electronic access systems are the use of mobile applications and API-access to payment services, with the means of electronic access are mobile devices, mPOS-terminal, biometric data, contactless technologies - NFC-technologies, QR-technology, NS-technologies, etc.

The use of mobile devices - smartphones and watches - has become widespread in Ukraine. Ukrainians are most often paid for purchases with the help of gadgets in shops, transport, catering establishments, gas stations.

The use of NFC technology has become very popular in recent years.

NFC (Near Field Communication) in translation it means - communication at short distances. The technology allows communication and data exchange between devices at short distances. For example, between a reader terminal and a smartphone / bank card. NFC range is up to 10 centimeters.

The most common NFC payment option is contactless credit card payment. The development of technology has led to the emergence of cards such as Visa PayWave and MasterCard PayPass, which have a built-in NFC antenna. Upon purchase, it is enough to bring the card to the terminal and the amount will be automatically debited. The process takes less than five seconds and does not require a PIN.

Contactless payment is a popular option for smartphone owners as well. In this case, the phone acts as a bank card. The payment scheme is similar: we simply bring our smartphone to the terminal to make a payment [14].

There are several advantages to using a NFC card. At first, payment by NFC-chip guarantees a much higher level of security than when paying with a regular bank card. Secondly, chip operations are faster and take seconds. It should also be noted that if the POS terminal is not equipped with an NFC chip, then it is possible to perform operations using the magnetic tape of the card [15].

According to MasterCard [15], today 21 national banks have activated mobile wallets for their users with the help of MDES, the MasterCard integration platform for card tokenization, which underlies the NFC technology. MasterCard has brought banks, on the one hand, and global digital wallet providers (Apple, Google, etc.) on the other hand, as well as merchants and vendors of IT solutions.

The mPOS terminal accepts credit card payment anywhere, not just at a fixed point of commerce.

Merchant acquiring with mPOS mini-terminals is a banking service that allows you to accept a card of international payment systems VISA and MasterCard for goods, works, services through mini-terminals.

mPOS Mini-Terminal is a portable mobile terminal that connects to a smartphone or tablet and accepts all types of payment cards (magnetic tape, chip and contactless technology) wherever you are comfortable, unbound to the physical point.

It is advisable to use the mPOS mini-terminal in the following segments: outlets, online stores, insurance companies, medical companies and clinics, transport companies and delivery services, service companies and providers, taxi services, other mobile vendors / sellers [16].

A QR-code is a type of matrix (two-dimensional) barcodes that were originally developed for the Japanese automotive industry but soon became popular in many industries around the world, including payment services. Unlike conventional barcode scanners, a QR-code is recognized by a sensor or camera as a two-dimensional image. The main advantages of QR-codes over conventional barcodes are fast reading, high capacity and the ability to scan without internet access.

Today, QR-technology is the most widely used in the Asian market. The huge popularity of QR-payments has gained in China: bright examples of the success of this technology in China can be called digital payment systems, such as WeChat Pay from Tencent and Alipay from Alibaba. You can pay with the mobile app and QR-code almost anywhere - from traveling to a taxi and buying takeaway food to encouraging street musicians with a small amount of electronic money.

As far as North American and European markets, QR-technology is not as widespread as in Asian countries, but successful projects have already managed to prove themselves, such as mobile applications from Starbucks and Walmart. QR-codes are also used in outdoor advertising, encrypted links, business cards, e-tickets and even on a Japanese visa [17].

In Ukraine, QR payment technologies are used to pay for transportation, utilities, gas stations, shops, etc. QR-payments are offered by Privatbank, Alfa-Bank, EasyPay.

According to Melnyk O.I. and Bodnar O.A. [8], the introduction of biometrics in the banking sector is an innovation that directly affects bank customers. Biometric parameters are natural characteristics of a person. This includes both the unique (so-called static) signs she received at birth (such as fingerprints, structure of the retina, etc.), and dynamic features that can change throughout life (such as voice, handwriting or gait). In the financial field, they have learned to apply both types of parameters, though some are predominant in use.

Having tried many methods of personality recognition, the developers came to the conclusion that the natural characteristics of the person to forge the hardest.

Preferably now use biometrics in customer recognition when it: withdraws money through an ATM; calls the bank; uses mobile and internet banking, makes online transactions.

The main modern biometric methods for identifying individuals are: fingerprint; voice recognition; face recognition; eye scan; palpitation. In addition to the above methods, vein readings, behavioral analysis, brain signals, and even scans of the ears can be used to confirm a person [8].

According to Javier Perez, MasterCard President of Europe, biometric technologies are ideally suited to people's expectations for secure payment solutions for the future, in which the rapid digitalization of everyday life will be even more evident. Biometrics can provide customers, retailers and banks with significant benefits by simplifying the shopping process and ensuring transaction security [15]. MasterCard, in partnership with Privatbank, is implementing a behavioral biometrics based customer verification project.

Further development of the national payment system depends on socio-economic, political and legal, technical and technological factors, in particular: increase of real incomes of citizens, increase of turnover, rates of development of the financial and banking system, globalization of the payment market, migration processes, decrease of population of working age mistrust and financial literacy of the population, political situation in the country, regulation of the payment market by the national regulator, development of the Internet, mobile technologies, Fin-Tech, artificial and intelligence, and so on.

Thus, for the effective development of national payment systems in terms of digital transformations, a number of measures are necessary, in particular:

The National Bank of Ukraine needs to harmonize national legislation in the area of payment market regulation, taking into account the experience of leading countries, in particular with regard to the implementation of the European PSD2 Directive (on Open Banking) and the development of financial technologies. When regulating the payment market, it is necessary to provide a system of protection of the rights of all users of payment services.

Financial literacy and financial inclusion enable financial services consumers to reach their full potential. Young and middle-aged, middle- and high-income citizens are increasingly using innovative payment instruments and banking services in general.

Banks and other payment service providers need to consider that factors such as changes in customer behavior, customer expectations, data security, mobile technologies, Fin-Tech, Big Data, social networking development, biometrics, distributed registry technologies, including block chain will affect the further development of the payment infrastructure and the development of the entire economy as a whole.

Therefore, in order to maintain competitive positions and take into account their further integration with the IT industry, banks need to dynamically implement innovative technologies, develop new digital products and services, and work more closely with Fin-Tech startups.

Conclusions. One of the factors of economic independence of any state is its own payment system. A key element of the national payment system is the payment system of the National Bank of Ukraine. Reliable and efficient payment systems are a prerequisite for the stable functioning of the country's financial system and economy as a whole.

The activity of payment and settlement systems in Ukraine is regulated by the National Bank of Ukraine. The national legislation provides for the functioning of national and international payment systems.

There are 46 national and international payment systems in Ukraine, owned by banking and non-banking organizations, residents and non-residents of Ukraine. Based on the experience of developed countries, there are two state payment systems in Ukraine: the electronic payment system and the National Payment System "Ukrainian Payment Space" (PROSTIR), for which the National Bank of Ukraine is a payment organization and a settlement bank. On the national payment market there is a single systemically important payment system of the NBU EPS, 6 socially important payment systems, 5 important payment systems. Among the card payment systems, there are two national and four international.

The positive trends in the development of the national payment market are the increase in the volume of non-cash payments, including contactless payments, the steps taken by regulators in the direction of digitalization and improvement of the legal framework of the payment market and its infrastructure.

The use of mobile applications and API-access to payment services are innovative directions of creation of payment infrastructure, with means of electronic access being mobile devices, mPOS-terminal, biometric data, contactless technologies - NFC-technologies, QR-technology, NS-technologies, etc.

It need to be considered that the further development of payment systems will be under the influence of digital technologies, and the requirements for payment systems will be formed not by system operators and participants, but by their clients, because the customer-oriented approach becomes the leading paradigm of doing business. At the same time, technologically outdated payment systems will lose the customers.

Harmonization of legislation in the field of payment systems will facilitate the further development of digital payments in Ukraine, the entry into the market of new payment products, services and technologies, increase the share of non-cash payments will contribute to the transparency of payments and, consequently, positive effects for the national economy.

References

1. Kaletnik H., Kozlovs'kyj S. & Kozlovs'kyj V. (2012). Stijkist' ekonomiky iak faktor bezpeky ta rozvytku derzhavy [Economic stability is a factor of security and development of the state]. *Ekonomika Ukrainy – Economy of Ukraine*, 7, 16-25 [in Ukrainian].
2. Rozporiadzhennia Kabinetu ministriv Ukrainy Kontseptsiiia rozvytku tsyfrovoi ekonomiky ta suspil'stva Ukrainy na 2018-2020 roky ta zatverdzhennia planu zakhodiv schodo ii realizatsii: pryjniaie 17 sich. 2018 roku. Retrieved from <https://www.kmu.gov.ua/npas/pro-shvalennya-koncepciyi-rozvitku-cifrovoyi-ekonomiki-ta-suspilstva-ukrayini-na-20182020-roki-ta-zatverdzhennya-planu-zahodiv-shodoyiyi-realizaciyi> [in Ukrainian].
3. Azarova A.O. & Tesliuk O.V. (2017). Problemy rozvytku platizhnoi systemy Ukrainy ta shliakhy ikh vyrishennia [Problems of development of the payment system of Ukraine and the ways of their solution]. *Visnyk Khmel'nyts'koho natsional'noho universytetu : Ekonomichni nauky – Herald of Khmelnytskyi national university: Economic science*, 1, 19-22 [in Ukrainian].
4. Bortnyk N. & Yesimov S. (2017). Struktura natsional'noi platizhnoi systemy Ukrainy [The structure of the national system of Ukraine]. *Visnyk Natsional'noho universytetu "L'vivs'ka politekhnika". Yurydychni nauky – Bulletin of Lviv Polytechnic National University. Law*, 865, 177-183 [in Ukrainian].
5. Nazarenko V. (2017). Do pytannia vyznachennia poniattia "platizhna systema" v Ukraini [On the issue of determining the concept of "payment system" in Ukraine]. *Pidpriemnytstvo, gospodarstvo i pravo. Finansove pravo – Entrepreneurship, Economy and Law*, 10, 151-155 [in Ukrainian].
6. Chernomor V. (2017). Teoretychni zasady, stan i praktyka rozvytku platizhnykh system v Ukraini [Theoretical foundations, condition and practice of development of payment systems in Ukraine], *Skhid – East*, 1, 32-37 [in Ukrainian].
7. Bondarenko L.P., Yaroshevych N.B. & Tarabinovych A.B. (2019). Praktyka vykorystannia bezkontaktnykh platezhiv v Ukraini ta sviti [Practice of using contactless payments in Ukraine and the world]. *Efektivna ekonomika – An efficient economy*, 2. Retrieved from <http://www.economy.nayka.com.ua> [in Ukrainian].
8. Mel'nyk O. I. & Bodnar O.A. (2018). Zaprovadzhennia finansovykh innovatsij u vitchyzniani bankivskij praktytsi [Implementation of financial innovations in domestic banking practice], *Modern Economics*, 8, 102-111 [in Ukrainian].
9. Zakon Ukrainy Pro platizhni systemy ta perekaz koshtiv v Ukraini: pryjniatyj 05 kvitn. 2001 roku № 2346-III [Law of Ukraine On Payment Systems and Funds Transfer in Ukraine from April 05, 2001, № 2346-III]. Retrieved from <https://zakon.rada.gov.ua/laws/show/2346-14> [in Ukrainian].
10. Zakon Ukrainy Pro Natsional'nyj bank Ukrainy: pryjniatyj 20 travn. 1999 roku № 679-XIV [Law of Ukraine On the National Bank of Ukraine: from May 20, 1999 No. 679-XIV]. Retrieved from <https://zakon.rada.gov.ua/laws/show/679-14> [in Ukrainian].
11. Sajt Natsional'noho banku Ukrainy [Site of the National Bank of Ukraine]. bank.gov.ua. Retrieved from <https://bank.gov.ua/> [in Ukrainian].
12. Sajt Natsional'noi platizhnoi systemy "Ukrains'kyj platizhnyj prostir" [Site of the National Payment System "Ukrainian Payment Space"]. www.prostir.gov.ua. Retrieved from <http://www.prostir.gov.ua/> [in Ukrainian].
13. Bilyk O.I., Drebot N.N. Sovremennye tendencii innovacionnogo razvitija bankov Ukrainy [Modern trends of innovative development of Ukrainian banks]. (n.d.). rep.polessu.by. Retrieved from <https://rep.polessu.by/bitstream/123456789/10223/1/2.pdf> [in Ukrainian].
14. Scho take NFC i iak tse pratsiuie? [What is NFC and how does it work?]. (n.d.). blog.easypay.ua. Retrieved from <https://blog.easypay.ua/uk/shho-take-nfc-i-yak-tse-pratsyuye/> [in Ukrainian].
15. Sajt Mastercard v Ukraini. [Sajt Mastercard in Ukraine]. www.mastercard.ua. Retrieved from <https://www.mastercard.ua/> [in Ukrainian].
16. Torhovyj ekvajryn: terminaly mPOS. [Trading Acquisition: mPOS terminals]. (n.d.). bank.com.ua. Retrieved from <https://bank.com.ua/mpos-terminal> [in Ukrainian].
17. Preimushhestva QR-platezhej dlja biznesa. [Benefits of QR Payments for Business]. (n.d.). ain.ua. Retrieved from <https://ain.ua/2019/03/19/preimushhestva-qr-platezhej-dlya-biznesa/> [in Ukrainian].

Список використаних джерел

1. Калетнік Г., Козловський С., Козловський В. Стійкість економіки як фактор безпеки та розвитку держави. Економіка України. 2012. № 7. С. 16-25.
2. Концепція розвитку цифрової економіки та суспільства України на 2018-2020 роки та затвердження плану заходів щодо її реалізації: Розпорядження Кабінету міністрів України від 17.01.2018 р. URL: <https://www.kmu.gov.ua/npas/pro-shvalennya-koncepciyi-rozvitku-cifrovoyi-ekonomiki-ta-suspilstva-ukrayini-na-20182020-roki-ta-zatverdzhennya-planu-zahodiv-shodo-yiyi-realizaciyi> (дата звернення: 10.03. 2019).
3. Азарова А.О., Теслюк О.В. Проблеми розвитку платіжної системи України та шляхи їх вирішення. Вісник Хмельницького національного університету : Економічні науки. 2017. №1. С. 19-22.
4. Бортник Н., Єсімов С. Структура національної платіжної системи України. Вісник Національного університету "Львівська політехніка". Юридичні науки. 2017. № 865. С. 177-183.
5. Назаренко В. До питання визначення поняття "платіжна система" в Україні. Підприємництво, господарство і право. Фінансове право. 2017. №10. С.151-155.
6. Черномор В. Теоретичні засади, стан і практика розвитку платіжних систем в Україні. Схід. 2017. № 1. С. 32-37.
7. Бондаренко Л.П., Ярошевич Н.Б., Тарабінович А.Б. Практика використання безконтактних платежів в Україні та світі. Ефективна економіка. 2019. № 2. URL: <http://www.economy.nauka.com.ua> (дата звернення: 12.03. 2019).
8. Мельник О. І., Боднар О.А. Запровадження фінансових інновацій у вітчизняній банківській практиці. Modern Economics. 2018. № 8. С. 102-111.
9. Про платіжні системи та переказ коштів в Україні: Закон України від 05.04.2001 р. № 2346-III. URL: <https://zakon.rada.gov.ua/laws/show/2346-14> (дата звернення: 12.03. 2019).
10. Про Національний банк України: Закон України від 20.05.1999 р. № 679-XIV. URL: <https://zakon.rada.gov.ua/laws/show/679-14> (дата звернення: 12.03. 2019).
11. Сайт Національного банку України. URL: <https://bank.gov.ua/> (дата звернення: 14.03. 2019).
12. Сайт Національної платіжної системи «Український платіжний простір». URL: <http://www.prostir.gov.ua/> (дата звернення: 20.03. 2019).
13. Бильк О.И., Дребот Н.Н. Современные тенденции инновационного развития банков Украины. URL: <https://rep.polessu.by/bitstream/123456789/10223/1/2.pdf> (дата звернення: 20.03.2019).
14. Що таке NFC і як це працює? URL: <https://blog.easypay.ua/uk/shho-take-nfc-i-yak-tse-pratsyuye/> (дата звернення 21.03.2019).
15. Сайт Mastercard в Україні. URL: <https://www.mastercard.ua/> (дата звернення 21.03.2019).
16. Торговий еквайринг: термінали mPOS. URL: <https://bank.com.ua/mpos-terminal> (дата звернення 21.03.2019).
17. Переваги QR-платежів для бізнесу. URL: <https://ain.ua/2019/03/19/preimushhestva-qr-platezhej-dlya-biznesa/> (дата звернення 21.03.2019).

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