

# Digitalization of Payment Systems in Ukraine

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**Abstract:** *The world is changing due to technological innovations that are reflected in both the customers' needs and the payment systems themselves. Payment systems that operate on the territory of Ukraine have certain properties, which the potential client draws attention to when choosing one of them. Let's conduct complex research and we will propose solutions of a relevant scientific task which consists of the development of theoretical and methodological foundations, methodological approaches and practical recommendations on the implementation and improvement of the functioning of payment systems in Ukraine in the light of world experience. Modern payment systems are one of the most important and fundamental parts of Ukraine's financial infrastructure. The article offers a theoretical understanding of the payment system and considers the peculiarities of the payment systems functioning in Ukraine at the present stage. The payment systems market and its structure are presented in details. Payments and transfers number are highlighted. The statistics on illegal payment card transactions are reviewed. The payment systems of the leading European countries are characterized. The prospects of the National Bank of Ukraine with the largest European payment systems are described. On a basis expansion of the structure of criteria of the importance of payment service providers and accounting of the presence of crucial participants in payment service providers is developed a methodical approach to the assessment of the priority of payment service providers. The practical value of the received results consists in their use for the development of normative legal acts of the National Bank of Ukraine, the safety of payment service provider of Ukraine regulating an order. Measures to increase payment system's security level in Ukraine are outlined. For the banking system of Ukraine, European experience in the field of payment systems is very important, as today the concept of borders is quite conventional when it comes to payment services. In this regard, determining the priority of payment systems that operate in Ukraine is of particular importance, which determines the relevance of the chosen topic.*

**Keywords:** *payment systems; cross-border transfers; innovative services; electronic payment system.*

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## I. INTRODUCTION

The important of the study is to develop proposals to improve the reliability of the payment infrastructure, as one of the key goals of oversight delivery in the context of ensuring financial stability. For this, this article examines the market for payment systems, namely the need to study the payment organization, participants, banks, as separate economic entities that make up the payment system, as well as the study of the individual payment system and its relationships. Adopting the methodology of problematization, this article analyses illegal actions with payment cards. Measures to improve the security of the payment system of Ukraine are outlined. Much attention is paid to the activities of the wholesale (the SEP by the NBU) and retail payment systems, which are interconnected elements that increase the possibility of spreading systemic risks in the event of disruption of their activity, as well as a high level of concentration in the payments and wire transfers market, individual payment systems of Ukraine, the payment organization of which is the NBU. Important is the ability of banks to improve the procedure for making payments in a special period in case the bank is unable to operate in the SEP in full-time mode.

The perspective of digitalization of payment systems in Ukraine requires a deeper theoretical study and practical aspects of its implementation, which indicates the relevance of this topic.

## II. LITERATURE REVIEW

Many domestic and foreign scientists pays attention to the study of theoretical principles and practical experience of using payment systems, in the scientific and economic literature, in particular, A. Epifanov [6], B. Summers [19], V. Mishchenko [6], I. Babukh [1], O. Dziabenko [5], M. Pozhydaieva [16], O. Kalmykova [8], R. Listerfield and R. Montes-Neeret [11], T. Kokkola [10] and others. It is expedient to single out M. Pozhidaiev's opinion, which states that the term «national» should be applied to the unified payment system of Ukraine and be an integrating category for all existing payment systems in Ukraine (both domestic and international [16]). However, in the final definition of «national payment system» it is illogical to limit its relations arising in the state payment systems of the National Bank of Ukraine (the NBU) [2]. We agree with the scientist, that the term «payment system» essence definition is used in a much wider sense for definition of the economic phenomenon as a payment system of the country, for the identification of which we propose to use the term «national payment system».

The urgency and insufficient scientific development of these issues serve as a significant impetus for the development of new mechanisms of payment systems.

Research conducted by Gadetska S. and Uspenska M. has a theoretical and practical importance for banks, because it allowed to evaluate the prospects for the payment systems development, as well as helped the potential client to decide in favour of a particular payment system [7]. However, the spectrum of payment systems has not been fully covered.

Banks in the Visegrad countries increased their productivity mainly due to technological progress. The banking sector took advantages mostly of information technologies and reached a higher production frontier [4]. It is worth paying attention to foreign experience and using this practice to digitize payment systems in Ukraine.

Synthesis of bank financial management integrated technologies should involve consistency of indicators used as part of these technologies. For this purpose, they should reflect the strategic goals and be interrelated so that one can trace how changes in some indicators affect the others [12, 24]. This means that during the process of implementation of bank financial management integrated technologies priority should be given to the most significant indicators, such statements are covered in her work by Iryna Chmutova [3]. Banking management has been sufficiently covered, but bank analysis has not been sufficiently analysed.

The payment systems market should be considered as a market for issuing and acquiring payment cards within international and national payment systems [18, 22]. It is a set of principles, forms, methods of subjects relations that are provided within the payment card system the conditions for using plastic cards as a means of payment [9]. In our opinion, the payment system market should be defined as a set of economic relations in the process of which the demand and supply for payment or transaction services are formed.

Effective operation of a secure and save banking payment infrastructure reduces the cost of exchanging goods and services, enhances the stability of the financial sector and increases access to financial services [20]. Due to the extreme importance of banking payment systems, they are subject to regulation not only by central banks but also by specialized international organizations [21]. The importance of banking payment systems has increased in recent years against the background of rapid growth in the number and volume of financial payments [23], all of which determine the relevance and timeliness of research topics.

### III. RESEARCH METHODS

The theoretical and methodological basis of the research is the basic provisions of modern economic theory, the work of leading domestic and foreign scientists on the issues of payment systems. The methodological basis of this research is the work of scientists in the field of theory development: payment systems, finance, interaction and state regulation of the economy. Using the systematic reproduction approach in the study allows us to show the process of interaction between the payment system and the real economy as a set of functioning elements of the Ukrainian economic system.

The purpose of the quantitative research method is to show the influence between the variables by looking for a theory,

looking for generalizations that have prognostic value. Variable studies can be interpreted as temporary responses to a research problem, but the truth should be tested empirically. The hypothesis is to describe the relationship between two variables, namely, cause and effect and is a comparison of one variable from two samples. At the same time, the analysis of the scientific literature shows the ambiguity of the impact of payment systems on economic growth.

In the article, all materials are worked out by means of a complex of methods of scientific research, in particular, the direct description of the studied phenomenon, processing of statistical information by means of economic methods of research, representation of the received results by means of a tabular form and a graphic method. In the research, we used general scientific and specific economic methods, as well as a basic research approach that allowed us to determine the economic nature and scope of payment systems.

### IV. RESULT AND DISCUSSION

In today's world, the key to a stable financial system and economy is the payment systems market.

The definition of the payment system as a general economic phenomenon is determined by the role and functions of the country's payment system in the economy: through the national payment system, payments and settlements between economic entities are ensured, and the central bank is able to influence the processes not only in the monetary sector but also in the real sector of economy, maintaining the liquidity of commercial banks by refinancing them [8].

The payment system may include a large number of economic entities (central banks, banks, non-banking institutions, etc.) providing services under the payment system's brand or trademark, but may at the same time carry out other types of core business. At the same time, the central bank during oversight controls to a certain extent the activity of, firstly, each individual entity of the payment system (for example, eliminates banks from the list of participants in the payment system, conducts on-site inspections of participants, payment organization of the payment system, etc.); secondly, the individual payment system as a whole (in particular, by carrying out its complex evaluation), and thirdly, it also analyzes, regulates, promotes the development of the whole set of payment systems and their connections both within and outside the country, that it is the international payment system, operating in more than one country. The structure of payment systems is shown in Figure 1.

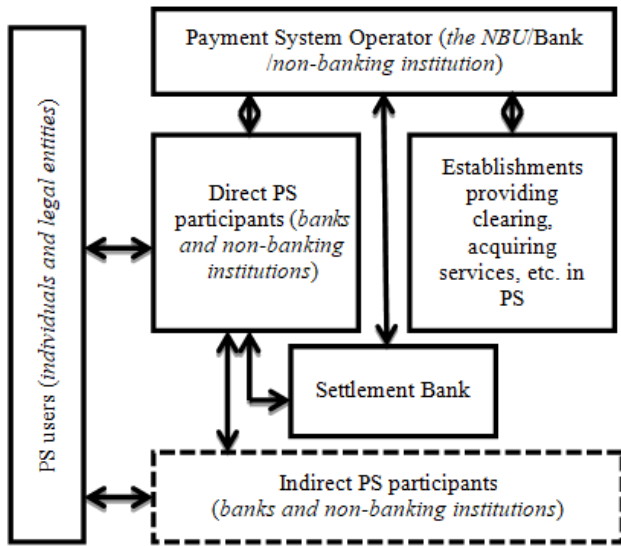


Fig. 1. Structure of the payment system

Source: Built by Authors

The payment system should be considered at several levels. Firstly, it is the micro level when there is a need to study the payment organization, participants, and settlement banks, as separate economic entities that make up the payment system. Secondly, it is a study of a separate payment system and its interconnections [1]. There are doubts about the possibility of assigning the payment system to the categories of microeconomic level, since in its essence, it goes beyond its limits, but does not reach the macroeconomic level of the economy.

At the beginning of 2019, 42 domestic and international payment systems were operating in Ukraine, created by residents and non-residents, as well as two systems of the National Bank of Ukraine [14]. The current market for payment systems is shown in Figure 2.

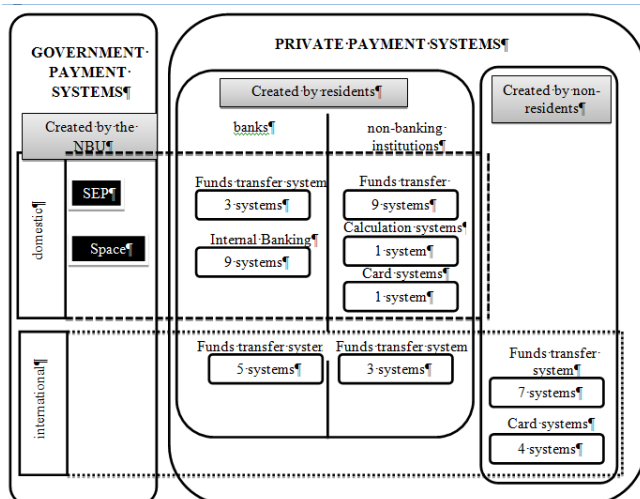


Fig. 2. The market of payment systems in Ukraine at the beginning of 2019

Source: Built by Authors

In total, 150.5 billion UAH or 5.5 billion USD was transferred within the limits of Ukraine through the funds transfer systems in 2018. From the beginning of 2019 on the volume of cross-border transfers the money transfer systems created by residents of the USA (Western Union,

MoneyGram, RIA) remain in the lead: 92 % - to Ukraine and 97 % - from Ukraine.

During 2018, cross-border transfers were carried out by:

- 7 funds transfer systems created by non-residents: 3 systems from USA, 1 from Georgia, UK, Canada, Azerbaijan;

- 3 funds transfer systems created by resident non-banking institutions and 5 systems created by resident banks.

In the market of domestic transfers, the number is dominated by systems created by banks (18 systems, including 9 intra-banks) [15]. At the same time, the majority of domestic transfers (92 %) is carried out by systems created by non-banking institutions.

More than 70 % of transfers within Ukraine are related to the activity of 2 postal operators [17]. The amount of transfers made by the systems is independent of the participants' number. The two systems with the largest volumes of transfers within Ukraine («Post Transfer» and «FORPOST») have no participants at all. The main region where the transfers were sent in 2018 is Kyiv (the amount of paid transfers in 3.8 times exceeds the amount of transfers sent).

Ukraine remains a cross-border transfer's recipient country. During 2018, the amount of funds received in Ukraine using international money transfer systems is eight times higher than the amount of funds sent abroad. In 2018, significant transfers to Ukraine came from the US (17 %), Israel (13 %) and the Russian Federation (9 %). The largest volumes of transfers from Ukraine in 2018 were sent to the Russian Federation (36%), Georgia (10 %) and China (6%) [14]. The volume of transfers from/to the Russian Federation in 2017 decreased compared to 2016 due to the introduction of sanctions on October 17, 2016 into the Russian funds transfer systems.

According to the Law of Ukraine «On payment systems, payment organizations of payment systems», participants of payment systems and operators of payment infrastructure services have the right to operate in Ukraine only after their registration by entering information about them in the Register of payment systems. From the definition of the payment system, we can conclude that transfers are a characteristic feature of the payment system. Note that although the definition of the payment system, presented in the legislation of Ukraine, is consistent with the traditional understanding of the nature of the payment system, analysis of the activity of payment systems registered by the NBU, allows to conclude that the entities that are not traditionally considered payment systems in other countries are attributed to payment systems. In particular, intra-bank payment systems that are created within an individual bank and do not have participants, in essence, doesn't correspond to the features of the payment system and are not a source of systemic risks, as well as make it impossible to apply certain international standards to them.

In 2018, such an international payment system as UnionPay International (UnionPayInternational Co., Ltd., People's Republic of China) entered the Ukrainian market, which proved to be the largest in the world by the number of payment cards issued.



In addition, a new international payment system and two other domestic payment systems have been registered, which have expanded the list of services and become international.

As of early 2019, the System of Electronic Payment (SEP by NBU) remains the only systemically important payment system in Ukraine. Five major payment systems are included in the category of socially important payment systems: Mail Transfer, FORPOST, MasterCard, Visa, Western Union.

Six more payment systems were included in the important categories: InterPayService, City 24, Financial World, MoneyGram, INTELEXPRESS, RIA.

The first payment system evaluated by the National Bank for compliance with international standards was the SEP by NBU (2015), which is the only systemically important payment system in Ukraine.

More than 99 % of domestic transfers are made through payment systems created by residents of Ukraine – non-banking institutions and banks of Ukraine, as well as PJSC «Ukrposhta».

As of January 1, 2019, the number of payment cards issued by Ukrainian banks amounted to 59.4 million units, of which 62 % (or 36.9 million units) were active payment cards (Fig. 3).

As we can see, the load on payment systems is growing along with the pace of the payment instruments market development, in particular, of payment cards.

Since 2018, the number of active payment cards has increased by 6 %. At the same time, the number of non-contact active payment cards increased by 44 % (from 2.7 million to 4.0 million).

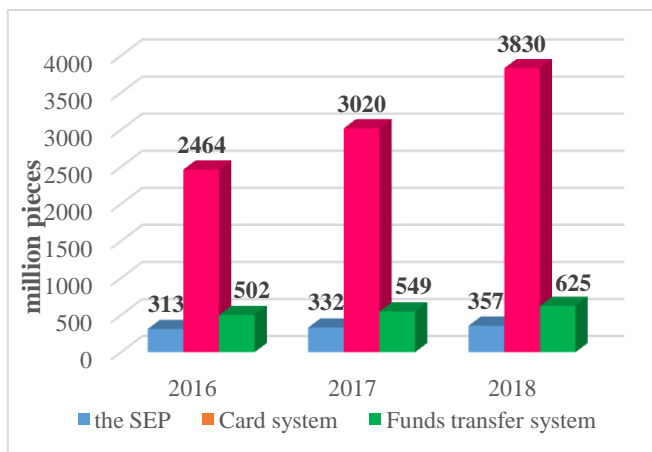


Fig. 3 Number of payments and transfers (within Ukraine)

Source: Copmlieted according to the NBU [14, 15]

As of January 1, 2019, the number of active cards in the MasterCard payment system amounted to 26.0 million units, in Visa – 10.5 million units and in SEP «SPACE» – 0.5 million units. The network of payment terminals increased by 18 % in 2018 and amounted to 297.3 thousand as of January 1, 2019. This increase was due to the increase in the number of merchant payment terminals: from 232.1 thousand up to 279,0 thousand pieces (up 20 % from early 2018). The number of banking terminals, on the contrary, decreased by 7 % and amounted to 18.3 thousand units.

At the same time, promoting innovative services such as Apple Pay and Google Pay is driving the development of

contactless payment infrastructure. As of January 1, 2019, already 79.4 % of the devices of the country’s trade network provide the possibility of making contactless payment (or 221.5 thousand units).

It should be noted that in Ukraine there is a joint oversight between the Central Bank of Belgium and the National Bank (based on the relevant memorandum) regarding the MasterCard payment system, through which about 70 % of non-cash card transactions in Ukraine are executed [13].

It is pertinent to note that with the rapid development of payment systems in Ukraine, illegal actions are increasing, which bring significant losses [6]. O At one illegal action in 2018 accounted for 2.5 thousand UAH (Table-I).

Table-I. Overview of statistic reporting on illegal actions/suspicious transactions with debit cards: key metrics

Period	Number of operations (thousand pieces)	The damage amount (million UAH)	The fraud damage share*
2016	94.6	177.2	0.011%
2017	77.6	163.7	0.0077%
2018	105.5	264.1	0.0092%

Source: own research based on [14]

The volume of losses from illegal actions/suspicious transactions in 2018, which was 0.0092 % of the total transactions using payment cards volume, had no significant impact on the payment card market in Ukraine.

For 2018, 30 banks participating in card payment systems have reported losses in the statistical reports. Most of the complaints concerned unauthorized write-offs and the disappearance of funds from card accounts opened with banks in Ukraine. Fraud trends: physical hacking and ATM robbery, social engineering methods.

Figure 4 shows the number of suspicious transactions.

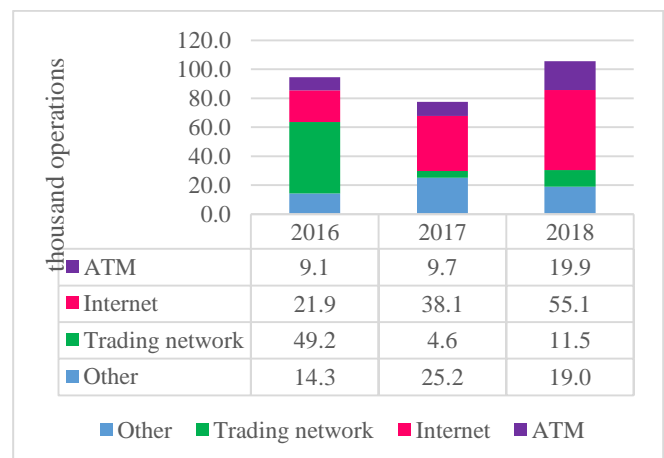
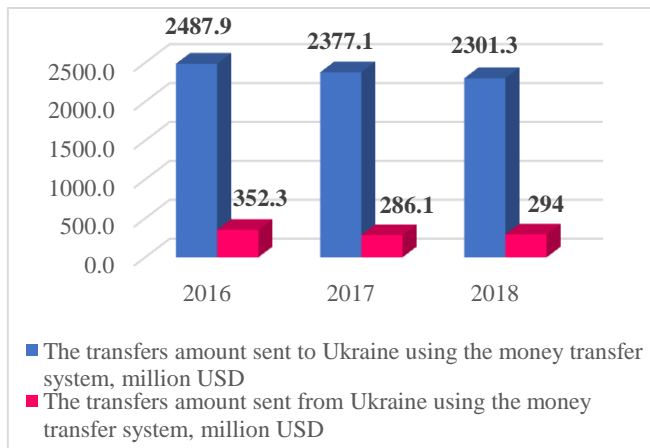


Fig. 4. Number of suspicious transactions

Source: Copmlieted according to the NBU [14, 15]

In 2018, there has been a significant increase in the number of illegal actions/suspicious transactions on the Internet (an increase of almost 2-fold compared 2017) and in the retail network.

The largest amount is payments up to 100 thousand UAH (96 % of total payments). More than 90 % of inter-bank transfers within Ukraine have been provided by the System of Electronic Payments of National Bank of Ukraine for more than ten years, while others are secured by transferring funds to direct banks correspondent accounts. It should be noted that the share of payments made through correspondent banks has significantly decreased with the advent of payment systems. The System of Electronic provides 97 % of the interbank national currency transfer within Ukraine. The amounts of funds transfers are shown in Figure 5.



**Fig. 5. Funds transfer amounts**

Source: Copmlieted according to the NBU [14, 15]

2018 was the first year of the next generation of the System of Electronic Payments (SEP-3) functioning. The system was transitioned to a new platform, the industrial application server environment, which significantly improved its performance and reliability. In 2018, 357.2 million payments were made with the help of the SEP (that is, the average daily load of the SEP was 1.43 million payments) for a total amount of over UAH 25.3 trillion. The average daily turnover ratio was 1.59 and in some days exceeded 3.7. In general, the number of payments made by the SEP is more than 7 % than in the previous year, and by amount – 21 %, the turnover ratio increased by 59 %. Work is still underway to further system develop, in particular, to implement SEP into current international financial messaging standards and to introduce new innovative cashless transfer tools.

The SEP is recognized as a systemically important payment system – 97 % of interbank transfers in UAH within Ukraine. The average daily volume of transactions within SEP is 1.4 million payments worth 101 billion UAH.

In a complex banking system that brings together a large number of participants, it is unprofitable for banks to establish a large number of bilateral links and open a large number of accounts with correspondent banks. On the other hand, it is not advisable for those banks that carry out a small number and volume of money transfer operations with a small number of correspondent banks to enter into payment systems, so they conduct transactions through correspondent accounts opened with other correspondent banks. That is why most banks of Ukraine, nevertheless, carry out interbank transfers through the SEP. The SEP is the only wholesale payment system in Ukraine that provides interbank transfers in national currency.

In Ukraine, one wholesale (the SEP by the NBU) and a significant number of retail payment systems operate. Their activities are characterized by:

- 1) interconnectedness between different payment systems and their elements, which increases the possibility of spreading systemic risks in case of violation of their activity;
- 2) a high level of concentration in the market of payments and transfers made through separate payment systems of Ukraine, the payment organization of which is both the NBU and non-banking institutions, resident banks and non-residents requiring enhanced and top priority overnight.
- 3) the strengthening of the international nature of payment systems and transfers, which influences the determination of the directions of joint overseas increase of the international payment systems number, for which the NBU is primarily responsible for the overseas.

## V. CONCLUSIONS

The conducted research has made it possible to conclude that the payment system is a complex entity that is a component of financial market infrastructure and contains an institution that provides operational activity of the payment system, participants, as well as other elements that provide payments for payment and transfers of participants and users of payment services systems or third parties by interacting with them within a defined legal field. The world is changing as a result of technological innovations which have the reflection both in customer needs and on payment service providers. The rapid development of payment systems, the dependence of the central bank on monetary policy and the maintenance of financial stability on the activities of some of them leads to the recognition of payment systems as an integral part of the state's financial and credit system.

The comprehensive development program of the Ukrainian financial sector until 2020 is to grant banks the right to open a remote account to individuals on the basis of data received from another bank (in which an account is already open) through the national electronic remote identification system of individuals (Bank ID system of the National Bank of Ukraine). It is also an opportunity for banks to improve the order of bank payments execution in a special period in case the bank is unable to operate in the System of Electronic Transactions in the regular mode.

The positive solution is the introduction of an International Bank Account Number (IBAN) in Ukraine, which will simplify the mechanism of the payer and payee identification, prevent mistakes when filling the payer/payee account details, speed up the process of payments processing, ensure the same approach in forming a bank account number both for cross-border payments and within Ukraine.

Another important aspect that will enhance the efficiency of the electronic payment system in Ukraine is to prepare the SEP and the servers for the transition to the 24/7 24-hour customer banking service (one hour needs to be reserved in a system for ensuring correct transition in new bank day) and then full 24/7.

Thus, it can be argued that the adaptation of the electronic payment system of the National Bank of Ukraine to the world standards will allow to accelerate the payment of clients, as well as to completely eliminate the situation when due to time constraints the date of currency payment is postponed to the next day.

Accordingly, the adaptation of the national payment system to international standards will create the preconditions for the implementation of the ISO 2022 standard for national payments in Ukraine. And thus, the possibility of full integration of the SEP with international, especially European, payment systems and standards will arise, which is one of the key elements of the overall integration of the financial markets of Ukraine and the European Union.

Risk minimization techniques using payment systems are a promising prospect for further research.

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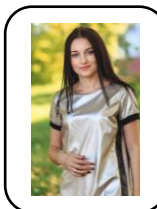
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