DIGITAL TRANSFORMATION TRENDS IN PAYMENT SYSTEMS

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Abstract: The focus of the research presented in this paper is on the digital transformation trends in payment systems, which are expected to initiate the dynamics of the payment ecosystem in the near future. The current trends in the payment industry are analyzed and the most important ones identified. The latest data provided by relevant national and international institutions were used in the analysis of these trends. This research paper presents some challenges the payment systems face in the new age of technological innovation and digitalization. Current trends in payment and financial systems are focused on the following issues: the expansion of payment options, the demand to place higher emphasis on data infrastructure and security, and the adoption of machine learning and artificial intelligence technologies. This research paper stresses that banks and regulatory authorities are encouraging migration of payments towards the digital sphere, which can lead to a reduction of transaction costs for banks and, consequently, to the reduction of operational costs. The results of the survey show that changes, generated by ICT development and digital transformations in the business sector, are requiring the payment systems to be adjusted to the demands of the "digital age"..

Key words: digitalization, payment systems, digital transformation.

1. INTRODUCTION

The digitalization as a social process refers to the transformation of the techno-economic environment and social-institutional operations via digital communication and applications. The payment systems are to be adjusted to the new "digital age" due to the development of information and communication technologies. The digitalization in all social aspects, the widespread use of smart devices and the increasing volume of digital payments will give way to new expectations and demands of customers and sellers. The consumer's habits have been changing. The customers expect to be able to buy what they want, anywhere and anytime. The sellers expect to receive the payment for the goods as soon as possible. Due to new technologies, the payment systems development has reached such scale that it has significantly changed the way most economic systems operate in the last decade. Currently the global payment industry is experiencing big operating changes. Trends as the new possibilities in the payment industry regarding the acceptance of API (Application Programming Interface) - the interface for communication among the applications, the increased volume of digital payments, innovation in cross border payments and challenges in new alternative service providers, have an impact on payment systems in terms of encouraging competition, fostering

innovations and improvement of process and system efficiency.

The financial systems have significantly evolved and have undergone a technological advancement in the past few years, and within that framework the payment systems are at the forefront of these changes. The global market of payment service providers is becoming increasingly larger. Not only that the innovative researches of the existing "players" are visible, but also a series of new creative solutions are offered by the newcomers in the field. The payment systems, in which banks are traditionally dominant, are exposed to a bigger competition due to new participants and most of them are non-banking institutions. These new "players" are retailers, telecommunication service providers, technology firms, start-up companies and other organizations specialized for payment processing services.

Bearing in mind all the abovementioned, the aim of this paper is to help to understand better the new ecosystems of the payment industry, as well as the potential challenges and benefits they face. For that purpose, an analysis was carried out based on documents and data provided by relevant national and international institutions.

2. Payment Systems

In the broadest sense, the payment system is a set of systems that support financial transfer (NBS, 2019). In order to fulfill its role in a satisfactory manner, it is necessary that the financial funds remain in the payment channels as short as possible. Besides, the system must be safe which primarily refers to transactions security and continuous availability for clients. Execution of a transaction at economically acceptable prices is also an important feature that contributes to the quality of the payment system.

A reliable and efficient payment system is one of the fundamental prerequisite for the operation of the whole financial system on an international and national level. Due to a high level of advancement of information and communication technologies, all the most important segments of payment systems have become digitalized. There are many benefits from introducing digitalization in the payment systems, but on the other hand, some new risks have emerged.

3. Digital Transformation Trends in Payment Systems

What causes the rapid pace of changes in current payment systems? Customers are aiming for greater value and their expectations are rising. Agile competitors are entering into this sector, while the regulatory agencies are promoting cooperation and open ecosystems. Business environment requires innovations and adoption of new technologies, such as open interfaces for communication among applications (API - Application program interfaces), real time payment (RTP - Real-Time Payment) infrastructure, Robotic Process Automation (RPA) and Internet of things (IoT) (Vudayagiri, Srividya, Sharma, 2018, p. 3).

The newcomers in the payment systems - from FinTech companies (Transfer Wise), e-commerce merchandisers (Amazon), tech giants (Google) to retailers (Walmart) - have great experience in using collected data about their users or customers so they can adapt its operations to their requirement as much as possible.

Some payment service providers have responded slowly to the pressures from multiple sides due to the lack of platform-based ecosystems (Paas - Platform as a Service). But the new "open banking" concept encourages companies to accept the Paas delivery platform models as services in order to connect with other interested parties for value and data exchange. The concept of "open banking" and the directive PSD2 (Payment Services Directive 2) brought major changes in the European financial industry and opened to third parties - service providers (TPPs - Third Parties Providers) the access to information on accounts and payments of customers (with their consent, of course).

In this manner, the service providers are able to create and offer to the customer different digital products and services. PSD2 (Directive EU, 2015) is a directive on payment services and currently has been implemented on markets of European Union member states. Banks in the European Union had to offer free of charge and open access via Application Programming Interface (API) by March 14, 2019. The directive, which implies a six month statutory deadline for implementation, is expected to change the financial service industry as we know it today.

Current trends in payment and financial systems are focused on the following: more payment options, greater focus on data infrastructure and data security, adoption of machine learning and artificial intelligence, and instant payments as the potential alternative to the existing payment instruments.

3.1. Expanding Digital Payment Options

The digital payment trends are increasing especially the use of instruments as digital wallets, contactless credit cards and payments by smart mobile phones. Improved security measures and the comfortable use will probably be the key

drivers in increasing the volume of digital payments on new and mature markets. A widespread use of cheap communication technologies and faster internet connections enable the clients a greater degree of practicality affecting the growth of digital payments adoption. Banks and regulatory bodies are encouraging payment migrations towards the digital sphere which can lead to a reduction of transaction costs for banks and, consequently, to the reduction of operational costs.

Business operations based on technology platforms enabled the technological giants (BigTech) as Amazon, Alibaba, Facebook and Tencent to enter the market of financial services threatening to banks which react slowly to the challenges of the digital process. Besides, it is obvious that the paying possibilities are expanding in all directions to meet the growing needs and expectations of the customers. Many options are available for mobile payments: Apple Pay, Google Pay, Samsung Pay, PayPal, Square, Venmo, alternative banks like Chase Pay or options in applications like WhatsApp or Facebook Messanger.

With the increase of electronic and mobile trade, there is a greater demand for more perfect and integrated methods of digital payments. The technologies for the next generation of digital payments comprise EMB (Europay, MasterCard, Visa) chips, QR codes (Quick Response Code) and NFC (Near-field communication) contactless payment systems. Currently the NFC segment is growing at the greatest rate due to integration and application of this technology in mobile and portable devices. It is expected the EMB chips will attain the dominant position by 2022. (STATISTA, 2019)

3.2 Greater Focus on Infrastructure and Data Security

Data security and privacy are critical factors for secure payment in the digital environment. The cyber risks are rising since the new payments methods are becoming more popular. Advanced solutions for digital identity can help reduce these risks. Online identification, authentication and authorization of users are crucial for the security of users in the digital environment.

To enhance the security infrastructure, the financial institutions will continue to assess the range of technological solutions, like secure data storage of clients based on Cloud, improved encryption methods that protect the transactions and artificial intelligence that operate in real-time to detect frauds.

The increase of identity theft and scenarios like Synthetic ID frauds require new protection mechanisms. By merging real and false data about the user, a new identity is created which can be used for financial fraud. To lower the risk the Risk-Based Authentication (RBA) is increasingly used. RBA is a method of applying different levels of precaution on the process of authentication and it relays on the probability that the access to the given system could be compromised. As the level of risk rise, the process of authentication becomes more comprehensive and restrictive.

As the difference between physical and digital channels is reducing, the management of digital identity becomes a critical element. Interface based on IoT like Apple Siri, Amazon Alexa, Microsoft Cortana, Google Assistant/Now and Samsung Bixby/Viv enable management of things by voice. Alexa is the Amazon's voice service based on Cloud available on more than a hundred of millions devices. Apple Siri is one of the widespread smart assistants on the market available on five hundred millions devices and it responds to ten billions requests per month.

Apple Siri is also used for voice activated P2P (person-to-person) payments. For this purpose it was first used by PayPal, Venmo and Square Cash, and then by banks, like the British Monzo, German N26 and Canadian RBC. It is estimated that the next battle in the tech world will be around the voice-driven digital assistants. (The Financial Brand, 2019)

3.3. Machine Learning and Artificial Intelligence Adoption

The financial institutions agree that the artificial intelligence and machine learning are not a vision of the future any more. Machine learning (ML) is a branch of artificial intelligence where data science is used for creating algorithms and computer systems, able to adapt to new situations and to learn based on experience.

Machine learning uses the generalization of existing data as a base for predicting the future ones. Through machine learning algorithms, for example, the company gathers statistical and historical data about typical purchases a customer makes and they are able to identify any suspicious activity that is outside of the statistical norm. This anomaly, or unusual behavior, is then tagged and the adequate notification is automatically sent to cardholder in real-time.

The tools for machine learning are also used by financial institutions for finding solutions for diverse inner challenges, including operating costs reduction and the increase of employers productivity by removing the double layers of human interaction. By applying the machine learning, characteristics of each account based on

the transaction data can be shown and a model for predicting the most appropriate offer for every customer can be created. Machine learning can be used to recognize customers, offer personalized services and building loyalty offering propositions based on the customer behavior. In addition, machine learning can combine transaction data and data from other sources, and in this manner enable the banks to better understand the customer's behavior. By knowing customer preferences, it is possible to make predictions about their next purchase and the payment cards use are encouraged. The machine learning tools can help eliminate interaction complexity for clients, to improve the customer experience and to reduce costs.

By using transaction data, banks and financial service providers can personalize and offer rewards for loyalty of certain people. Individual transaction-level data can help banks and service providers learn about customer interests, their hobbies, and financial position (Vudayagiri, Srividya, Sharma, 2018, p. 11).

As the transaction data analysis by implementation of machine learning tools and artificial intelligence is getting greater importance, there are realistic expectations that the traditional banks could become "intelligent banks".

3.4. Instant Payments as a Potential Alternative of Existing Payment Instruments

Even though there still are some concerns, instant payments are increasingly becoming an alternative for existing payment instruments. Instant payments are beginning to evolve in more and more countries due to the need for quick funds transfers. Based on the experience of countries that used instant payments for several years, as Denmark, Sweden and Great Britain, it can be concluded that this manner of payment is gaining significance and popularity very quickly. Instant credit transfer (instant payment) is a credit transfer, namely payment, initiated by the payer - consumer (natural person) or by a business entity.

There are many advantages of instant payments compared to the current payment methods. Some of the most important ones are: payment in the 24/7/365 (service) regime from every location and using various state-of-the-art telecommunication devices, money is available for the payee within a few seconds, lower costs of processing low-value transactions, possibility of creating new products and services, possibility that the service of acquiring payment instruments may also be provided by payment service providers who so far did not provide such services, reduction in payment costs, improvement in cash flow

management, new and cheaper payment instruments for merchants, competitive with card payments (NBS, 2019).

Instant payments find their application in payments between two consumers (P2P person-to-person), consumer to a business entity (P2B peer-to-business) and vice versa, and payments between business entities (B2B business-to-business). There are three main payment schemes in real-time initiated in 2018 - Real Time 1 (EBA RT1) for processing SEPA instant credit transfer (SEPA Credit Transfer Instant - SCT inst) in Europe, The Clearing House (TCH) real-time payments in United States, and The Australian New Payments Platforms (NPP) for payments in real-time in Australia. The European Central Bank (ECB) launched the system TIPS (TARGET Instant Payment Settlement) on November 30, 2018 available for consumers and companies in 19 euro zone countries.

This pan-European service offers customers the possibility, no matter of the location and working hours (within 10 seconds or less), to send and receive payments via smart phones, computers and POS systems in-store.

The ECB are offering TIPS to banks at a low price as 0.002 euros per transaction, so the banks can provide services to merchants and consumers at a similar competitive price. Global tech giants such as the American companies PayPal, Google, Facebook and Amazon, and the Chinese Alibaba and Tencent currently have the dominance in this kind of services in Europe. This has been a source of concern among the European politicians in the last several years. The European Central Bank is committed to establishing a single domestic market for Europe, and TIPS is supporting this vision by making it easier to harmonize instant payments. TIPS is only available for service providers that have accounts at the central bank connected to the euro zone TARGET 2 network, which means it is effectively restricted to banks within the European Union.

The system is designed only for transactions in euros, but the European Central Bank is eager to support also other currencies if there is a demand for it. This platform was developed by the central bank of Italy in cooperation with the central banks of Germany, France and Spain, so it is managed by all of them together. (ECB, 2019)

To overcome the challenges related to the different message formats, it is relevant to establish standards, such as ISO 20022. The ISO 20022 is a standard for electronic data exchange among financial institutions which comprise financial information transmitted between financial

institutions that include payment transactions, information on securities trade, credit and debit cards transactions and other financial information. Corporations are increasingly accepting ISO 20022 as a standard for message exchange and soon it could emerge as a global standard for message exchange.

But the European banks have a slow pace in joining the TIPS system, so the EU Commission and ECB are assessing ways to facilitate its use. The EU Commission Vice President in charge of financial services, Valdis Dombrovskis, stressed, "We are reflecting on whether a stronger regulatory push would be needed to speed up this process," and, "In a few years, we want Europe to set new global standards for payments technology" (PYMNTS, 2019). ECB could issue recommendations for improvements of technological standards.

The European Commission, empowered only to propose laws on EU level, would be entitled to come up with new regulations. Visa and Mastercard are currently dominating the European card payments market. EU politicians have many times stated that the EU needs its own payment system and the European Commission is now attempting to make the role of euro more important in the trade of goods and energy comparing to the dominant dollar. In order to promote payment innovations, the

ECB is cooperating with significant actors in the financial industry, especially around the agreements on common regulations and standards, and the ways to eliminate all the remaining barriers for paying in EU member states.

The Euro Retail Payments Board, chaired by ECB, in collaboration with the representatives of providers and paying services customers are working together to make the EU payment market even more integrated, innovative and concurrent. (EBC, 2019)

4. Digital Transformation Trends in the Payment Systems of Serbia

The instant payment IPS NBS has been launched in Serbia on November 22, 2018 operated by the National Bank of Serbia. It is a state-of-art payment system enabling the payment service provider to execute individual instant transfers 24 hours a day, seven days a week, 365 day a year within only few seconds.

In IPS system of NBS the orders are executed based on instant payments in individual amount up to 300,000 RSD.

Apart from executing instant payments by using standard payment methods (for example, via electronic-mobile banking or at the payment service providers' desk), the infrastructure of IPS NBS systems enables instant payments at the merchant's point of sale, the services of Bill Presentment (BP) and the service Central Addressing Scheme (CAS), namely, execution of instant payments to a registered pseudonym of the payment service user, for instance, mobile telephone number. The Central Addressing Scheme is a service for registration of the mobile telephone number in the central base, namely, linking it with the account number enabling the user to transfer the funds to the account of another user solely by knowing the mobile phone number, without need to have information about its account number. On the other hand, the service of taking over the data about the invoice enables the user to get via electronic way the needed data from big invoice receivers (mobile and cable operators, communal service providers etc.) based on which bills for services can be paid in a quick and comfortable manner, from any point and at any time.

Instant payments are of strategic significance for further modernization of the payments systems of the Republic of Serbia. The regulatory framework and the establishment of the NBS IPS system, as well as the fee policy related to the transaction execution within that system, ensuring the standardization in instant payments service providing and cost efficiency, which can be used by the payment service providers for introducing new services and improvement of the existing ones.

Concerning the fee The National Bank of Serbia charges to banks participating in the IPS NBS system, namely, low expenses for executing these instant payments, it is expected that the banks according to its business policy would set (low) fees for end users, attracting this way many instant payment users and being concurrent on the market.

By comparing the operating indicators of the newly established IPS NBS paying system (Table 1) with the operating indicators of clearing system (Table 2) and Real Time Gross Settlement system (Table 3), launched in Serbia in 2003, it can be noticed that the amount and value of instant payments in the first four months of 2019 reached one tenth of the amount and values of the payments in the clearing system. It is expected a rise of a volume of instant payments and a decline of payments in the clearing system.

But the NBS enabled in 2005 the participants to execute "small clearing payments" in the RTGS system by the rate set for clearing payments. That had an impact in the participation of clearing

payments in the total volume of payment which decreased from 94% in 2004 to 23.6% in 2018.

Besides, based on the review of the daily turnover value and the volume of payments, in the IPS NBS payment system, in March of 2019 (Table 1) it is shown that the volume of payments during the working days is many times larger than during the non-working days, pointing out a significant increase of payments in real-time in the Serbian payment system, executing after the working time of the clearing and RTGS systems.

Table 1. Operating indicators of the IPS NBS payment system (January to April 2019)

Month	Number of days	Total payments	Average number of payments per day	Turnover value in billions RSD	Daily average value in billions RSD	Average value of transaction	Average time in sec.
Jan	31	354,969	11,451	4.8	154.1	13,454.7	1.25
Feb	28	397,051	14,180	5.3	189.1	13,333.0	1.26
March	31	415,722	13,410	5.9	189.7	14,146.3	1.17
April	30	451,483	15,049	6.8	225.8	15,004.9	1.18

Source: National Bank of Serbia, May 2019

Table 2. Operating indicators of the clearing system NBS (January to April 2019)

| Month	Number of days	Total number of payments in millions	Average numbers of payments per day	Turnover value in billions RSD.	Daily average turnover value in billions RSD.
Jan	20	3.8	189,997	34.3	1.7
Feb	19	4.2	218,422	36.8	1.9
March	21	4.0	191,788	39.5	1.9
April	20	3.6	180,854	34.0	1.7

Source: National Bank of Serbia, May 2019

Table 3. Operating indicators of the NBS RTGS system (January to April 2019)

Month	Number of days	Total number of payments in millions	Average number of payments per day	Turnover value in billions RSD	Average turnover value per day in billions RSD
Jan	20	12.9	646,407	4,165.5	208.3
Feb	19	14.2	745,945	4,279.4	225.2
March	21	15.5	737,351	4,403.7	209.7
April	20	16.1	803,642	4,675.3	233.8

Source: National Bank of Serbia, May 2019

Graph 1. IPS NBS payment system - daily turnover values and number of payments in March 2019
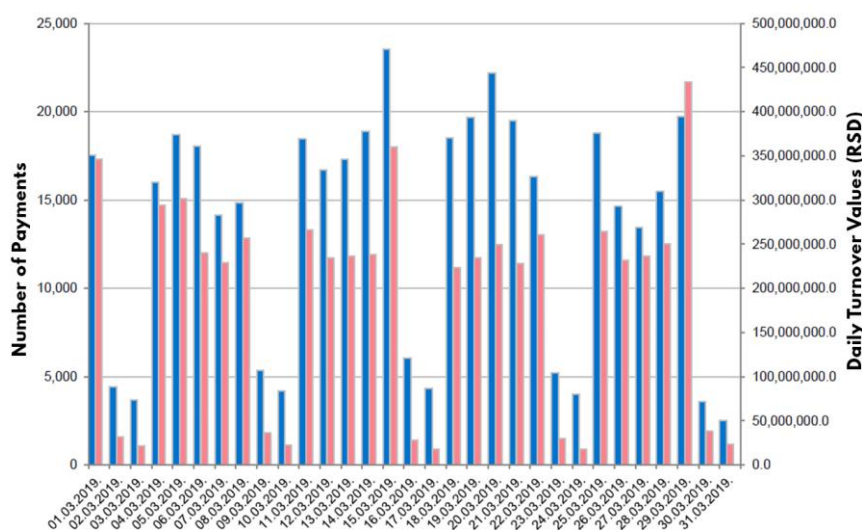
Source: National Bank of Serbia, April 2019

Since April 1, 2019 the banks in Serbia are obliged to provide its users the service of instant payment on the point of sale (physical or virtual). The buyer is entitled to pay using the QR code in two ways. One way is that the buyer generates the QR code on its mobile phone, which will be scanned by the merchant, and the other way is that the merchant is the one who generates the QR code on its point of sale, and then is scanned by the buyer and paid in that way. In order to encourage the use of smart phones for everyday payments, the National Bank of Serbia in cooperation with the representatives of the Chamber of Commerce and Industry of Serbia and the Association of Serbian Banks, prepared a document of Recommendation for the Use of QR Code in Displaying Elements of Transfer Order (NBS, CCIS, ASB, 2018), standardizing the elements of transfer order (approval transfer) by which the payment is initiated and which are contained in the QR code on the printed invoices. It is also contained in instant payments online or on physical points of sale, when the mentioned code is represented by the seller (for example, on the tablet or on POS terminal), or by the buyer (in the mobile banking application). Payments by QR code decreases the transaction costs and makes the electronic payments more simple. The consumer should only direct the mobile phone camera and scan the QR code to initiate the payment. The popularity of QR code in mobile payments worldwide is rising, which is in accordance with the increase of number of users of smart phones. Apart from speeding up the payment process, this system represents a real competitor to card payment, especially because it allows the merchant to have the money immediately available on its account, without need to wait a few days as it is the case with the card payments.

CONCLUSION

Based on the research and data exposed in this paper, it can be concluded that the global payment industry is experiencing a shift in operating paradigm influenced by the information and communication technology development.

The payment systems, traditionally dominated by banks, are exposed to a bigger competition due to new participants, which are mainly non-banking institutions. The data security and privacy are the critical factors of payment safety in a digital environment. Even though there still are some concerns, instant payment is increasingly becoming an alternative to the existing payment instruments. As the transaction data analysis by implementation of machine learning tools and artificial intelligence is getting greater importance, there are realistic expectations that the traditional banks could become "intelligent banks". New trends in the payment system, firstly the launch of instant payment system, are of strategic significance for further modernization of the payments systems of the Republic of Serbia.

The facts exposed in this research paper unambiguously point out that the digital transformation trends in payment systems, herein marked as the most important ones, will be even more pronounced in the coming years.

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SUMMARY

This paper elaborates the main trends of digital transformations in payment sistems. In that context the purpose of our analysis was to contribute to better undestanding of the new open payment ecosystem and to explain crucial benefits and challanges which payment systems are facing now.

The structure of the paper is the following: After the introduction, the second part of the paper presents the brief overview of the payment system role within the financial system, with a special focus on the impact of the information and communication technologies on the digitalization process in the payment systems. It is demonstrated that the trend of digitalization has brought substantial benefits to the payment system operations, but also has created certain risks that should be taken into consideration. In the third part of the research paper new digital transformation trends in payment and financial systems are discussed. It is explained that these trends are mainly focused on the following issues: expansion of payment options, data infrastructure and data security, applications of machine learning and artificial intelligence technologies and instant payments as an alternative to the existings payment instruments. Each of these trends is elaborated in more details. It is empasized that the trends of digital payments are in rise, which can be observed in an increased use of digital wallets, contactless payment cards and smart mobile phones. Special attention is put on the issues of the data security and data privacy, which are the most critical elements in the digital payment systems. It is evident that the cyber risks are becoming more serious as the new digital payment instruments are becoming more popular. One of the most promising option directed to lower these risks is the use of advanced digital identitity solutions. Having in mind that state-of-art transaction data analysis is heavily based on machine learning and artificial intelligence tools, it is expected that the traditional data bases will be replaced by intelligent data bases. In addition, in this part of the paper the topic of the instant payment is elaborated. After a brief overview of instant payment instruments, the TIPS (*TARGET Instant Payment Settlement*) system is presented in detail. This system has been in use in nineteen European countries from the end of 2018. Finally, we have observed that the previous explaind trends are affecting the payment systems by stimulating competition and inovations, and also by increasing its efficiency.

In the fourth part of the paper, the digital transformation trends of payment system in Serbia are analyzed. First, the new payment system IPS (Instant Payment System), introduced by the National Bank of Serbia, is discussed. Also, comparative analysis of IPS, clearing system and RTGS systems is presented. This analysis shows that the number of instant payments will be expanding in the future, while the scope of payments in the clearing system will decrease.

Finally, in the fifth part of the paper concluding remarks concerning the importance of digital transformations in payment systems are made.