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ENSURING BANKS' COMPETITIVENESS BY THE IMPLEMENTATION OF INNOVATIVE PAYMENT SYSTEMS

Abstract. *The article considers the main stages of the evolution of modern non-cash payment instruments. The rapid development of technologies in the banking sector was noted, which leads to increased competition in the struggle for customers. Payment systems, which can be both physical and electronic, have their own procedures. Standardization has allowed some of these systems to spread globally, but there are still many local products that are country-specific. The essence of biometric technology was determined, which consists in recognizing persons by one or more physical and behavioral characteristics inherent only to them, with the purpose of forming a profile of a person, which can be used in the future to ensure the reliability of payments in banking. Biometrics is the new way to securely identify and verify bank customers. Since banking has become such a sensitive industry that often requires consumers to identify themselves, biometrics security offers many excellent advantages. By making use of biometrics technologies, the banking industry can enjoy enhanced security, providing consumers with better security that protects their money, financial information and identity. Biometric identifiers, can be anything from fingerprints and veins, palm veins, iris, retina, face, voice, or even handwritten signature – as long as it is something unique for any individual. For example, the patterns of blood vessels in the finger or palm are so complex that no two individuals possess the same. Certainly, biometric technologies are not completely protected from frauds. Another problem is the fact that on rare occasions, due to illness or advanced technology , it's difficult or impossible to identify an individual using certain metrics (e.g. skin lesions & fingerprinting or blood vessel diseases, iris texture may change as a result of certain surgeries). To address these kinds of problems, banks use several biometric identifier at the same time. Despite all these issues, various biometric technologies have repeatedly proven to be both more secure and convenient that any traditional way of authenticating users. A vision of the further functioning of the biometric system is proposed, however, for the large-scale use and transfer of biometric data in compliance with safety rules, it is necessary to agree on a global standard.*

K e y w o r d s: payment cards, innovative payment systems, biometric identification, competitiveness, banking services.

JEL classification: G21, E42, O30.

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ЗАБЕЗПЕЧЕННЯ КОНКУРЕНТОСПРОМОЖНОСТІ БАНКІВ ШЛЯХОМ УПРОВАДЖЕННЯ ІННОВАЦІЙНИХ ПЛАТІЖНИХ СИСТЕМ

Анотація. *Узагальнено основні етапи еволюції сучасних безготівкових платіжних інструментів. Наголошено, що розвиток технологій у банківському секторі зумовлює посилення конкуренції у боротьбі за клієнтів. Досліджено платіжні системи, що можуть бути як фізичними, так і електронними, і завдяки стандартизації окремі з них набули поширення в глобальному масштабі, хоча існує багато локальних продуктів, орієнтованих на конкретні країни. Визначено сутність біометричної технології, яка полягає у розпізнаванні осіб по одній або кількох фізичних та поведінкових ознаках, притаманних лише їм, з метою формування профілю, що в подальшому може використовуватись для забезпечення надійності платежів у банківській сфері. Проаналізовано зарубіжний досвід, зокрема Польщі, Китаю, Швейцарії, Японії. Описано основні переваги та недоліки застосування біометричних технологій. Запропоновано бачення подальшого впровадження та функціонування біометричної системи в Україні, проте для її поширення та передачі відповідних даних із дотриманням правил безпеки варто узгодити можливість виконання загальносвітового стандарту.*

Ключові слова: платіжні картки, інноваційні платіжні системи, біометрична ідентифікація, конкурентоспроможність у банківській сфері, банківські послуги.

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ОБЕСПЕЧЕНИЕ КОНКУРЕНТОСПОСОБНОСТИ БАНКОВ ПУТЕМ ВНЕДРЕНИЯ ИННОВАЦИОННЫХ ПЛАТЕЖНЫХ СИСТЕМ

Аннотация. *Обобщены основные этапы эволюции современных безналичных платежных инструментов. Отмечено, что развитие технологий в банковском секторе приводит к усилению конкуренции в борьбе за клиентов. Исследованы платежные системы, которые могут быть как физическими, так и электронными, и благодаря стандартизации некоторые из них получили распространение в глобальном масштабе, хотя существует много локальных продуктов, ориентированных на конкретные страны. Определена сущность биометрической технологии, заключающейся в распознавании лиц по одной или нескольким физическим и поведенческим признакам, присущим только им, с целью формирования профиля, который в дальнейшем может использоваться для обеспечения надежности платежей в банковской сфере. Проанализирован зарубежный опыт, в частности Польши, Китая, Швейцарии, Японии. Описаны основные преимущества и недостатки применения биометрических технологий. Предложено видение дальнейшего внедрения и функционирования биометрической системы в Украине, однако для ее распространения и передачи соответствующих данных с соблюдением правил безопасности стоит согласовать возможность выполнения общемирового стандарта.*

Ключевые слова: платежные карты, инновационные платежные системы, биометрическая идентификация, конкурентоспособность в банковской сфере, банковские услуги.

Until recently, customers chose a bank primarily on the basis of the cost of services. But now the selection criteria has shifted to the field of innovative solutions – from high-quality remote services to business development support services.

Let's summarize the stages of the evolution of modern cashless payment instruments:

The first stage was the using of a carton card or loyalty program.

These were credit cards, but they were not bank cards and only confirmed the creditworthiness of the owner outside his bank. The famous American Express financial company in 1891 was an innovator in the use of carton cards. At that time, the company was engaged in the transportation of finance between companies and banking institutions. The traveler's check was drawn up in the form of a card [1].

In 1914, some shops and restaurants began issuing such cards to wealthy customers for use as a document in the transaction. Thus, the stores sought to "tie" a customer to themselves, which was later called a loyalty program.

The second stage is payment cards (availability of a mediator) and their improvement.

In 1950, the Diners Club Restaurant Credit Card was created, which ushered in the era of modern credit cards. Visitors to New York restaurants could shown this card instead cash. The restaurants handed over copies of the invoices to Diners Club, which invoiced the customer on a monthly basis. The customer paid with Diners Club, and the last one was paid to restaurants [2].

Payment services have begun to develop rapidly. For the first time in 1951, Franklin National Bank (the USA) issued a payment plastic card. It is the company American Express has launched a mass distribution of plastic cards.

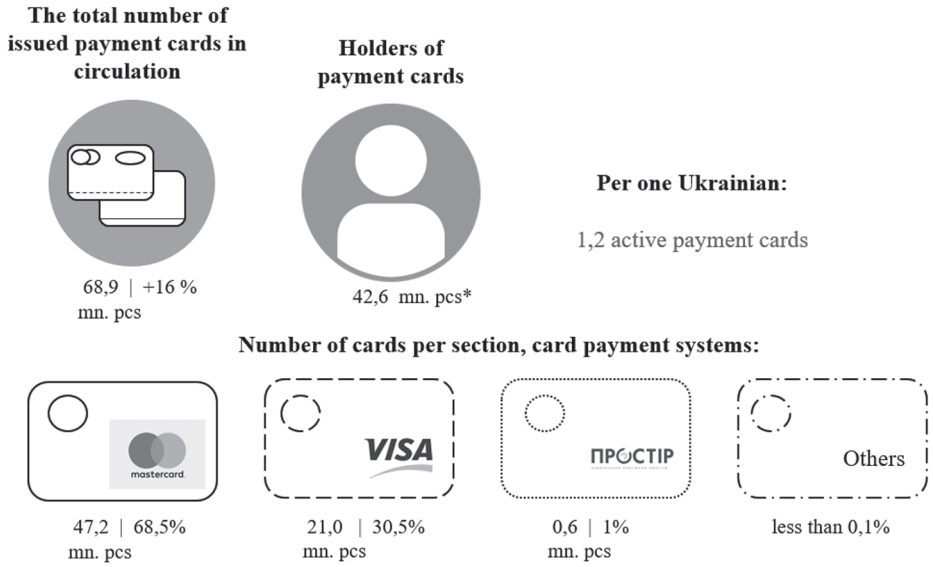
For promotion, the cards were sent free of charge to clients by mail. In the 1960s, a magnetic strip appeared on plastic cards for storing customer information. And in 1968, American Express released the first status gold card [1].

By 1979, there was already an international MasterCard system in which circulation contained more than 50 million cards across America. VISA and American Express systems were launched in parallel. Credit cards have spread globally around the world. MasterCard, VISA and American Express are world leaders today [3].

At the beginning of 1996, the leading Ukrainian banks were accepted into the international payment system Visa International Service Association, which began to fully work with cards of international systems, that is, to issue and service plastic cards of international systems.

According to the National Bank of Ukraine (hereinafter – NBU) research, the number of payment cards in circulation has increased by 16% and amounted to 68.9 million pieces in 2019. Here are some more interesting facts (see figure):

– 60% of all payment cards of Ukrainians are active;
– 8.6 million cards – non-contact;
– tokenized payment cards – 2.5 million;
– in 8 out of 10 cases citizens pay with a payment card (non-cash);
– on average, there are 1.2 active cards per person;



* The first half of the 2019 year.

Figure. **Payment card market in 2019**

Source: National Bank of Ukraine. (2019, February 20). Payment card market, first half of 2019. Retrieved from https://www.bank.gov.ua/admin_uploads/article/2_21-08-19_Platizhni_kartky_ua1.jpg?v=4 [in Ukrainian].

– the number of payment card holders as of the first half of 2019 reached 42.6 million persons (the total number of issued payment cards in circulation amounted to 68.9 million pieces).

The number of cards in the MasterCard payment system is 68.5% of their total – 47.2 million; Visa – 30.5% (21.0 million pieces), in the national payment system "PROSTIR" – 1% (0.6 million pieces) and for all other payment systems account 0.1% [4].

The third stage is mobile payment applications and other NFC tools (Near Field Communication). A reference point in NFC development history is 2004. And the first phone with an NFC chip was the Nokia 6131 (2006). NFC is a module in a smartphone that works only 10 centimeters apart, and this restriction is primarily about security. In order to activate contactless payments, you need to download a special Google Pay or Apple Pay application, adopt a privacy policy, and add a card (specify number, expiration date and CVV2 code) and specify other related settings. It is also possible to use Google Pay or Apple Pay watches with an NFC chip to pay for it. Payment with NFC is faster than cash or bank card.

Thus, more than half a century ago, such a payment tool, popular today as a payment card, appeared, but now the world is on the verge of a new revolution. Very soon we can go without wallet and paperwork thanks to biometrics.

The fourth stage is biometric technologies. With the help of special modern devices: scanners, sensors and other readers – human biometric data are recorded

in a special database. The system stores this information, such as a fingerprint, and converts it to digital code. Then, when a person reattaches his / her finger to the scanner, the system compares the new code with the one written down earlier [5].

There are the following types of biometrics: face image, voice, fingerprints, iris (the iris has a complex structure than prints, so this method is considered to be more reliable) [6].

In China, Zhengzhou residents can pay for a subway ride through a face scanner [7].

This is not the first time China has used face scanning in public places. Starting in 2017, visitors can pay a smile at KFC restaurants (via the "Smile to Pay" face recognition system) using Alipay from Alibaba technology company.

Visitors can pay by scanning their faces at the order booth and entering their phone number, which is intended to protect against fraud in the system [8].

A striking example of domestic such innovations was the service of PrivatBank and Visa's international payment system – FacePay24, thanks to which purchasers can pay for goods literally with their "faces". In order to use this option, it is necessary for the client to make a selfie and attach a bank card to his photo, after which it is enough to look in the special camera of the tablet near the cash desk for payment. Because of this pace of development, the classic payment card can go back in history, like other payment technologies we use today on phones and other devices.

Identification of the customer by face or fingerprint greatly simplifies the payment process (no need to use unique and long combinations with numbers of different sizes, with special characters, etc.), but it remains an open question of the security and reliability of such identification, namely the ability to accurately identify the customer, make the payment at will and to distinguish between deception (the first machinations were made with the help of a photo, but this problem was solved with the help of video identification, that is, you need to turn your head in the lateral view and full face).

For security, developers are deploying mobile user identification technologies through the use of behavioral biometrics (NuDetect technology).

Behavioral biometrics is a method that allows you to identify a person by his or her unique behavior when interacting with devices and applications. Subconscious movements and habits create a "dossier" of the user. This makes it easy to detect suspicious behavior and conclude that the device is trying to use a third party. There are two types of behavioral biometrics: active and passive.

Active biometrics – the client identifies himself / herself using a fingerprint, face scan or other parts of the body.

Passive biometrics is a behavioral identification, without any additional user action. The system analyzes many signals, including device characteristics and behavioral metrics, and then compares them to typical customer behavior in the past. Using machine learning, the NuDetect platform creates a digital customer profile that collects more than 300 of its unique parameters. It is behind them that the platform uses artificial intelligence to determine whether the user is a customer or a fraud [9].

The reliability of biometric identification is increasing every year, on the world stage it is supposed to use a matrix with several identification methods to find the

perfect balance between convenience, speed and security. Olena Korobkova, director of the Independent Banking Association of Ukraine, says that the Swiss company BehavioSec uses artificial intelligence to identify clients, analyzing a number of factors that cannot be tampered with – the client's behavioral characteristics, including the speed and power of keystrokes, the dynamics of movement [10].

The NBU stated that innovative payment services are even safer than traditional ones, and until the regulator is unknown of fraud cases using contactless payment technology NFC used in Apple Pay and Google Pay.

NFC payments are more convenient rather than card payments and faster then cash and card payments. But customers save time when using a bank card.

According to research, a person will notice the disappearance of his purse in an average of three hours, and the disappearance of a mobile phone – in 30 seconds. Because there are about 600 contacts with a mobile phone in a day, someone called, wrote, etc., the device seemed to have grown into a hand [9].

These technologies – Apple Pay and Google Pay – already have biometric identification tools available. The fingerprint on the phone replaces the pin-code, but as an additional security for payments of a considerable amount or in case of any doubt, the function of additional input of the PIN code at the pos-terminal may be provided.

Regarding the experience of implementing such a system, our Polish neighbors conducted the first biometric tests in the banking sector back in 2009 at ATMs. In 2010, Polish bank Pekao S.A was the first to introduce biometric technologies in the European market. Initially, they created fingerprint readers, this solution allowed online banking customers to log in and confirmed transactions. Already in 2014, Pekao provided non-contact mobile payments to customers, and in October 2017, a new version of the mobile application using biometric data was used to authorize transfers and payments. Bank representatives say that the use of biometrics has significantly improved the quality of customer service during transactions at POS terminals, as well as when making payments in e-commerce. In 2018, the bank introduced BLIK and Apple Pay payment services, with the latter providing Face ID and Touch ID authorization. Already this year, new bank customers can create an account remotely without visiting a branch or meeting with a consultant. The process itself is done using a smartphone (completely online) and takes only a few minutes: the customer fills in a simple application form, the person is verified using a selfie and an ID card. According to bankers, the use of biometric solutions can increase security, since the risks of misidentification or unauthorized access are significantly reduced, which in turn leads to a reduction in the proportion of fraud [10].

In general, experts call biometrics the potential technology of future but the use of this technology is still limited. For example, the introduced FacePay technology is now launched for "PrivatBank" clients and in a certain network of outlets that work with this bank. If a bank customer goes on a business trip or vacation to London, they will not be able to use the technology because the London bank does not have biometric data of that client.

To figured out the issue of biometric data compliance with security rules, we must first come to an understanding with a worldwide standard. Visa Digital Solutions Director in Ukraine, CIS and Southeastern Europe Alexander Stelmakh

believes that a solution will be found, citing Apple Pay technology, where customer identification is already done through biometrics but data is stored on the device and nowhere are not transmitted.

It is also important to focus on the ethical component. The rapid development of innovative payment services is accompanied by the uncomfortable feeling that privacy ceases to be personal and becomes a digitized object for the collection, analysis and storage of information.

Experts from the international company KPMG in their study on the main banking trends in the nearest future give an example of legitimate but not always beneficial for the client to use such information [11].

The process of assessment borrower's creditworthiness will be more holistic and can be updated in real time, taking into account lifestyles and purchase histories using predictive analytics. In turn, the borrower's riskiness assessment will be based on living habits and shopping histories [11, p.11].

Banks and financial organizations will use every step of the users to understand their needs, the role of the bank will be to identify and offer the client the most relevant service at the moment, to order and to secure its payment.

In KPMG predicts that over the next decade, cash will gradually disappear from circulation, that will resulting in reducing the shadow economy, reducing employee exploitation and reducing fraud. At the same time, digital currencies and other innovative services will be developed. Company analysts recognize that new technologies can create unforeseen risks for consumers, above all, ethical, so it is important that the banking industry cooperates with regulatory authorities to create robust systems for users [11, p.11].

According to KPMG, the availability of modern digital channels will become the basic standard of service, and banks without such technologies will not survive on the market [11].

In turn, the desire to survive can push financiers into the fight for clients, to implementing "raw" unfinished services.

Therefore, summarizing all of the above, innovative services are gradually becoming an integral part of civilized society [12]. Particularly acute humanity felt the need to introduce and develop online services during the pandemic.

The introduction of innovative payment systems will help to ensure competitiveness in the banking sector, in the pursuit of clients banking institutions will be motivated to teach clients to use new services, to introduce new banking products and services, which will be aimed at quality customer service and cost reduction. It is only necessary to accept the fact that now the servicing bank will become a "family member" and be aware of all the details of our daily lives.

In our opinion, classic payment cards will not be obsolesce because of the huge number of available ATMs and payment devices, which are used with the card.

With regard to biometrics, it is likely that the future with technology and the combination of different tools will increase the reliability of biometric identification.

At the same time, the NBU warns that face recognition technology is only being implemented and many issues have not yet been investigated or regulated. In particular, the disadvantages of biometrics include: the issue of technological security of such operations, because it is possible to use the image of the client or

his double; "False Rejection Rate" (FRR), which determines the likelihood that a person may not be recognized by the system (for example, if the voice has changed in case of illness); more serious requirements for the computing power of the system and the communication channels; however, the main disadvantage of biometric technology is still the high cost, which is generated through additional sophisticated equipment and its maintenance, also needed skilled workers.

But, analyzing the foreign practice of introducing biometrics, it can be noted that this technology has many positive aspects for Ukraine: reducing costs in the future; better protection because overcoming biometric identification codes is much more difficult than picking a pin-code; emergency management (in Japan, after the 2011 earthquake and tsunami, many people were left without papers and bank cards; they had to go through lengthy and exhaustive identification procedures to withdraw money from their accounts, after which they created a biometric system in the country) and simplifying financial transactions, because convenience and speed in servicing is always one of the main drivers of the popularity of non-cash instruments and the transition from cash to cashless payment instrument payments This in turn reduces the share of the shadow economy.

For the introduction of biometric technologies in the banking system it is necessary to go through the following steps: 1. to create a law that will regulate biometric technologies; 2. obtain access to data, draw up all documents, permits and certificates; 3. ensure protection of channels and services; 4. find an integrator who can debug convenient and balanced software.

In the NBU intends to initiate accelerated implementation of this technology in national legislation. The regulator is already working on the implementation of the EU's second payment directive and plans to publish in the near future the text of a new bill on payment services, which will provide for increased security and authentication requirements.

The PSD2 directive uses this approach when, in addition to known client logins and passwords, which can be stolen, it is necessary to use confirmation that the client by self is performing the operation. Biometric verification tools are most suitable for this purpose.

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