
Development trends of payment ecosystems as a key link of the e-commerce infrastructure

Olena Vynogradova

Department of Marketing, State University of Information and Communication Technologies, Kyiv, Ukraine

ORCID 0000-0002-7250-5089

Iryna Sovershenna

Department of Marketing, State University of Information and Communication Technologies, Kyiv, Ukraine

ORCID 0000-0003-3462-5554

Alua Yesmakhanova

Department of Marketing, State University of Information and Communication Technologies, Kyiv, Ukraine

ORCID 0009-0002-6069-9020

Olha Ihnatenko

Department of Marketing, State University of Information and Communication Technologies, Kyiv, Ukraine

ORCID 0009-0001-1845-978X

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Abstract: The article provides an analytical assessment of trends and prospects for the development of payment ecosystems as a key link of e-commerce infrastructure. The factors of the development of electronic payment systems are systematized: the formation of technical and technological prerequisites related to general digitalization (payment infrastructure, network of POS terminals; mobile telephony capabilities; Abstract. The article provides an analytical assessment of trends and prospects for the development of payment ecosystems as a key link of e-commerce infrastructure. The factors of the development of electronic payment systems are systematized: the formation of technical and technological prerequisites related to general digitalization (payment infrastructure, network of POS terminals; mobile telephony capabilities; blockchain technology; creation of robots-consultants; innovative financial services; built-in financing); formation of socio-psychological prerequisites (digital literacy of the population; affordability of mobile phones with appropriate payment services; mental understanding of the importance of the transition to digitization of payments; convenience, security and speed of cashless payments; the impact of advertising). A modern paradigm of the renewed payment ecosystem of Ukraine is proposed, which will lead to its profound positive transformation. The necessity of applying European experience in the organization and operation of payment systems in order to improve the forms of interbank settlements and increase the efficiency of the payment system of Ukraine is substantiated.

Keywords: payment ecosystem, e-commerce, online payments, cashless payments, payment services, digitization of payments, bitcoin, digital dollar.

1. Introduction

Currently, there is a rapid increase in the volume of online trade in all countries of the world. Payment systems are one of the main elements of e-commerce infrastructure. Electronic payments ensure the viability of the banking system and business, are a necessary condition for the successful development of the country's market economy, therefore the introduction of more reliable and convenient payment systems is a priority.

There are many different payment systems in the world, the construction, technology of operation and characteristics of which differ significantly in different countries. Payment systems are a channel that is significantly affected by crises in the money markets. Therefore, efficiency, efficiency, economy, reliability, security and convenience are the main requirements for a payment system. Only electronic payment systems that use the most modern advances in technology and equipment can meet the requirements.

The analysis of trends in the development of payment systems and the development of proposals for improving their functioning are relevant today.

2. Analysis of recent research and publications

The study of the development of electronic commerce systems was carried out by L.V. Oliynyk, T.D. Kovtun, A.P. Matvienko, O.M. Yudin, M.V. Makarova, V.O. Sobolev, S.V. Ctepova, V. A. Yushchenko, A. S. Savchenko, V. P. Straharchuk, V. M. Kravets, and Y. I. Chaikovsky studied the theoretical foundations of the construction and operation of payment systems. and other. But in their works, either individual elements of the functioning of payment systems or the effect of these systems at certain stages of economic development are investigated.

Payment systems of Ukraine need further scientific research and development. In particular, the development of proposals and recommendations for improving the functioning of the system of electronic payments, the system of urgent transfers, and the National system of mass electronic payments is relevant today.

3. The purpose of the article

Analytical assessment of trends and prospects for the development of payment systems as a key link of e-commerce infrastructure, substantiation of the impact of technological advances in the field of electronic payments on new opportunities for entrepreneurs and consumers.

4. Research methods

Scientific research was conducted using a systematic approach using general scientific and special methods during: description of trends in the development of electronic commerce and payment systems (methods of logical, historical analysis, dialectical method). For theoretical generalizations, conclusions and proposals, the methods of scientific abstraction, system analysis, generalization and specification, and a systematic approach were applied.

5. Presentation of the main research materials

Rapid changes in the direction of expanding the implementation of e-commerce mechanisms and tools in business practice necessitate the study of modern trends in the transition of business entities to the latest forms of interaction using e-commerce technologies.

Digitalization of all spheres of society has fundamentally affected the forms and methods of conducting business. According to the 2023 report of the Global Media Agency "We Are Social" and the developer of the social network management platform "HootSuite", the Internet has become an

important part of the life of more than half of the world's population (64.4%). E-commerce reached a total of 4.11 billion people who shopped online (59.8% of the population) [1].

According to Statista, the dynamics of the share of online buyers from the total number of all buyers in the world shows stable growth, which is shown in Table 1 [2].

Table 1. The share of online buyers from the total number of buyers in the world [2].

Indicator	Year		
	2020	2021	2023
The fate of online shoppers	15,3%	17,5%	22%

According to the American stock exchange NASDAQ: by 2040, the e-commerce market will account for 95% of all trade in the world. It is necessary to be ready for this [2].

It is known that 58% of people shop online because stores are open 24/7. 2.5% - the average conversion of sites around the world (the ratio of conversions to the site to the number of applications). 72% of those aged 25 to 34 said they would make a purchase if they were offered previously abandoned items at a lower price. 36% of buyers name price as the most important factor when making an online purchase. According to forecasts, mobile commerce will account for 72.9% of all e-commerce sales in the coming year [2, 3].

The rapid development of such a powerful segment of international business as e-commerce gives impetus to the formation and development of other areas that also belong to e-commerce: electronic movement of capital (Electronic Funds Transfer, EFS), electronic money (E-Cash), electronic marketing (E-Marketing), electronic banking (E-Banking), etc [4, p.176].

Against the background of the growth in the volume and number of transactions in the field of electronic commerce, various electronic payment systems have been developed: ASH, Achex, BankNet, BidPay, BillPoint, BIPS, CAFE, Cartio, CashBox, CyberCash, DebitNet, DigiCash, DigiGold, eCash, E-gold, EMV, Gmoney, HashCash, iBill, IPAY, iPIN, Kagi, MagnaCash, Mondex, PayCash, PayPal, PayWord, PCPay, PocketPass, MicroMint, Millicent, NetCard, NetCash, NetCheque, NetPay, NetChex, Qpass, QuickCommerce, TeleCheck, Transfer, WebCharge, WebMoney, WiSP, WorldPay, Ziplock, which ensure international payments both in the B2C and B2B sectors [5]. In Europe, most online shoppers prefer payment providers such as PayPal or Alipay.

According to the Law of Ukraine "On Payment Services", a payment system is a system for performing payment transactions with formal and standardized agreements and general rules regarding processing, clearing and/or settlement between payment system participants [6].

Modern payment ecosystem — an interconnected system of correlating electronic equipment, banking organizations and non-banking financial corporations that provides the transfer of funds in various forms between the buyer and the seller. It offers many ways to buy, sell, donate, invest, save, and more [7, 8, 9].

In general, it is expected that by 2025 the volume of the global FinTech market will reach \$305 billion. This is a clear indicator of the growing interest and desire to modernize all participants in the field of payment processing [10].

The main factors in the development of electronic payment systems include:

1) formation of technical and technological prerequisites related to general digitalization:

- expansion of the payment infrastructure, the network of trading POS terminals;
- improvement of mobile telephony capabilities;
- formation of payment service technologies for mobile users by banks, retailers and service providers;
- development of innovative services and cashless payments using payment cards, smartphones and other NFC devices;

2) formation of FinTech prerequisites (new financial technologies and solutions):

- mobile payments;
- online banking;
- peer-to-peer lending;
- crowdfunding;
- digital currencies;
- blockchain technology;
- creation of robots-consultants;
- innovative financial services;
- built-in financing;

3) formation of social and psychological prerequisites:

- increasing the general digital literacy of the population;
- spreading the affordability of mobile phones with payment services;
- sharp shifts in the mental understanding of the importance of the transition to digitalization of payments as a result of COVID-19;
- increased convenience, security and speed of non-cash payments;
- targeted advertising activity regarding non-cash payments.

Let's consider the influence of each these factors.

The first factor in the development of the electronic payment systems is that cash is losing ground. COVID-19 was a turning point in the global transition to the digitization of payment ecosystems. The share of cash payments in stores worldwide decrease into 20% in 2021, compared to 30% a year before. 66% of business owners said they are shifting their business strategies toward a cashless future to better serve their customers' needs. Today, it's hard to imagine a successful retailer that doesn't accept credit or debit card payments. There are 2.8 billion credit cards in use worldwide, such as Visa, MasterCard or American Express [11].

The development of innovative services and cashless payments using payment cards in Ukraine has a positive effect on the financial habits of Ukrainians. If earlier payment card holders more often withdrew cash from ATMs, today cashless transactions prevail in terms of volume and number.

Contactless credit card payments have become the norm for everyday use today. Eight out of ten transactions with payment cards are cashless. Global contactless card transactions are expected to reach \$6 trillion by 2024, up from \$2 trillion in 2020. The payment ecosystem will have a cashless future [11,12].

The trend towards the active spread of contactless payments, both with the use of contactless cards and with the help of smartphones and other NFC devices, remains relevant due to security and speed.

The number of tokenized payment cards as of January 1, 2020 was 2.5 million. So today more than a quarter of active payment cards are contactless and tokenized cards (26.5% or 11.2 million cards) [12].

Over the past several years, the payment market has seen a stable dynamic of the expansion of the payment infrastructure, the network of POS terminals in Ukraine as of January 1, 2020 grew by 19.7% to 333.8 thousand units. Commercial POS terminals provide the possibility of contactless payment [12].

The ratio of the total number of payment terminals (contact and contactless) to the permanent population of Ukraine as of January 1, 2020 was 8.4 thousand. per 1 million population. In terms of the number of payment cards and payment devices for their service, Kyiv, Dnipropetrovsk and Kharkiv regions dominate [12].

5.1 The mode of online trading is growing

According to estimates, by 2024 the global volume of retail e-commerce will reach \$6.16 trillion. And, according to Statista, 21.8% of all retail sales will be online by now [2]. This means an urgent need to create even more sophisticated payment methods that ensure the convenience of processing all types of payments.

Online payments mean the exchange of money on the Internet. In addition to merchants and customers, several important links such as payment processors and payment gateways are involved in this process. Specifically, payment processors manage the entire transaction process, while payment gateways are responsible for collecting customer payment information and transmitting it to processors.

Thus, access to the Internet and the transition to online payments involves the well-established interaction of several parties. And here lies the main difficulty that many providers and sellers face when their service turns out to be too slow or inconvenient for the user.

After all, 88% of e-commerce users declared their reluctance to return to the resource after an unsuccessful user experience. That's why an instant, clear and hassle-free checkout process has a huge impact on the ultimate success of e-commerce resources.

5.2 Smartphones and mobile devices

In 2022, the number of mobile phone users will reach 7.26 billion people, i.e. today 91.6% of the global population own mobile devices that are part of the payment ecosystem [2,12].

This proliferation of mobile devices has led to a special interest in payment service technologies for mobile users on the part of banks, retailers and service providers. What could be more compact and convenient for payment than a mobile phone?

And the answer to the above question is wearable devices. Various types of wearable devices are becoming increasingly popular payment methods that are much more convenient for everyday use than traditional bank credit cards or even smartphones. Just touch your smart watch or "smart" jewelry to make a payment.

The global market for wearable payment devices was valued at just \$285.5 billion in 2019, and will reach \$1.37 trillion by 2027, representing a 21.7% year-on-year growth [12].

5.3 Businesses need a business version of an innovative payment ecosystem with a wide range of services

In the traditional model of payments in business, it was necessary to fill out a significant number of documents and forms, to follow the rules. It required a lot of work, skill and paper. To deal effectively with consumers, suppliers, retailers, investors and regulators, businesses urgently needed something much more efficient than paper documents and cash. The innovative payment ecosystem offers a wide range of services that make payments for all types of businesses much more productive.

5.4 Fast payment is an urgent need for SMBs

It is very important for small businesses today to support the following different payment options for their customers and not overpay for transaction processing:

1) **mPOS.** Traditional and widely used payment solutions are payment terminals. Mobile POS terminal or mPOS (from the English mobile Point Of Sale — mobile point of sale) is a compact device, a trading terminal connected to a smartphone, which allows you to make cashless payments using a bank card. The advantages are compactness and the ability to make payments at any point where there is an Internet connection.

Mobile points of sale are a very promising and effective trend in the development of payments. By 2025, the market for mPoS terminals is expected to grow by \$6.01 billion compared to the current year, representing a 20% annual growth rate. The European market for mPOS terminals is consolidating: SumUp and Payleven announced a merger. mPOS terminal provider companies today jointly process more than €1 billion of payments per year in 15 countries [11,12].

2) **Tap-on-Phone** – the need to convert a mobile phone into a payment terminal is increasing. A set of solutions is offered by payment leaders such as MasterCard with Tap-on-Phone or Visa with its Tap-to-Phone. The service "Terminal in a smartphone" is offered by Privatbank in cooperation with Visa, as well as a wide range of banks with new payment services that turn a mobile phone into a payment terminal. This reduces the maintenance costs of the card networks' equipment, because only a smartphone with an app is needed to process payments.

3) **Real-time payments**. The main function of real-time payments can be described as an interbank system where account payments are made and confirmed instantly. It's fast, accurate and secure, regardless of the country of origin. In 2021, 80% of US businesses were connected via RTP, also indicating a rapidly growing trend [11].

Companies use new financial technologies and solutions in the fight for the hearts and money of customers. The FinTech field includes: mobile payments; online banking; peer-to-peer lending; crowdfunding; digital currencies; blockchain technology; robots-consultants; innovative financial services [13].

One of the fintech trends is **embedded finance**. Embedded financing refers to the integration of financial instruments or services into the offerings of non-financial institutions. The embedded finance ecosystem is large, covering financial services such as banking, lending and investing, as well as payment processing and insurance [14].

Among all forms of embedded financing, **the "buy now, pay later" sector** is growing the most (**BNPL**). This payment option allows customers to buy products now and pay for them later in several installments.

Millennials and Generation Z enthusiastically embrace BNPL, according to The Ascent survey. For this reason, the BNPL model has been criticized and accused of causing debt among young people.

Nevertheless, the upward trend continues. In early 2022, Block (formerly Square) struck a deal with Afterpay to acquire Australian platform BNPL for \$29 billion. Afterpay's European counterpart, Klarna, has also raised billions in venture capital.

It is predicted that by 2026, USD 576 billion worth of transactions will be transacted globally with the BNPL option, compared to USD 120 billion in 2021 [14]. If your business involves payments in the form of B2C or B2B, buy now the "pay later" module is what you need.

Amazon, the world leader in online commerce, is introducing innovative payment technologies. The Amazon Pay payment system was created back in 2007. The essence of the system is that all Amazon buyers can use bank card data to pay for goods and services stored on amazon.com, and not only on the Amazon site, but also on other sites where there is a Pay with Amazon button. Partner companies embed this button in their sites using a special code. At the same time, Amazon takes a commission from stores: 2.9% of the transaction amount and 33 cents from each purchase of \$10 and above [15].

As you know, there are many different ways to pay at cash registers for purchases: cash, plastic card, mobile payments, check book. Some retailers have explored the possibility of paying with a fingerprint or even a face scan. Amazon today introduces another new payment technology - scanning the buyer's palm, believing that the lines on it are more reliable than other methods of personal identification. Simply raise your hand to pay for the product. The company is implementing Amazon One palm scanning technology in all 500 Whole Foods stores nationwide, putting an end to traditional forms of payment [15].

Chinese WeChat is a complex of applications of the Tencent holding. The platform includes the "WeChat Payments" option, to which every 5th user (889 million people use the application every

month) has linked their bank card and has access to the "Wallet", all commercial functions and trading accounts. They help pay for goods and services with a smartphone [16].

5.5 Processing digital technologies for cross-border payments

In the conditions of blockades and restrictions, there was a need for convenient cross-border interaction. For businesses, cross-border payments have always been associated with additional costs related to regulatory compliance, currency exchange fees and time costs. Therefore, payment ecosystem 2024 is focused on providing new processing digital technologies for simple cost-effective international payments.

SEPA (Single Euro Payment Area) – a single euro payment area created at the initiative of the EU. This is a payment standard used in 36 European countries. In this zone, all euro payments are made on the same terms both within a single country and in other European countries that are part of the SEPA zone. SEPA enables cashless payments in euros in the form of credit transfers and direct debits in a secure, fast and efficient way. There are two types of such transfers: SEPA - a simple euro transfer, and SEPA Instant - an instant euro transfer (about 10 seconds). At the moment, almost 3,000 banks from 23 countries are connected to the system, and in the future the SEPA Instant scheme aims to unite all banks in 36 SEPA countries and remove the geographical borders of transfers in Europe [17].

ACH. Automated Clearing House Network — America's digital payment ecosystem for the secure and cost-effective electronic movement of money and information from any US bank account to another, regardless of state. Automated Clearing House / ACH - an institution through which bank transactions involving more than one financial institution are carried out. ASN debits and credits licensed financial organizations [3,12].

Blockchain. Cryptocurrencies and smart contracts, Web 3.0 and NFTs are symbols of the 21st century based on blockchain technology. It is called the main invention of mankind and the future of the digital world. The Bank of England defines blockchain as "a technology that allows people who don't know each other to use a trusted and shared record of events." Since December 4, for the first time since April 7, 2022, one bitcoin is worth more than \$40 thousand on popular crypto exchanges. On December 5, the price of the world's first cryptocurrency rose to \$44,488 [18].

In 2023, the leaders of the payment industry - Visa and MasterCard — are increasingly involved in the blockchain payment market. However, blockchain technology is now more focused on transparent supply chains, smart contracts, cryptoassets, Central Bank Digital Currency (CBDC), and decentralized exchanges.

Global spread of cryptocurrency digital banking is expected in the world. By 2030, blockchain technology is expected to become one of the major factors affecting global GDP, reaching \$2 trillion. [14].

Recently, the author of the best-selling financial book Rich Dad Poor Dad, Robert Kiyosaki, urged followers to stock up on Bitcoin, gold and silver as soon as possible before the digital US dollar hits the market. Kiyosaki expressed concern about the July 2023 launch of the FedNow Service, an instant payment infrastructure developed by the US Federal Reserve System. The entrepreneur is sure that the FedNow payment system is a preparation for the introduction of the digital dollar. According to Kiyosaki, the Fed's digital currency will lead to a loss of user privacy, as the digital dollar will allow authorities to track Americans' payments and spending habits. In addition, the introduction of the digital dollar will lead to an increase in the value of gold, silver, bitcoin and cash, Kiyosaki is sure. He urged investors to invest in these assets right now.

«The digital dollar is coming. Privacy will disappear. Everyone will be under Big Brother's hood. When the digital dollar hits the market, gold, silver, bitcoins and cash will become worthless. So start raising cash and buying these assets right now before it's too late," Kiyosaki wrote on X (Twitter) [12].

Indeed, in the USA, on April 6, 2023, a bill on the creation of a digital dollar was submitted to the US House of Representatives. The bill is part of the broader Digital Dollar Project, which aims to create a digital version of the US dollar [19].

CBDC (Central Bank Digital Currency) — it is a new form of currency that is the digital equivalent of a national currency, is issued by a central bank, can be used for electronic transactions, and has the potential to improve the efficiency of the financial system as a whole. Can exist as a supplement to traditional currencies or, if necessary, completely replace physical money, optimizes the logistics chain, reduces time and maintenance costs. CBDC is an electronic record in the central bank database, can be used for online payments, cross-border transfers, micropayments and other forms of electronic transactions. However, there are also security and privacy risks. The digital dollar in the form of CBDC will be pegged to the US dollar at a ratio of 1 to 1 [19]. For the US government, the digital dollar is a matter of national security, and for ordinary users it is a faster and more convenient form of traditional currency.

To date, central bank digital currencies (CBDCs) have attracted interest from more than 80 countries, 80% of national financial regulators, and 40% have already started CBDC testing. According to forecasts, from three to five countries in the world will fully implement CBDC by 2030 [19].

Ukraine not only keeps up with global trends, but also began to analyze the possibility of launching the e-hryvnia as one of the first — back in 2016. Our E-hryvnia is a digital national currency issued by the National Bank of Ukraine. This currency differs from other electronic currencies in that the NBU is the issuer. The pilot project began to be implemented in 2023, and the decision on the implementation of the digital hryvnia will be made in 2024. Currently, the Ministry of Digital, TAsKombank and the companies Stellar and Bitt are experimenting with the pseudo e-hryvnia [20].

6. Conclusions and proposals

According to forecasts, by 2040 the e-commerce market will account for 95% of all trade in the world. The rapid development of such a powerful segment of international business as e-commerce entails the development of other areas that belong to e-commerce: electronic money, electronic banking, electronic payment systems, payment methods, etc.

The main requirements for the payment system are efficiency, efficiency, economy, reliability, security and convenience. Only electronic payment systems that use the most modern advances in technology and equipment can meet the requirements. Payment ecosystem 2024 is focused on further digitization, provision of new processing digital technologies.

Nowadays small businesses can grow quickly and increase sales with quality online payment processing. With the help of modern technologies, including bank payment processing, companies can accept payments from customers all over the world. Processing companies ensure safe reception and processing of payments. The only thing required is access to the Internet.

Influence factors and development trends of payment ecosystems are determined by:

- consumers prefer non-cash payments, which prevail in terms of volume and quantity;
- COVID-19 became a turning point in the global transition to digitization of payment ecosystems;

- business requires an innovative payment ecosystem with a wide range of services, open banking, fast different payment options for customers, therefore the market for wearable payment devices is growing;

- mPOS payment terminals, mobile points of sale — a promising and effective trend in the development of payments;

- the need to convert a mobile phone into a Tap-on-Phone payment terminal is increasing, new payment services are offered by MasterCard and Visa, a wide range of banks.

—the demand for Real-time payments - instant execution and confirmation of payments - is growing.

—implementation of simple and effective international payments in conditions of blocking and restrictions is possible with the help of processing digital technologies;

—among all forms of embedded financing, the "buy now, pay later" (BNPL) sector is noticeably growing;

—global spread of cryptocurrency digital banking based on blockchain technology is expected;

—world central banks are launching their own digital currencies, for the state it is a matter of national security, and for ordinary users it is a faster and more convenient form of traditional currency.

Among the challenges facing our country today are the victory of Russian armed aggression, the return of its territories, the promotion of entrepreneurship, the development of small businesses, the economic recovery of the country and the implementation of private-state partnerships, the activation of the domestic stock market and the accumulative pension system.

Modern payment ecosystems create new opportunities for entrepreneurs and consumers. It is obvious that it is appropriate to continue to develop e-commerce and digital economy, digital platforms, implement new payment systems, and receive benefits from them, in order to build a more sustainable developed competitive society.

7. Prospects for further research

In our opinion, the modern paradigm of the updated payment system of Ukraine, which will lead to its profound positive transformation, should provide for: methodological aspects of the functioning of the new market of payment services; terminological update of the legal framework regarding payment systems and money transfers; functional model of the updated payment system of the country; change of payment technologies and passage of payment information in payment systems; ensuring information security of the payment ecosystem; determination of the role of the regulator in the field of payment services.

According to the results of a comparative analysis of the functioning of the payment space in the European Union and Ukraine, it was established that the payment and settlement system of the euro zone has the characteristics of a more developed, modern and open one. Therefore, it is appropriate to continue working on improving the forms of interbank settlements and increasing the efficiency of the payment system of Ukraine based on the principles of the organization and functioning of European payment systems, as well as on the implementation of relevant regulations and standards in the payment sphere of the country.

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