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## Improvement of organization and automation of commercial enterprise electronic money accounting in conditions of economy digitalization

**Abstract.** In the conditions of digitization of the globalized world economy, Ukrainian enterprises have an informational request for methodical recommendations regarding the technique of conducting and computerized accounting of electronic money payments, which are an innovative form of settlement transactions. The purpose of the study was to form actual methodological recommendations regarding the organization of automated accounting of payments in electronic money at the enterprise, as well as to justify the choice of the necessary software product for this purpose. To achieve the goal, the method of morphological analysis, comparative and critical analysis, system-structural approach, bibliographic method was used. Ukrainian enterprises are suggested to implement accounting work with electronic money in two successive steps. The transformations that will take place in the accounting work for settlement transactions of the enterprise in the case of the introduction of national digital currencies are substantiated. The technological possibilities of using neural networks for processing arrays of data regarding electronic money calculations carried out in payment systems are explained. It has been proven that, according to the forecasted trends, it is expedient for Ukrainian enterprises to switch from local accounting software products to the use of cloud services. Functional capabilities of 12 cloud-based software solutions popular in Ukraine for automating accounting and analytical work were analysed, from the point of view of the possibility of computerized accounting of settlement operations in electronic money. The advantages and disadvantages of individual SaaS services are explained, and the expedient ones are recommended for use. Recommendations were made to adjust the Order on accounting policy, following the scheme of organizational and procedural measures developed in the work. It is proposed to assess the compliance of the existing accounting software product with management information

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requests that arise when using electronic money to make payments. The recommendations were developed on the basis of a detailed study of the prospects for the further popularization of electronic money. The study is of practical interest for Ukrainian enterprises that involve in their business innovative payment solutions in the conditions of rapid digitalization of the economy

■ **Keywords:** e-wallet; payment system; transaction; electronic financial reporting; taxonomy; cloud accounting services

## ■ INTRODUCTION

In today's world, the Internet, in addition to a global network of entertainment and communication, is also becoming an integral component in the field of payments. In the conditions of growing needs of people, changes in the economy and scientific and technical progress, there is a need for a fast and efficient payment system that is able to satisfy the requests of both buyers and sellers. Electronic money and electronic payment systems were developed for this purpose. There are many views of researchers on the origin of e-money, but almost all of them come down to this. This is confirmed by the works of W.J. Luther (2019), B. Eichengreen (2019), A. Klein (2020). In 2018, Law of Ukraine No. 2473-VIII "On Currency and Currency Transactions" (2018) included settlement transactions with electronic money to the set of currency transactions. Companies traditionally make payments in fiat money in cash and non-cash forms. Existing legal provisions, theoretical developments and methodological recommendations of scientists comprehensively explain the procedure for accounting settlement operations carried out in fiat national and foreign currencies. The role of electronic money is to create a universal payment environment capable of uniting the buyer and seller of goods and services. Electronic money is a fairly flexible payment instrument that can completely replace fiat money.

Accounting legislation regarding settlement operations in digital currencies is under development both in Ukraine and in other countries of the world. In accounting, electronic money is recognized as an asset. However, regulations and other methodological recommendations do not imply the allocation of e-money as an independent accounting object. At the same time, it can be considered that electronic money has enough individual characteristics for its identification as a separate, independent accounting object. This requires the development of e-money accounting methods. The problematic issues of electronic money accounting were studied by such Ukrainian scientists as T. Mokienko *et al.* (2019), O. Podolyachuk (2019) and others. The introduction of cloud technologies into the accounting process is of great importance for the improvement of the accounting system of payments using electronic money. The rapid development of science and technology, the growth of data volumes, and the widespread use of Internet applications created the necessary context for the emergence of such a concept as cloud accounting. This method of accounting has many supporters among scientists all over the world. Authors such as P.M. Modi (2018), L. Ou & Z. Zhang (2020), I. Paiman (2020), who in their works noted the convenience of cloud accounting and its development prospects. The technique and methodology of accounting for payments made in electronic money is a field of scientific research. The reason is the transition period of gradual introduction of e-money to the global

business environment. The question of the essence and role of electronic money was considered by such well-known scientists as T. Adrian & T. Mancini-Griffoli (2019), D. Duffie (2019), C. Berg *et al.* (2019). In their opinion, the use of e-money in the future will be extremely popular and widespread when making payments around the world.

A fairly wide range of researchers devoted their work to defining the essence and concept of electronic money, its classification. However, the issues of evaluating and documenting settlement transactions with electronic money, organizing their synthetic and analytical accounting, as well as choosing the appropriate accounting software remain unresolved. The inadequacy of the theoretical base is primarily related to the incompleteness of the long process of introducing e-money to the world financial system. Taking into account the relevance of electronic money and their growing popularity in calculations, as well as the insufficient degree of research into the accounting system of electronic money, the purpose of the study was the formation of relevant methodological recommendations regarding the organization of automated accounting of payments in electronic money at the enterprise in the conditions of the current transition period of the formation of digital currencies, as well as justification of the choice of the necessary software product for this. The objectives of the research were: development of methodical recommendations regarding the accounting of settlement operations of a commercial enterprise carried out in electronic money; formulation of prospective changes in the current procedure for accounting settlement transactions under the influence of digitalization of the global financial system; substantiation of the expediency of the transition of Ukrainian enterprises from the accounting of settlement operations with local software to cloud-based software.

## ■ LITERATURE REVIEW

In modern economic science, a coherent theory of electronic money has not yet been developed. The presence of numerous publications that investigate various aspects of the development of digital payment systems does not ensure the formation of a conceptual basis for the functioning of electronic money. Definitions of electronic money formulated by foreign scientists can be reduced to three most common interpretations:

- as a dematerialized or electronic form of a bank ticket, the emission of which is carried out by "transformation" into an electronic form of monetary value (Peneder, 2022);
- as a financial product with a prepaid cost (Duffie, 2019);
- an instrument of exchange issued by a separate issuer and is a guarantee of the issuer to pay an equivalent amount (Adrian & Mancini-Griffoli, 2019).

According to M. Peneder (2022), in the process of replacing fiat money with electronic money, the function of money as a measure of value absorbs the function of a medium of exchange. With digital payments, they are no longer distinguishable and verifiable units of account that have become de facto mediums of exchange. Digitization of money brings to the fore the immaterial nature of money as a social accounting technology.

As noted by N. Windasari *et al.* (2022), the emergence of digital banking has significantly influenced changes in banking, but it is still new and not sufficiently widespread in many countries of the world. However, this industry is promising and actively developing, as evidenced by the research conducted by the authors. Z. Kuppenova *et al.* (2020) believe that the use of electronic money by enterprises in settlement transactions requires the development of an effective system of their accounting. Such a system should be based on digital technologies. Significant changes in all areas of social life and the transformation of economy based on information drivers of development determine the importance of updating the information environment of the new economy, which significantly affects accounting. Traditional accounting software has certain disadvantages, among which limited access to data, constant updating of software maintenance and ongoing costs of backing up all financial information can be highlighted. This requires some initial investment, which is treated as a fixed cost. P. Sharma (2018) concluded that an IT team is needed for continuous support, because the main threat is potential physical damage to equipment that can cause data loss. The details of the impact of cloud accounting on various factors in the entire business sphere are discussed in the work of P.M. Modi (2018).

M. Allahverdi (2017) notes that the integration of accounting information systems in cloud systems provides many advantages and opportunities compared to traditional systems. Low costs, easy access and application of high security standards are the main advantages of cloud systems. However, there are also disadvantages: the need for online access, data confidentiality, integration and use in mobile applications, and legal barriers. L. Ou & Z. Zhang (2020). However, the authors note that by analysing the relationship between cloud accounting and traditional accounting, they discovered the advantages of cloud accounting technologies and the potential for their future development and distribution to all enterprises. S. Hosack (2015) describes in his work that from a tax perspective, cloud accounting allows accountants to perform work faster and with lower internal costs, which positively affects customer satisfaction. With e-reporting supported by the government and a number of online services and mobile applications, it serves the purposes of both individual and corporate taxpayers.

Cloud accounting is the future of the accounting profession. The only thing that limits the use of cloud accounting is security. M. Ummulkhairy (2022) determined that if cloud accounting service providers ensure high data security, then the implementation of cloud technologies in accounting will certainly increase in the future. A similar opinion is held by X. Wu (2021), who notes that the information system of cloud accounting combines accounts into an organic whole, which will be the basis

for decision-making and enterprise management. Despite the existence of a large number of studies on electronic money, e-money accounting, cloud accounting systems, the problem of organizing cloud accounting of e-money settlements for Ukrainian commercial enterprises is not enough researched.

## ■ MATERIALS AND METHODS

A combination of general scientific and special methods and techniques of scientific research were used to fulfil the tasks set in the work. The study of the degree of development of the problem of electronic money accounting was carried out using the bibliographic method. The use of causal analysis to establish connections and identify the state of development of electronic money payments in Ukraine made it possible to draw a conclusion about the growth of their popularity. Morphological, comparative and critical analysis was used. The method of systematization made it possible to systematize the proposals of Ukrainian scientists regarding the organization of the system of accounts for accounting for electronic money at enterprises of Ukraine. A logical-comparative method was used to substantiate possible options for accounting for electronic money. System-structural and functional approaches were used in the construction of a scheme of organizational and procedural measures for accounting for electronic money. The diagnostic approach was used to formulate the need to record digital data on the movement of electronic money and to form macro-arrays of information on the calculations made. A comparative method was used to compare the current and forecast order of accounting of enterprise settlement operations using electronic money. A comparative analysis of the functionality of cloud accounting SaaS (Software as a Service) services presented on the IT market of Ukraine made it possible to draw a number of conclusions regarding the choice of the optimal accounting product for accounting of settlement operations in electronic money. Through the system of analysis and synthesis, the work gradually revealed the accounting features of electronic money and their registration in the cloud environment.

The information base for writing the work was specialized scientific research on the problems of modern realities and trends of electronic money settlements, as well as on the construction of accounting and analytical support for the enterprise using local and cloud software products. During the study of the importance of using electronic money and its reliable accounting, the conclusions of T. Adrian & T. Mancini-Griffoli (2019) regarding the ease of use of e-money in payments, its prevalence in different countries, minimal transaction costs when making payments and network effects arising from the use of e-money were considered.

## ■ RESULTS AND DISCUSSION

### **Methodical recommendations regarding the accounting of payments of a commercial enterprise with electronic money**

As of 2023, Ukrainian enterprises make payments in fiat money: with residents of Ukraine in national currency, and with foreign partners in foreign currency. At the same time, there is a gradual formation, state regulation and spread of the use of electronic money. Over the years 2000-2020,

experience has been accumulated in making settlements with fiat electronic money (PayPal, Virtual digital card of Visa, Virtual digital card of MasterCard, Global Money, Maxi, NovaPay, Alfa-Money, Electrum Prostrir) and electronic money of private issue (Skrill, Epayments, Payeer, Facebook Pay, Google Pay, Perfect Money, EasyPay) (Kurhan & Aksyuta, 2021).

According to the NBU (National Bank of Ukraine), in Ukraine during 2020, the number of “electronic wallets” increased by 5 million units (by 7%) – to 79 million, and the volume of transactions with electronic money – by UAH 2,590 million (by 15%), up to UAH 19,304 million (Statistics at the..., n.d.). The use of e-money is becoming more and more transparent, and e-money users are more informed and protected. Digital payment systems identify and verify users in the same way as during the usual opening of a bank account. Law of Ukraine No. 2473-VIII “On Currency and Currency Transactions” (2018), Law of Ukraine No. 2346-III “On Payment Systems and Money Transfer in Ukraine” (2001), as well as Resolution of the Board of the National Bank of Ukraine No. 210. “Regulations on Issuing Electronic Money and Carrying Out Payment Transactions with It” (2022) comprehensively regulate the issue, conversion, storage in digital wallets and settlements with electronic money in Ukraine. As of 2023, the use of e-money issued by Ukrainian banks is allowed (for example, GlobalMoney from JSC Bank “Alliance”, Maxi from PJSC “Taskom-bank”, Alfa-Money from PJSC “Alfa-Bank”, Electrum from JSB “UkrGasbank”) and non-residents (Facebook Pay; Google

Pay; PayRun; Apple Pay), provided that the issuers of these e-money are registered in the Register of Payment Systems of Ukraine. Illegal digital payment systems are prohibited for use by Ukrainian enterprises. In view of the above, the object of accounting is a legally limited number of types of electronic money, including fiat money (issued by banks) and private issuance.

The financial system of the globalized economy is preparing for the innovative introduction of national electronic currencies in the countries of the world. China is testing a digital yuan (e-CNY) from 2020. The EU plans to launch a digital euro in 2026. The US is considering a digital dollar (Stephenson, 2022). In September 2021, the National Bank of Ukraine launched the “e-hryvnia” project with the aim of “wide-scale issuance of the digital form of the hryvnia” (About e-hryvnia..., n.d.). Therefore, the current legislative approach to electronic money, including its accounting, will necessarily be modernized in accordance with the changes that will take place. The scientific search for organizational and program solutions regarding the accounting of e-money is carried out during the transition to national electronic currencies. The methodology of electronic money accounting in compliance with Ukrainian accounting standards was developed by T. Mokienko *et al.* (2019), N. Kurhan (2020), A. Stovpova (2021). The views of these researchers regarding the organization of the accounting system of electronic money can be conventionally divided into two groups, as illustrated in Table 1.

**Table 1.** Systematization of the proposals of Ukrainian scientists regarding the organization of the system of accounts for the accounting of electronic money at the enterprises of Ukraine

Authors and regulatory documents	Names and codes of the accounts proposed by the authors for accounting of the company's payments with e-money			
	accounting of e-money on account 33 “Other funds”		accounting of e-money on account 32 (additional)	
	335 “Electronic money denominated in the national currency”	336 “Electronic money denominated in foreign currency”	32 “Software electronic money”	32 “Electronic money”
Order of the Ministry of Finance of Ukraine No. 291 “Chart of Accounts for Accounting of Assets, Liabilities, Capital and Business Operations of Enterprises and Organizations” (1999)	✓			
N. Kurhan (2020)	✓	✓		
A. Semenets (2017)	✓			
T. Mokienko <i>et al.</i> (2019)	✓			
O. Podolyachuk (2019)	✓	✓		
P. Sakharov (2017)			✓	
A. Stovpova (2021)				✓

**Source:** developed by the authors

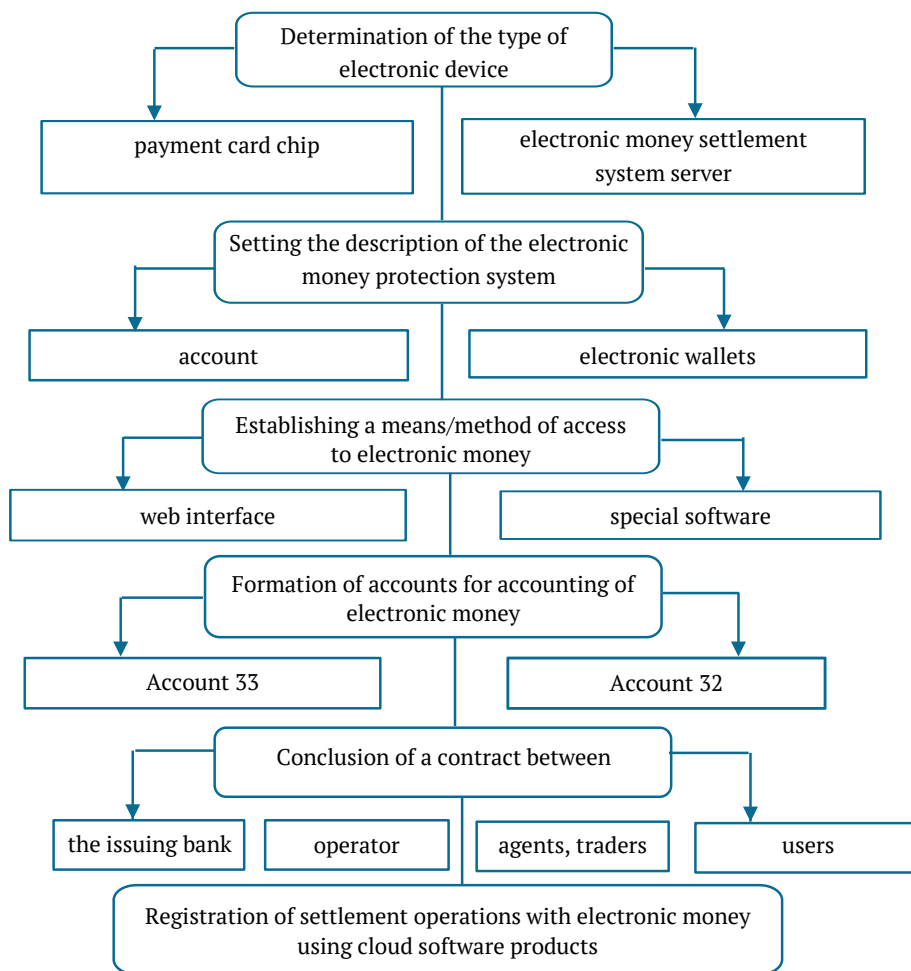
According to the results of the theoretical generalization performed in Table 1, it was concluded that one group of authors (Semenets, 2017; Mokienko *et al.*, 2019; Kurhan, 2020) suggests that Ukrainian enterprises conduct synthetic accounting of electronic money using account 33 “Other funds”. The second group (Sakharov, 2017; Stovpova, 2021) follows an alternative approach and emphasizes the need to separate electronic money on a separate

account 32, which is not used in the Chart of Accounts as of 2023. Regarding the feasibility of using account 32, A. Stovpova (2021) states the following arguments: firstly, electronic money is an independent payment instrument and therefore it does not need to be equated with other monetary funds; secondly, the presence of only one account 335 for recording electronic money makes it impossible to account for exchange rate differences.



Regarding the development of methodological recommendations for the accounting of settlement operations of a commercial enterprise carried out in electronic money, the following is proposed. In view of the fact that electronic money as an innovative type of currency is increasingly acquiring the status of an independent payment instrument, it is considered sufficient to display and register exchange

rate differences in the accounting establish sub-accounts to account 33 or 32. Such detailing will allow for the separation of electronic money in national and foreign currencies, as well as by types and methods of carrying such money. Figure 1 suggests a scheme of organizational and procedural measures for the development of electronic money accounting at a Ukrainian commercial enterprise.



**Figure 1.** Scheme of organizational and procedural measures of electronic money accounting

**Source:** developed by the authors

According to Figure 1, it is possible to give the main recommendations to Ukrainian commercial enterprises regarding the improvement of the organization of e-money accounting with mandatory reflection in the Order on Accounting Policy: determination of the type of electronic device using which settlement operations with e-money are carried out; establishment of the e-money accounting procedure in accordance with the involved stakeholders of settlement transactions; description of the system of protection against unauthorized viewing and the means/method of access to e-money; development of a scheme for the movement of information flows of settlement transactions with e-money, which participate in the exchange and processing of such information; defining the system of accounts and opening sub-accounts for electronic money settlement operations in accordance with the company's accounting policy; formation and collection of

documentation to confirm settlement operations with e-money (service contract, cryptographic protocols, algorithms and keys); selection, description and justification of a cloud-based software product for accounting of settlement operations with e-money. The provided recommendations will contribute to the clear establishment of specific organizational procedures for accounting for e-money, taking into account the specifics of each company's activities, as well as the protection of information from fraudsters and unscrupulous stakeholders.

For the organization of e-money accounting at the enterprise, the proposed improvements to the accounting policy and accounting system are insufficient. Organizational or business decisions of modern companies require digital implementation. In this case, it is about the search for software, the functionality of which will allow implementing methodological recommendations developed by

the authors. Since electronic money is in the current process of rapid development, it is necessary to choose a software product for accounting of settlement operations with electronic money after researching existing trends in the transformation of the world economy under the influence of the latest digital technologies. Further, the article examines the main trends of ongoing changes in the current order of accounting for settlement operations, which are produced by the digitalization of the global financial system.

#### **Justification of projected changes in the accounting of settlement transactions under the influence of digitalization of the financial system**

The innovative difference of electronic currency is the possibility of recording and saving electronic records of all settlement operations for each electronic monetary unit. Similar functionality has already been tested as transaction records for cryptocurrency transfers using blockchain technology. The recording of digital data on the movement of e-currency opens up the possibility of forming macro-arrays of information on the performed calculations in the analytics of all payment participants. In the future, calculations using national digital currencies will not require the operator to enter primary payment documents into the accounting information databases of enterprises. Registers of completed transactions can be uploaded to the database from the server of the e-money issuer.

The gradual transition from fiat currency to electronic currency will fundamentally change both the technique of conducting settlement transactions of enterprises and the procedure for accounting for such transactions. Simultaneously with the global development of the financial system of electronic currencies, such large-scale transformations are observed in the global economic environment as: the creation, testing and implementation of the use of neural networks, virtualization of business assets, development of intangible forms of capital. There is continuous digitization and the accompanying internationalization of both

economic and social life. Information is becoming an increasingly significant factor in production and sales. Neutron networks (for example, ChatGPT, Galactica Meta, deep learning artificial intelligence of Google, EOSDA, Amazon) imitate the analytical work of the human brain and demonstrate impressive results during testing, instantly processing macro-arrays of data and interacting with users in the mode of normal human communication. According to the authors, in the future, the technological capabilities of neural networks will be used to process digital data related to payments in electronic money.

Against the background of the described changes, the transition to the international XBRL (XBRL – eXtensible Business Reporting Language) format of electronic financial reporting is being carried out in Ukraine, in accordance with Clause 6 of Article 11 Law of Ukraine No. 996-XIV “On Accounting and Financial Reporting in Ukraine” (1999), recommended by the International Financial Reporting Standards Board (IFRS) and generally accepted in the EU and the USA. The content of this form of reporting is the transfer to external users of financial information standardized according to the IFRS taxonomy via the Internet, the possibility of its high-speed machine processing and viewing by a person exclusively in electronic form on an IT device using special software. The reporting of enterprises is modified from graphic not simply to digital, but to interactive, which opens up the possibility of storing and processing digital arrays of virtual financial information about business entities.

Table 2 shows the forecast changes that will take place in the accounting of settlement operations of a commercial enterprise in the event of the transition of the world economic system to electronic money. For now, the further digitization of the technique of carrying out, documenting and accounting for payments is clear. Row 4 of Table 2 explains that the current trend is a gradual transition to processing business data on the Internet using cloud software products.

**Table 2.** Comparison of the current and forecast order of accounting of the enterprise’s settlement operations (in case of introduction of electronic money as an alternative to fiat money)

<b>Stages of accounting for settlement operations</b>	<b>The procedure for accounting settlement operations as of the beginning of 2023</b>	<b>Predictive data processing procedure for settlement operations</b>
1. Documentation and initial accounting of the enterprise’s settlement operations	When using fiat money (in cash and non-cash forms), primary bank and cash documents are drawn up by executors for each separate payment transaction and entered into the company’s information base (manually or by uploading an electronic document – bank statement, receipts, etc.); based on these primary documents, the accounting program automatically forms a transaction.	When using electronic money, information on settlement operations carried out with each monetary unit will be stored as an accompanying digital protocol in a single array of data of the state financial system. The primary accounting of settlement transactions in the company’s information base will take place as a data download from such a macro array.
2. Processing of data related to settlement operations, formation of accounting registers	On the basis of transactions compiled according to primary documents, accounting journals, information and other registers are automatically created in the information base at the user’s request. Turnovers and balances according to accounting registers allow the accounting specialist to determine the necessary financial indicators of the period, as well as to check their correctness.	When using neural networks, there will be no need to compile a set of accounting registers and check their correctness, completeness and comparability. Artificial intelligence will provide unwavering data control over all the company’s settlement operations, performing instant retrospective and predictive calculations at the user’s request.

Table 2. Continued

Stages of accounting for settlement operations	The procedure for accounting settlement operations as of the beginning of 2023	Predictive data processing procedure for settlement operations
3. Display of settlement operations in the company's financial statements	Accountants of enterprises required to report under IFRS manually prepare electronic financial statements in XBRL format using special programs (for example, IPHIX, Arkk XBRL Adapter); it is not possible to transfer data from the information base. Financial reporting of all other commercial enterprises is compiled in an information base with the direct participation of a user specialist, then downloaded in XML (XML – eXtensible Markup Language) format to reporting programs (e.g. “M.E.Doc”, “OPZ”, “iFin”). Reporting is verified by electronic digital signatures and sent to external users via the Internet.	The XBRL format for electronic financial reporting is based on the metadata provided in the IFRS taxonomy. This allows you to quickly identify, structure, compare and analyse the financial data of enterprises through machine processing. If neural networks are used to process and analyse period accounting data, reporting will also be fully automated. The array of financial indicators of an individual enterprise will be subject to software processing for prompt generation of XBRL reports in the necessary analytics.
4. Software and conditions necessary for accounting of settlement operations of the enterprise	Local (on a personal computer) or cloud-based accounting software for maintaining the information base; remote banking software for servicing accounts (“Client-Bank”); special software for preparing and transmitting reports; Internet access (systematic in the case of the accounting base on a local server; uninterrupted in the case of a cloud-based server).	Information flows regarding electronic money payments will be generated online and stored in special cloud storage. Under these conditions, priority will be given to cloud-based software solutions that will allow the use of virtual artificial intelligence to generate arrays of data for an individual company.

**Source:** developed by the authors

The introduction of electronic money, digital reporting and analytical processing of calculation operations and financial indicators by neural networks is accompanied by the expansion of the scale of cloud computing and storage. Under such trends, it is obvious to choose a cloud-based software solution for organizing enterprise accounting, including accounting for settlement operations.

#### **The advantages of cloud services over local programs for automating the accounting of e-money payments**

The expediency of the transition of Ukrainian enterprises from local software solutions to cloud-based ones for maintaining an information base and accounting in it, among other things, for e-money settlement transactions in digital payment systems is explained and proved below. At the time of the study, most companies in Ukraine used individually developed accounting information bases at the companies (NJSC “Naftogaz”, PJSC “Shvydko-Ukraine”, LLC “Procter & Gamble Ukraine”, Fozzy Group networks, LLC “ATB-market”) or standardized licensed software products (for example, “MASTER: Accounting”, “1C: Enterprise. 8.3”, “BAS Accounting”), which were installed on local servers. Since 2018, there has been continuous dynamic growth of the cloud services market in Ukraine, including cloud accounting services (for example, “MASTER: Accounting”, “jSolutions”, “IT-Enterprise: Accounting”, “Oblik Saas”, “BukhSoft”, “BookKeeper”, “1C DataStore”, “Parus”). The potential of cloud-based accounting software products of Ukraine should be investigated in more detail in terms of the organization of automated accounting of payments with electronic money. Summarizing the results of the study in Table 2, it can be seen that as of 2023, it is expedient for Ukrainian enterprises to organize accounting work based on software products with cloud access, abandoning Stand-Alone technology based on local computers.

Cloud software solutions are classified by the degree of user involvement in administration into three groups: PaaS (Platform as a Service), IaaS (Infrastructure as a Service) and SaaS services. A cloud service in the form of PaaS means that the user enterprise receives a platform and sets of ready-made components, on the basis of which it independently creates functional modules (applications), which it later administers and uses. In the case of an IaaS solution, the user rents cloud processors, memory, and networks from the vendor (service provider), on the basis of which he creates router servers and configures the individual topology of the accounting system. SaaS services are used by subscription; in this case, the vendor performs full administration of the service, and the user company receives a ready-made accounting software product that requires minimal individual settings.

In Ukraine, as of 2023, more than 95% of commercial enterprises according to the parameters of Article 2 Law of Ukraine No. 996-XIV “On Accounting and Financial Reporting in Ukraine” (1999) belong to small business (State Statistics Service of Ukraine, n.d.). This explains that the vast majority of cloud accounting products on the Ukrainian IT market are represented by SaaS services. The development of individual cloud PaaS and IaaS accounting and analytical systems requires significant financial and human resources, which can be afforded only by large companies that need comprehensive compliance of the system with the specifics of their organization and management, as well as complete information confidentiality. Small and medium-sized businesses choose between various options of ready-made SaaS solutions, the use of which is convenient and economical (Kurhan, 2020). Table 3 compares the functionality of 12 popular SaaS services in order to justify the best of them for use by a Ukrainian enterprise that performs settlement operations in electronic money.

**Table 3.** Comparison of the functional capabilities of cloud accounting SaaS services presented on the IT market of Ukraine as of 2023

Functional characteristics, users of the cloud accounting SaaS service/ name of the SaaS service	Application modules			Sustainable software solution						Reporting		
	iBuh.Online	IT-Enterprise: Accounting	ISpro	MASTER: Accounting	jSolutions	Oblik Saas (standard)	BookKeeper	Dilovod	DebetPlus	M.E.Doc	Webzvit	Taxer
1. General functionality available to users of the SaaS service:												
1.1. financial accounting;	Y	Y	Y	Y	Y	Y	Y	Y	Y	P	P	P
1.2. management accounting;	Y	P	Y	Y	N	P	N	P	N	N	N	N
1.3. tax accounting;	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1.4. electronic administration of VAT (value added tax);	Y	N	N	N	N	N	N	N	N	Y	Y	Y
1.5. sending electronic reports with digital signatures to supervisory bodies;	Y	N	N	N	N	N	N	N	N	Y	Y	Y
1.6. electronic document flow with buyers and suppliers;	Y	Y	Y	P	P	P	N	P	N	Y	Y	Y
1.7. electronic document flow with servicing banks;	P	P	P	P	N	N	N	N	N	N	N	N
1.8. automatic updating of documents and reports, according to legislation.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2. Functional capabilities of e-money accounting:												
2.1. built-in algorithm for state-regulated e-money accounting;	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
2.2. editing the Chart of Accounts;	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
2.3. adding new forms of electronic payment documents;	P	P	P	N	N	N	N	N	N	N	N	N
2.4. data exchange with digital wallets, digital payment systems for e-money settlements.	N	N	N	N	N	N	N	N	N	N	N	N
3. Administration of software applications and service algorithms for their adjustment in accordance with user requests.	N	N	N	N	N	N	N	N	N	N	N	N
4. Groups of users of the SaaS service, according to the classification of Article 2 of the Law on Accounting (Law of Ukraine..., 1999):												
4.1. large enterprises;	-	-	-	-	-	-	-	-	-	-	-	-
4.2. medium enterprises;	✓	✓	✓	✓	✓	✓	-	-	-	✓	-	-
4.3. small enterprises (including micro-enterprises).	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

**Note:** Y – the functionality is fully provided by the SaaS service; N – the functionality is not provided in the SaaS service; P– the functionality is partially, but not completely, provided by the SaaS service

**Source:** developed by the authors



With the help of the comparative analysis performed in Table 3, a number of conclusions can be drawn that will allow choosing the best cloud accounting product for accounting of settlement operations in electronic money. First, the structure of SaaS services is different: more complex software products that provide users with a wider range of opportunities, formed as a set of functional modules (applications) that are activated at the user's request ("IT-Enterprise: Accounting", "ISpro", "iBuh.Online"). Other SaaS services are a single standardized cloud software product that cannot be improved by connecting applications (for example, "MASTER: Accounting", "BookKeeper", "M.E.Doc"). Second, the general functionality of the SaaS service usually subordinated to a clear goal: either compiling and providing electronic reporting to authorized bodies ("M.E.Doc", "Webzvit", "Taxer"), or keeping company accounting records. This practice has developed due to the fact that many companies use local software products and need an electronic application for interaction with state authorities in terms of VAT administration and reporting. Some modular SaaS services (for example, "iBuh.Online") already provide a digital document management service, which is indicated in points 1.4-1.5 of Table 3. Thirdly, accounting SaaS services addressed exclusively to small businesses (for example, "BookKeeper", "Dilovod"), have the most simplified functionality for simple accounting calculations and records.

Points 2.1-2.4 of Table 3 reveal the functionality of the studied SaaS-services regarding the accounting of company payments in electronic money. As you can see, SaaS products focused on reporting ("M.E.Doc", "Webzvit", "Taxer") are absolutely not suitable for this purpose. Cloud accounting and analytical systems (from "iBuh.Online" to "DebitPlus" in Table 3) contain a built-in algorithm for state-regulated e-money accounting, as well as an edited Plan of accounts, which allows the use of accounts 32 and 33 for electronic money accounting. Only modular SaaS products ("IT-Enterprise: Accounting", "ISpro", "iBuh.Online") can add new forms of electronic payment documents and registers at the user's request. However, it is not yet possible to interact with digital wallets and digital payment systems regarding e-money calculations of the user database created in the SaaS resource.

Thus, under the influence of digitalization of the global economy, Ukrainian enterprises are increasing the volume of settlement operations in electronic money. A predictable prospect is the transition to national electronic currencies as an alternative to fiat money. In the transitional conditions of the transformation of the financial system, commercial enterprises are recommended to master the technique of making and accounting for payments with digital money, using cloud accounting software products for this. The study of the functionality of 12 popular SaaS services made it possible to establish that modular SaaS products (such as "iBuh.Online", "IT-Enterprise: Accounting", "ISpro") have the most complete functionality for cloud accounting of a Ukrainian enterprise. Developers of modular SaaS services quickly update existing applications and offer new ones at the request of the market, as well as carry out their individual refinement at the request of the client. The enterprise can implement innovative software solutions

for the accounting of electronic money payments only on the basis of cloud PaaS and IaaS services, but this requires financial investments.

The conclusions obtained by the authors are consistent with the conclusions and proposals of foreign and Ukrainian scientists, and also supplement and continue them. Review of works by A. Semenets (2017), T. Mokienko *et al.* (2019), A. Stovpova (2021) indicates the lack of scientific research and development on the issue of electronic money accounting using cloud software products, which complicates the development and implementation of effective technologies in this area. Group of researchers T. Mokienko *et al.* (2019) singled out the classification features of electronic money and studied the development of electronic money circulation. A. Semenets (2017) carried out the identification of the economic essence of the concept of "electronic money" and formed a classification approach to the accounting display of transactions with electronic money without the use of accounting software systems. A. Stovpova (2021) substantiated the feasibility of accounting for electronic money on a separate account 32 "Electronic money". In the work of O. Podolyachuk (2019), a comprehensive approach to the accounting provision of funds in the relationship of the elements of the accounting method is proposed. The work of A. Klein (2020) emphasizes the integration of the Chinese payment system into global payments. The transformation of accounting activities in the conditions of digitalization of the economy, changes in the accountant's function and the addition of artificial intelligence to accounting operations were studied by scientists Z. Kuppenova *et al.* (2020). However, none of the listed works contain proposals for accounting display of e-money using cloud environment programs.

It is explained that the attractor of these inevitable changes is the further distribution of electronic money, the highest point of which will be the introduction of digital national currencies. Similar conclusions were reached in their works by T. Adrian & T. Mancini-Griffoli (2019), D. Duffie (2019), M. Peneder (2022), who studied the chronology of the formation of electronic money and tried to identify further trends. M. Peneder (2022) emphasizes the importance of understanding the transition to digital currencies and changes in payment systems. In his opinion, it is possible to observe the preservation of public sovereignty over the common unit of account by central banks, which in the near future are considering the possibility of issuing their own digital fiat money. D. Duffie (2019) investigated the efficiency of the payment system and the control of monetary policy transmission by central banks. In his work T. Adrian & T. Mancini-Griffoli (2019) continue the general thinking of researchers D. Duffie (2019) and M. Peneder (2022) regarding the emergence of a digital form of money and its transformation into electronic money, which will be measured by an electronic monetary value denominated and tied to such a currency, like euro or dollar. The developed Table 2 not only embodies the collective opinion of the mentioned scientists regarding the inevitability of digitization of the global financial system and its modification due to this, but deepens and continues their research, as it contains a forecast exclusively for the subjects of the Ukrainian economy, taking into account the specifics of national business realities.

The authors' conclusion regarding the prerogative of cloud services over local accounting software is consistent with the opinion of Z. Kuppenova *et al.* (2020), N. Windasari *et al.* (2022), who emphasize the importance of using advanced software solutions to automate the accounting of companies participating in electronic money settlements. Also, in the study, the opinion asserted by Z. Kuppenova *et al.* (2020) was developed that the use of a cloud-based accounting program provides resource savings that are significant enough to represent a relevant criterion when choosing an accounting solution. P.M. Modi (2018), L. Ou & Z. Zhang (2020), I. Paiman (2020) substantiated the advantages of cloud accounting solutions over programs installed on local servers using examples from different countries around the world. L. Ou & Z. Zhang (2020) investigated the adoption of cloud computing for accounting purposes in China and demonstrated the benefits of cloud computing for small and medium-sized enterprises. I. Paiman (2020) directed his research to review the concept of cloud accounting and its advantages on the example of companies in Kurdistan. I. Paiman (2020) singled out five key reasons for the popularization of cloud accounting services, which are consistent with the opinion of the authors expressed in the work: lower cost of using the program, easy and fast access to the information base located in the cloud, a high level of data security, which the vendor provides a large amount of virtual memory for storing client data and automatic backup, compatibility of cloud services with all operating systems and web browsers. At the same time, the researcher formulated six main risks of using cloud solutions for accounting, which are related to potential technical shortcomings of Internet connections and cybercrime. Similar conclusions to I. Paiman (2020) were reached in his research by P.M. Modi (2018), who, using the example of accounting practices of Indian companies, identified the benefits and challenges of cloud accounting, as well as the capabilities of an individual small firm in terms of accounting and decision-making. In his opinion, the benefits outweigh the challenges of using a cloud-based accounting system. The researches of these scientists confirm the results of the work carried out regarding the advantages of cloud technologies (Table 2): continuous digitalization of economic and social relations; digitization of relations and document flow of market subjects among themselves, with state bodies and financial institutions; artificial intelligence testing for the analysis of information macroarrays; formation of global cloud capacities for data processing and storage.

The difference between the research conducted by the authors of options for cloud automation of accounting is that one of the criteria was the functionality of entering e-money settlement transactions into the accounting base. This criterion was not taken into account by scientists, since only in the last two years the popularization of electronic money took place and business requests for software support for their use and accounting were formed. Instead, J. Singerová (2018) indicates that the reason for choosing cloud accounting is the possibility of fast user access to the database from any software device, as well as the constant updating of the cloud service algorithm by its vendor. The authors share the opinion of J. Singerová (2018)

regarding the fact that cloud accounting software gives its users real-time access to business finances, easy setup and easy use, access to information from anywhere, which is a great advantage. according to S. Hossack (2015), companies choose cloud services due to their cost-effectiveness compared to the purchase of computer equipment and licensed accounting software, which provides lower internal costs for automation of accounting and analytical work. The criteria for choosing an accounting software product identified by these scientists are important, but insufficient. The paper substantiates that when choosing a cloud program, it is necessary to familiarize yourself in advance with its compliance with the realities of the transition to digital banking. The authors agree with the opinion of I. Paiman (2020) that when implementing a cloud solution for accounting automation, it is necessary to detect the presence of uninterrupted Internet connection conditions. It is also advisable to take into account the recommendations of P.M. Modi (2018) and M. Ummulkhairy (2022), who warn about cyber threats of losing confidential business information and call for careful selection of a cloud service provider also based on this criterion.

## ■ CONCLUSIONS

The result of the conducted research was the development of recommendations relevant in the conditions of total digitalization regarding the development of automated accounting of payments in electronic money at the Ukrainian enterprise, as well as regarding the selection of the necessary software product for this. The analysis of the views of Ukrainian scientists on the organization of the electronic money accounting system allowed to draw a conclusion about the need to detail information about electronic money in national and foreign currency, as well as exchange rate differences related to the use of electronic money, in the system of synthetic and analytical accounts. Ukrainian commercial enterprises that use electronic money were asked to implement certain organizational and procedural measures that will allow to improve the organization of electronic money accounting. Among such procedures, the establishment of the accounting procedure taking into account the involved stakeholders of settlement transactions, the development of the scheme of movement of information flows of settlement transactions using e-money, the formation and collection of documentation to confirm settlement transactions, etc. are separated.

When choosing software for accounting for digital payments in electronic money, it is necessary to take into account the existing trends of further digitalization of business. It is explained in the paper that the procedure for accounting for settlement operations, effective at the beginning of 2023, will inevitably be modernized under the influence of the following main factors: the transition to electronic national currencies, which have transaction records for each monetary unit; application of technological capabilities of neural networks and artificial intelligence for the analysis of macro-arrays of data on the circulation of e-money; implementation of electronic financial reporting of enterprises by taxonomy. Objective changes in the accounting of settlement operations at all stages of its implementation – documentation, data processing in registers, reporting – are substantiated. It was revealed that the

further rejection of local media in favour of cloud storage will be a distinctive feature of the forecast changes.

The use of electronic money in settlement operations causes the need to expand the scale of cloud computing and storage. The conducted research showed that it is expedient for enterprises to organize accounting work on the basis of software products with cloud access. This article presented an overview of various groups of cloud software solutions. At the same time, special attention was paid to the functional capabilities of cloud accounting SaaS services available on the Ukrainian market. This made it possible to draw conclusions that help choose the best cloud accounting product for accounting settlement operations using e-money. Enterprises are recommended to use modular SaaS products that can be customized,

scaled, and systematically updated. The novelty lies in the development of methodological approaches to the construction of an accounting system for settlement transactions using electronic money based on cloud software. The conducted research opens up prospects for further research in this subject area, aimed at establishing cause-and-effect relationships between indicators of the efficiency of calculations using e-money and digital accounting technologies.

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#### ■ CONFLICT OF INTEREST

None.

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## **Удосконалення організації та автоматизації обліку розрахунків комерційних підприємств е-грошима в умовах цифровізації економіки**

■ **Анотація.** В умовах цифровізації глобалізованої світової економіки українські підприємства мають інформаційний запит на методичні рекомендації щодо техніки проведення та комп'ютеризованого обліку платежів електронними грошима, які є інноваційною формою розрахункових операцій. Метою дослідження було формування актуальних методичних рекомендацій щодо організації на підприємстві автоматизованого обліку розрахунків у електронних грошах, а також обґрунтування вибору необхідного для цього програмного продукту. Для досягнення мети було використано метод морфологічного аналізу, порівняльний та критичний аналіз, системно-структурний підхід, бібліографічний метод. Українським підприємствам запропоновано впроваджувати облікову роботу з електронними грошима у два послідовні кроки. Обґрунтовано трансформації, які відбуватимуться в обліковій роботі за розрахунковими операціями підприємства, в разі впровадження національних цифрових валют. Пояснено технологічні можливості використання нейромереж для обробки масивів даних щодо проведених у платіжних системах розрахунків електронними грошима. Доведено, що за прогнозованих тенденцій українським підприємствам доцільно переходити від локальних бухгалтерських програмних продуктів до використання хмарних сервісів. Проаналізовано функціональні можливості 12 популярних в Україні хмарних програмних рішень для автоматизації обліково-аналітичної роботи, з позиції можливості ведення комп'ютеризованого обліку розрахункових операцій у електронних грошах. Пояснено переваги і недоліки окремих SaaS-сервісів та рекомендовано доцільні до використання. Надано рекомендації відкоригувати Наказ про облікову політику, дотримуючись розробленої в роботі схеми організаційних та процедурних заходів. Запропоновано оцінити відповідність наявного бухгалтерського програмного продукту інформаційним запитам управління, які виникають при використанні електронних грошей для проведення платежів. Рекомендації розроблено на підставі детального вивчення перспектив подальшої популяризації електронних грошей. Дослідження має практичний інтерес для підприємств України, які залучають до свого бізнесу інноваційні рішення проведення платежів в умовах швидкісної цифровізації економіки

■ **Ключові слова:** електронний гаманець; платіжна система; транзакція; електронна фінансова звітність; таксономія; хмарні бухгалтерські сервіси