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Digital assets in accounting: the concept formation and the further development trajectory

Abstract

Introduction. The transition to digital technologies stimulated the emergence of new accounting objects in the form of digital assets whose features are problematic for being displayed in a rather tightly regulated system of accounting and reporting standards. In the context of emerging new ways of using crypto assets in business practice and increasing the volume of transactions with them, accounting has problems with displaying digital assets in part of confirming their controllability, their assessment at various stages of the life cycle, and identification of participants of cryptocurrency transactions. The paper deals with impact of economy digitalization on accounting methodology in the context of the Industry 4.0, in particular, the prospects for a separate display of digital assets in financial statements.

Purpose. This article is aimed at the systematic substantiation of the exclusive status of digital assets as a fundamentally new accounting object in order to further develop, on this basis, the strategy for the development of their accounting and displaying them in the companies' reporting.

Methods. The paper contains a critical analysis of scientific publications devoted to the essence, status and features of the digital assets' use, as well as the formation of information about them in the accounting and financial statements. The authors have carried out a bibliometric analysis of the frequency of use of terminology in the field of digital assets with the help of special software (VOSviewer and Google Trends).

Results. The authors have developed a taxonomy of digital assets based on the use of distributed ledger technology and cryptography. The paper also explores the issue of the differentiated application of existing valuation bases for various types of digital assets. The article systemizes approaches to the deanonymization of participants in transactions with crypto assets which are used to control their origin and the legal regime of applying, for the purpose of rational organization and accounting of them.

Conclusions. There is a need to introduce a separate standard designed to regulate accounting and display of digital assets in financial statements, in order to provide stakeholders with relevant information in the process of making managerial and investment decisions.

Keywords: Crypto Assets; Cryptocurrency; Digital Assets; Non-crypto Assets

JEL Classification: M40; O31; K24

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**Цифрові активи у бухгалтерському обліку:
формування концепції та траєкторія подальшого розвитку**

Анотація

Вступ. Перехід на цифрові технології стимулював появу нових об'єктів обліку у вигляді цифрових активів, специфічні ознаки яких проблематично відобразити в досить жорстко регламентованій системі стандартів бухгалтерського обліку та звітності. В умовах появи нових способів використання криптоактивів у діловій практиці та збільшення обсягів операцій з ними бухгалтерський облік має проблеми з відображенням цифрових активів у частині підтвердження їх підконтрольності, оцінювання на різних етапах їхнього життєвого циклу та ідентифікації учасників операцій з криптовалютою. У статті проаналізовано вплив процесу цифровізації світової економіки на методологію бухгалтерського обліку в умовах четвертої промислової революції та визначено перспективи відокремленого відображення цифрових активів у фінансовій звітності.

Метою статті є системне обґрунтування виняткового статусу цифрових активів як принципово нового об'єкта обліку з розробкою на цій основі стратегії розвитку їх обліку та відображення у звітності компаній.

Методи дослідження. У статті було проведено критичний аналіз наукових публікацій, присвячених сутності, статусу та особливостям використання цифрових активів, а також формуванню інформації про них у системі бухгалтерського обліку та фінансової звітності. За допомогою спеціального програмного забезпечення (VOSviewer та Google Trends) здійснено бібліометричний аналіз частоти використання термінології у сфері цифрових активів.

Результати. Розроблено авторський підхід до побудови таксономії цифрових активів на основі застосування технології розподіленого реєстру та криптографії. Також у роботі вивчено питання диференційованого застосування існуючих баз оцінки різних видів цифрових активів. Систематизовано підходи до деанонізації учасників транзакцій з криптоактивами, що застосовуються для контролю їх походження та правового режиму використання, з метою раціональної організації та ведення їх обліку.

Висновки. В результаті проведеного дослідження автори дійшли висновку про те, що назріла необхідність запровадження окремого стандарту, призначеного для регулювання ведення обліку та відображення цифрових активів у фінансовій звітності, з метою забезпечення стейкхолдерів релевантною інформацією у процесі прийняття управлінських та інвестиційних рішень.

Ключові слова: криптоактиви; криптовалюта; цифрові активи; некриптоактиви.

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**Цифровые активы в бухгалтерском учете:
формирование концепции и траектория дальнейшего развития
Аннотация**

Введение. Переход на цифровые технологии стимулировал появление новых объектов учета в форме цифровых активов, специфические характеристики которых проблематично отражать в достаточно жестко регламентированной системе стандартов бухгалтерского учета и отчетности. В условиях появления новых способов использования криптоактивов в деловой практике и увеличения объемов операций с ними, бухгалтерский учет сталкивается с проблемами отображения цифровых активов в части подтверждения их подконтрольности, оценки на разных этапах их жизненного цикла и идентификации участников операций с криптовалютой. В статье проанализировано влияние процесса цифровизации мировой экономики на методологию бухгалтерского учета в условиях четвертой промышленной революции и определены перспективы обособленного отражения цифровых активов в финансовой отчетности.

Целью статьи является системное обоснование исключительного статуса цифровых активов как принципиально нового объекта учета с разработкой на этой основе стратегии развития их учета и отражения в отчетности компаний.

Методы исследования. В статье был проведен критический анализ научных публикаций, посвященных сущности, статусу и особенностям использования цифровых активов, а также формированию информации о них в системе бухгалтерского учета и финансовой отчетности. С помощью специального программного обеспечения (VOSviewer и Google Trends) проведен библиометрический анализ частоты использования терминологии в сфере цифровых активов.

Результаты. Разработан авторский подход к построению таксономии цифровых активов на основе применения технологии распределенного реестра и криптографии. Также в работе изучены вопросы дифференцированного применения существующих баз оценки различных видов цифровых активов. Систематизированы подходы к деанонимизации участников транзакций с криптоактивами, которые применяются для контроля их происхождения и правового режима использования с целью рациональной организации и ведения их учета.

Выводы. В результате проведенного исследования авторы пришли к выводу, что назрела необходимость введения отдельного стандарта, предназначенного для регулирования ведения учета и отражения цифровых активов в финансовой отчетности, с целью обеспечения стейкхолдеров релевантной информацией в процессе принятия управленческих и инвестиционных решений.

Ключевые слова: криптоактивы; криптовалюта; цифровые активы; некриптоактивы.

1. Introduction

High demand for accounting is explained by its ability to qualitatively meet the information needs of various stakeholders and the permanent evolution of its system without cardinal changes in key elements due to the universal nature of its methodology.

The driving forces in the first two industrial revolutions were innovations that qualitatively transformed the tools of labour as a key factor in material production, while the concept and tools of accounting focused on the reflection of physical capital. With the beginning of the third industrial revolution, it was human capital that was considered the main factor of development - as a holder of knowledge and a generator of innovations. At that stage, for the first time, accounting faced a serious problem associated with the need to recognize, to display and to evaluate such components of intellectual capital that have not influenced yet the creation of added value by the company and ensuring its competitive advantages. The accounting methodology turned out to be unable to fully cover and reproduce with its traditional tools all the components of intellectual capital as a factor of production, which distorts its role in the results achieved by the company.

The transition to digital technologies and the use of computer equipment intensified the development and integration of cyber-physical systems into material production and meeting human needs. It also stimulated the emergence of unique technological phenomena, causing the emergence of new accounting objects operating under the conditions of digital economy. Having failed to solve the problem of recognizing and evaluating the intangibles of intellectual capital, accounting has taken on a challenge in the form of digital assets, whose nature and use are based on the achievements of the fourth industrial revolution. Some features of digital assets are problematic for being displayed in a rather tightly regulated system of accounting and reporting standards - a decentralized nature of issuance and circulation, anonymity of owners, as well as the assessment mechanism at various stages of the life cycle.

Insufficient flexibility and efficiency in solving the problems of accounting of digital assets cast doubt on the ability of accounting to meet the requirements for displaying objective economic reality in the conditions of the rotation of the importance of production factors and the revision of the system of socio-economic relations. Therefore, a comprehensive analysis of the essence and features of the use of digital assets to substantiate recommendations for their accounting will contribute to the actualization of the possibilities of displaying new objects and, on this basis, to increase the information content of the reporting as a source of data for decision-making.

This *study is aimed* at the systematic substantiation of the exclusive status of digital assets as a fundamentally new accounting object in order to further develop, on this basis, the strategy for the development of their accounting and displaying them in the companies' reporting.

2. Literature Review

The attitude of the humankind to digital assets is constantly changing. It leads to a revision of their status as an economic category and an accounting object. During the period of about thirty years, digital assets have trodden a path from being perceived as part of intangible assets (Goldfinger, 1997; Moore, 1998) to being recognized as unique (Toygar, Rohm, & Zhu, 2013; Kaal, 2020), which requires an individual approach to regulating their display in accounting and reporting (Sterley, 2019; Yatsyk, & Shvets, 2020).

The cornerstone for the correct recognition of digital assets and their valuation in the accounting system is their classification, which has to systematize the variety of existing digital assets and take into account the potential directions of their further emergence and use in the future. In this context, the scientific work of M. Henderson and M. Raskin is of interest. The researchers came to the conclusion that digital assets do not fit into the current regulatory framework and are related to the spheres of life for which the regulatory framework has not been developed yet (Henderson & Raskin, 2019).

Now, in the world, there is no common idea of the role and place of crypto assets as the most demanded part of digital assets, around which a comprehensive strategy for their development could be built (Huang, Yang, & Loo, 2020). Due to the lack of approved standards, professional judgment is actively used to solve applied problems of reflecting crypto assets in financial statements (Deloitte, 2018; EY, 2018). A specific feature of such works is the search in some types of crypto assets for common characteristics with such groups of traditional assets as cash, stocks, financial investments and intangible assets in order to subsequently apply the norms of the relevant accounting and reporting standards to them and then to display them in the corresponding

set of assets (Henderson & Raskin, 2019; Sixt & Himmer, 2019; Ankenbrand et al., 2020; Morozova et al., 2020, Ozeran, & Gura, 2020). However, Druszcz and Prochaska (2021) distinguish two separate types in crypto assets - cryptocurrencies and digital tokens. This split is based on the specific characteristics of these assets and the purpose of their use. In turn, Bernie et al. (2018) consider cryptocurrency to be a new asset class and form a classification of cryptocurrency tokens based on their functionality.

Due to the uncertainty around the final status of cryptocurrency, it remains the subject of numerous scientific publications. Treating cryptocurrency as a hybrid that combines characteristics of fiat currency and commodity, some researchers try not only to determine which of the above prevails in it at the current stage, but also to predict prospects for its further use, taking into account the identified properties and trends (Baur, Hong, & Lee, 2018; Schaub & Phares, 2020). A few years ago, Baur et al. (2018) found out, based on the results of the analysis of the statistical properties of bitcoin, that it was uncorrelated with traditional asset classes and concluded that it was used as a speculative investment, not as an alternative currency and a medium of exchange. However, now we are talking about the fact that a specific country is going to recognize bitcoin as a legal tender (BBC, 2021).

Due to the dynamic development and volatility of both the stock and the over-the-counter cryptocurrency markets, the solution to the problems of its valuation comes down to recognition of the status of: a) a financial asset whose fair value is determined by the costs of its creation (Hayes, 2016), the market exchange rate or the price of the initial offering (Procházka, 2018; García-Monleón, Danvila-del-Valle, & Lara, 2021); b) an intangible asset with an indefinite useful life (Foy, 2019). At the same time, it is believed that the existing theories of value are not able to systematically interpret the source of the value of cryptocurrency, and the rapid growth of the bitcoin rate has actualized their search in such areas as the value system of the bitcoin community and the sentiments prevailing in it (Pagnotta & Buraschi, 2018; Wingreen, 2020).

Despite the fact that now the regulators of financial systems do not recognize cryptocurrency as a fiat currency, Prochaska (2018) highlights the cases when cryptocurrency should be accounted as a foreign currency, while a cryptocurrency purchased for investment purposes should have a fair value. Foy (2019) believes that cryptocurrency should be recorded in accounting as an intangible asset with an indefinite useful life, but for tax purposes it should be treated as property. At the same time, the researchers widely use IFRS to substantiate the proposed accounting models for cryptocurrencies (Lapitkai & Leahovcenco, 2020; Subačienė & Kurauskienė, 2020; Durr, 2021). However, they emphasize the importance of developing an individual standard to display the characteristics of crypto assets in accounting.

The anonymity of participants in cryptocurrency transactions is abused in order to launder criminal proceeds, which poses additional risks in the areas of public security and finances, and the concept of its regulation needs to be reviewed (Albrecht et al., 2019; Teichmann & Falker, 2020). Although at this stage, cryptocurrencies are already considered rather pseudonymous than anonymous (Sun Yin et al., 2019), but it does not remove the problem of tracking transactions with them. And if a company starts using cryptocurrency in its activities, then, maintaining its anonymous/pseudonymous status, it will automatically evade taxes on income from such operations (Hazar, 2020). The regulation of accounting is centralized in nature and is characterized by high requirements for confirming the reliability of data displayed in the company's accounting system, which is discordant with the key characteristics of the cryptocurrency and prevents its adequate recognition in accounting.

Considering the above-mentioned, the purpose of the article is to substantiate the features of digital assets which would be sufficient for them to acquire a status of a new accounting object as a prerequisite for the further development of a separate standard, which will regulate their recognition, assessment and reflection in financial reporting.

3. Materials and Methods

To achieve this purpose in the Article through the use of such general scientific research methods as deduction, analogy and comparison, the author's approach was formed and a taxonomy of digital assets was developed. The systematization method was used to substantiate the differentiated application of the existing valuation techniques to various types of digital assets, as well as the tools for deanonymizing participants of transactions with crypto assets. The dynamics of the popularity of the use of the terminology applied to the objects in this study in the

computer network and in the scientific environment was analysed with a Google Analytics application and a VOSviewer program. The results obtained are displayed with a graphical method of data presentation.

4. Results

4.1. The Meaning of Digital Assets

The use of information technologies leads to the emergence of a number of assets operating in the digital environment and creates preconditions for assigning them into a separate group of accounting objects. In the scientific literature and official documents, different categories, which are synonymous by nature, are used to define them, namely, «virtual assets», «digital assets», «crypto assets». Thus, the Financial Action Task Force on Money Laundering (FATF) proposes to understand virtual assets as «... a digital representation of value that can be digitally traded and can be used for payment or investment purposes» (Financial Action Task Force on Money Laundering, 2021). At the same time, it does not include the digital representation of financial assets. Furthermore, this document widely uses the term «digital assets» as a synonym for «virtual assets».

However, in the report of the International Organization of Securities Commissions (IOSCO) the term «crypto-asset» is used. It refers to «... a type of a private asset that depends primarily on cryptography and distributed ledger technology or similar technology as part of its perceived or intrinsic value and may represent such an asset as currency, commodity or security, or be derived from a commodity or security» (International Organization of Securities Commissions, 2020). However, the comments indicate that there are opinions on replacing the term «crypto-assets» with «virtual assets». They also note that the national legislation of individual countries (the USA, Malaysia, Thailand) uses the term «digital assets».

The lack of a unified approach to the definition and classification of such assets hinders the formation of regulatory and methodological support for their display in accounting and reporting. Since their appearance and expansion is due to information technologies and the Internet, in order to determine the degree of popularity of each of the above-mentioned terms the search queries of Google users were analyzed for the 5-year period from February, 2017, when the first surge in the value of bitcoin was recorded, and it attracted the attention of Internet users, to February, 2022. A comparative analysis of the volume of search queries for the phrases «virtual asset*», «digital asset*», «crypto asset*» was carried out using Google Trends. It shows how often a certain category is searched in relation to the total volume of search queries. The results of the analysis are shown in Figure 1.

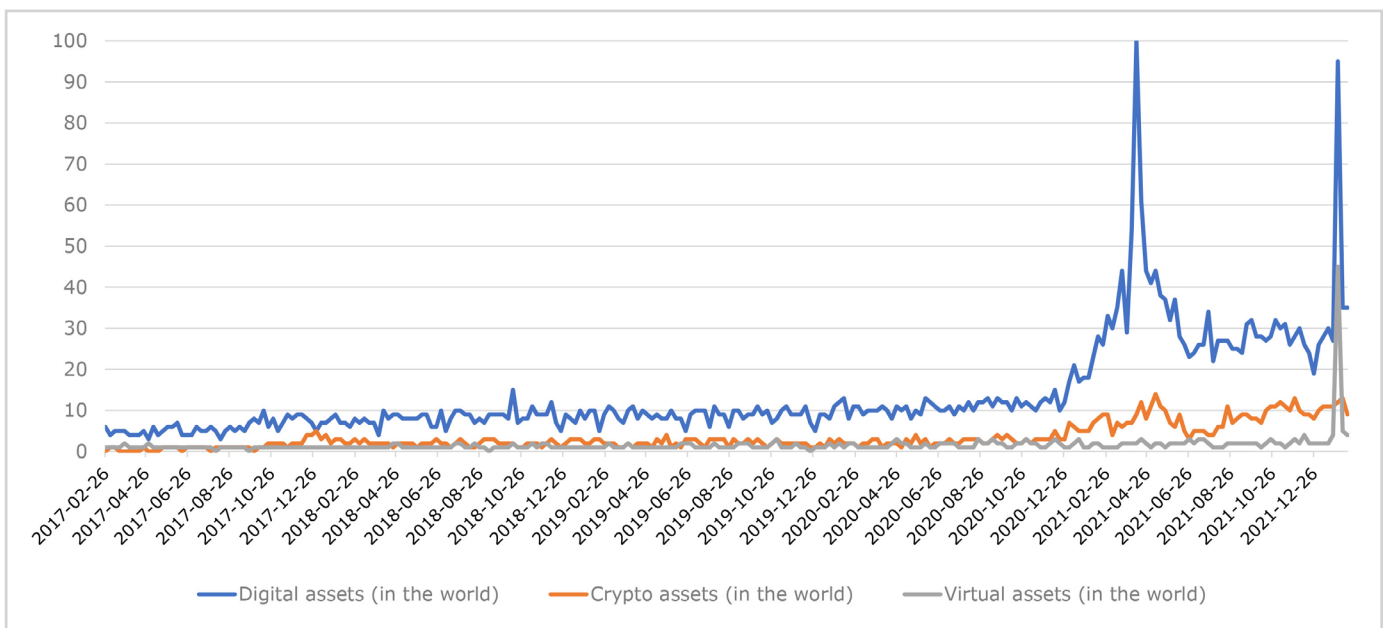


Figure 1:
The dynamics of the popularity of entries «digital assets», «crypto assets» and «virtual assets» in the Google search engine from February, 2017 to February, 2022

Source: Data of Google Trends

Data in Figure 1 shows that over the past five years, «digital assets» has been the most popular term in Google search queries, indicating a high level of its perception. It is also worth noting a stable gap in relative popularity between «digital assets» vs. «virtual assets» and «crypto assets» among Google users.

The term «digital assets» also prevails in scientific publications on economics and management. It was found out as the result of the analysis of the use of the above-mentioned terminology in 932 publications selected using search queries in the database of Web of Science Core Collection, for which two filters were used: the time period from 2008 to February, 2022 and the search by keywords in the publications using the word combinations «digital asset*», «crypto asset*», «virtual asset*» and an OR operator. To produce a graph on the results of the linguistic analysis of the texts of the selected articles, a shingle token filter of at least 5 mentions of these terms was set. The results of the bibliometric analysis carried out with VOSviewer and the chronological aspect considered are shown in Figure 2.

According to the bibliometric map shown in Figure 2, the terminology of studies conducted in this area indicates that most of them are associated with researching the essence of digital assets, crypto assets, distributed ledger technologies (in particular, blockchain) in the business information systems, cybersecurity problems and the introduction of technological innovations in the financial sector, legislative and regulatory support for the circulation of crypto assets and cryptocurrencies, etc. When interpreting the results obtained with VOSviewer, it should be noted that the size of the circle indicates the frequency of use of the corresponding term, while the colour shows the time of presentation of the publications. Since the program builds network connections based on the publications containing the most similar shingles of keywords and classifies them into the groups, then Figure 2 shows that in the sample from 2008 to February, 2022 the terms «digital asset*», «crypto asset*» and «virtual asset*» were more actively studied in the period from February, 2017 to February, 2022. Despite the fact that «digital assets» is the term used

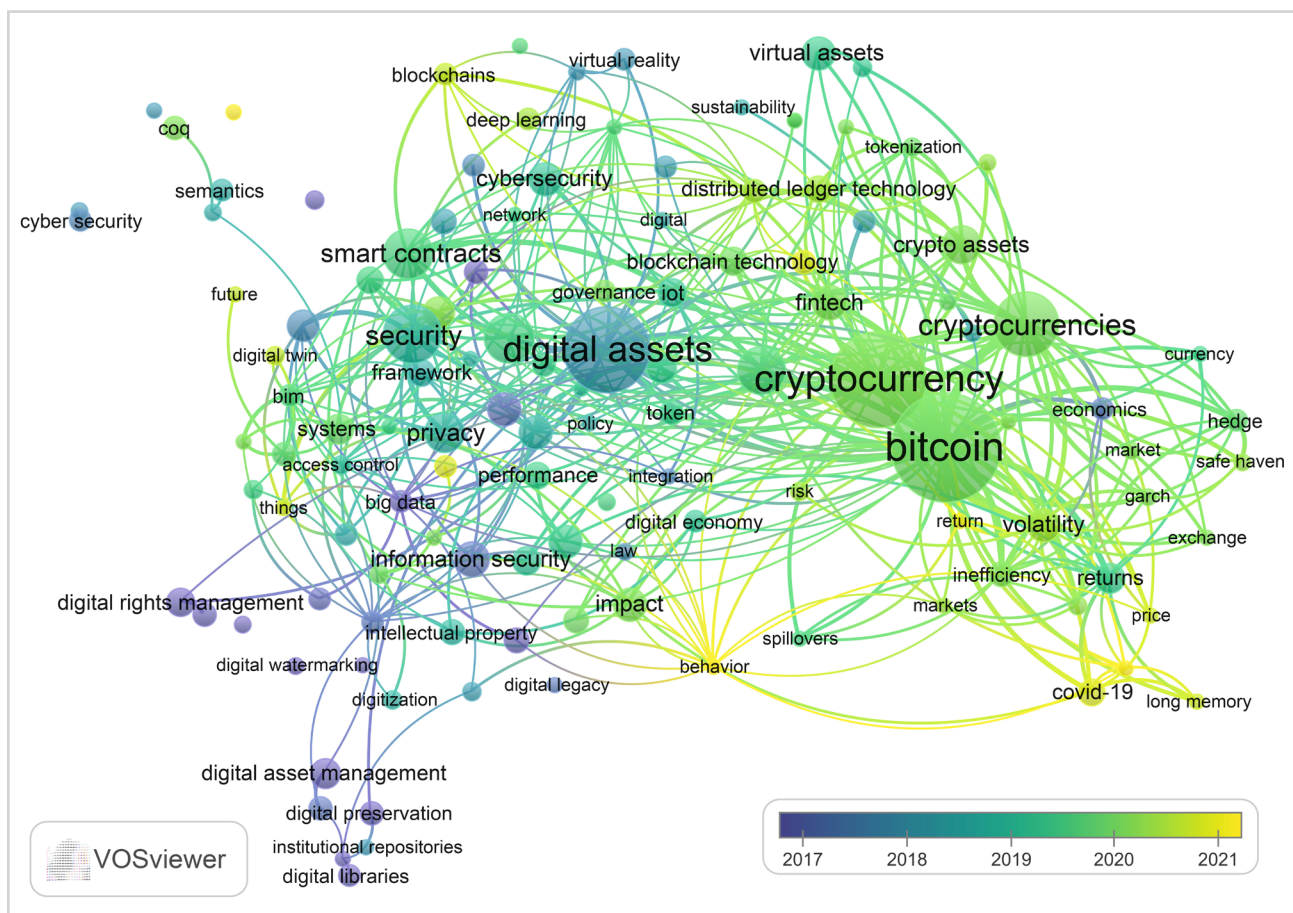


Figure 2:
**Bibliometric map on using the terms «digital assets», «virtual assets»
and «crypto assets» in scientific publications**
Source: Produced by the authors with VOSviewer

most often among the three studied, it is worth noting that the intensity of the use of «crypto assets» tends to increase. In general, this is in line with the results of the analysis of Google search queries shown in Figure 1.

Considering the things mentioned above, in our opinion, a special set of assets formed in the process of digitalization of the economy and manifested in computer networks in digital form using software and devices for automated data processing should be treated as digital assets. In addition to meeting the main criteria for recognizing assets, which include the possibility of a reliable assessment, the controllability of an object and the receipt of future economic benefits from their ownership and/or using them, digital assets are characterized by a permanent digitalized form.

4.2. Taxonomy of Digital Assets

Obtaining economic benefits from the ownership of digital assets is due to observance of the rights to their use, which, combined with the lack of a physical form, once became the reason for their classification as intangible assets. However, in the conditions of a regular emergence of new types of digital assets, areas of their application and methods of obtaining economic benefits and the benefits from owning them, some prerequisites have been established for separating digital assets into a set of assets by the form of functioning. In this regard, an important applied task of accounting is structuring of the classification (taxonomy) of digital assets as the basis for their recognition and assessment.

In our opinion, cryptography methods and distributed ledger technology used for the reliability of information protection when using such assets for commercial purposes, and the potential for their transfer to tangible media allow us to distinguish two sets of digital assets with fundamentally different essential features and characteristics - crypto assets and non-crypto assets.

The key role of cryptography and distributed ledger technology in defining crypto assets is noted in the reports of such international organizations as the International Securities Commission, the Financial Stability Board, the European Organization for Securities and Markets, and the European Banking Association. Due to the use of cryptographic methods, crypto assets are characterized by confidentiality, authentication, data integrity and encryption, while distributed ledger technology ensures the availability and transparency of data on transactions carried out with them. It gives them the characteristics necessary for unhindered commercial use.

Under non-crypto assets, it is proposed to understand a part of digital assets created without the use of cryptographic methods and which can be transferred to tangible media with their functional purpose retained. They can be significant and valuable for the company, but there are objective risks of their commercial use associated with the lack of a mechanism of protecting the rights to dispose of them.

Figure 3 shows the results of structuring the classification of digital assets on this basis for the rational organization of accounting for the financial and economic activities of the companies.

The essence of the sets of crypto assets and non-crypto assets identified within the proposed taxonomy of digital assets is presented in Table 1.

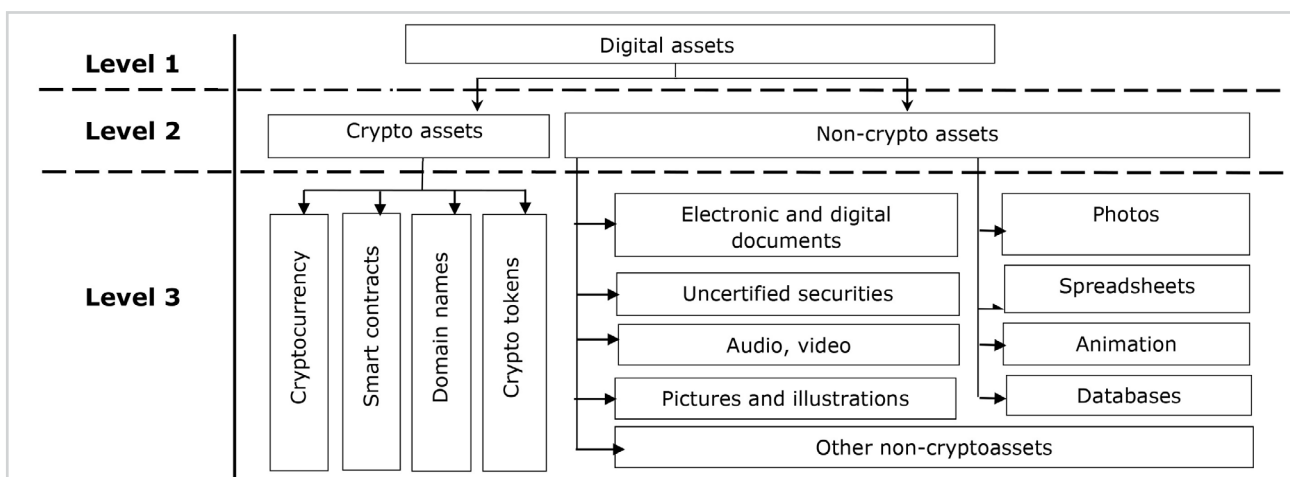


Figure 3:
Taxonomy of digital assets
Source: Created by the authors

Table 1:
The meaning of the individual constituents of crypto assets and non-crypto assets

Name	Meaning
Crypto assets	
Cryptocurrency	the owned asset of the blockchain network, which can be traded, used as a medium of exchange and accumulation. It is based on cryptography and distributed ledger methods, served by a decentralized automatic payment system, which provides anonymity of the counterparties
Smart contract	a type of a deal which is made independently between two counterparties in relation to transactions that are presented on the Internet with a computer algorithm based on blockchain technology. The execution of terms and conditions of the contract and irreversibility of the actions of the counterparties are controlled by an automatically generated code, which allows avoiding control by a third party
Domain name	a symbolic name that is used to define a realm of administrative autonomy, authority or control within the Internet.
Crypto token	an accounting unit designed to represent a digital balance of any asset. Crypto tokens are used to protect confidential data and, from the point of view of technology, represent their non-confidential equivalent, which has no independent meaning for external or internal use. Types of crypto tokens: investment tokens act as digital securities; platform tokens are designed to be used for the blockchain infrastructure to deliver decentralized programs for various purposes (servicing platforms for games, digital collections, global advertising and marketplaces); utility tokens are integrated into the distributed network protocol to access the services that are provided in it; payment tokens work as accounting units and are exchanged for goods and services, however, unlike cryptocurrency, transactions with them can be carried out on a centralized basis; mixed tokens combine the features of at least two tokens of different types, for example, investment and utility tokens; non-replaceable tokens – unique tokens that represent such assets as pieces of art, collectibles, real estate that are truly unique
Non-crypto assets	
Electronic and digital documents	information that is created, generated, sent, transmitted, received or stored with electronic means. At the same time, digital documents are readable paperless documents that look the same both on the electronic device and in a printed form, while electronic documents represent the data which after been sent or received become available for automatic transferring from one computer system to another without human intervention
Uncertified securities	an account in the electronic register of depository accounting of securities that confirms the ownership of the security
Audio and video content	electronic products containing both audio and visual components, for example, slide presentations, films, TV programs, webcasts, video conferencing and live broadcast services
Pictures and illustrations	static images created electronically with graphic editors to interpret or visually explain a text, a concept or a process. Designed for integration into such digital products as banners, magazines, books, educational materials, video games, or films
Photos	static images created electronically by recording light with an image sensor for artistic and recreational use, filmmaking and video production, hobbies, and mass communication
Animation	dynamic (animated) images created in electronic form using computer graphics and software. Used in video games, filmmaking, television industry, user interfaces for visual effect
Spreadsheets	computerized analogues of paper accounting tables for systematization, analysis and storage of data in tabular form
Databases	an ordered set of tabular-structured information or data which is stored and used electronically in a computer system. Unlike spreadsheets, most databases are relational, i.e., data between tables is cross-referenced.
Other non-crypto assets	digital products and services that do not belong to any of the above groups of non-crypto assets (electronic wallets, social media accounts, virtual environments, bonus points on electronic platforms, etc.)

Source: Created by the authors

Tokenization is becoming an important direction in the development of the use of digital assets. Due to it, virtual analogues of tangible and financial assets are created, which represent traditional assets in the digital environment and are secured directly by their value. In addition, in order to reduce the volatility of the cryptocurrency rate and the risks of losing funds, they are pegged to fiat currencies or tangible goods (gold, oil), whose exchange rates are subject to smaller fluctuations than the rates of typical cryptocurrencies. Therefore, there are all grounds to talk about the formation of a specific set of secured digital assets, including crypto tokens. The most popular among them are investment tokens and stablecoins - cryptocurrencies whose value is secured by fiat money, commodities, other cryptocurrencies or a cryptocurrency portfolio. Pegging to traditional currencies or tangible assets is contrary to the decentralized nature of cryptocurrencies in principle, so classic cryptocurrencies are unsecured digital assets.

4.3. Valuation of Digital Assets

The need to develop approaches to the monetary valuation of digital assets is a logical continuation of their separation into an independent group of accounting objects. Within its practical implementation in compliance with the Conceptual Framework for Financial Reporting, three groups of asset and liability valuation models can be used: based on historical value, current value and mixed models (International Accounting Standards Board, 2018). If the first group of models focuses only on the costs incurred at the moment of gaining control over the asset, then fair value, as the most common of all models of current value, focuses on the benefits that can be obtained from the sale of an asset or its exchange in the market. So, the result of applying this model embodies not the expectations of the enterprise for the use of the asset and obtaining future benefits

from it, but the expectations of market participants, while the historical cost is a unique indicator for each specific enterprise. Thus, the key difference between the application of historical and fair value is determined by the company's existing plans for assets in the future. Mixed models are based on the principle of prudence and are aimed at a further evaluation of the object at the lowest possible price (production cost, purchase price or fair value), and therefore its value will never be higher than its original/initial value.

Since the results of valuation of assets for each of the models can vary greatly, then when choosing a valuation method for a specific set of digital assets, an accountant should consider not only their specific characteristics determining the possibility of applying a particular method, but also the impact of consequences of this choice on financial reporting indicators. This primarily applies to secured digital assets due to their relation to traditional assets, and obtaining information about the change in their value does not require any specific skills or efforts from the accountant. Unlike the constituents of physical capital, digital assets cannot lose their value as a result of wear and tear in the process of their use. In this regard, doubts arise about the expediency of applying the basic accounting model of long-term assets to them. This model assumes a gradual transfer of their value to the newly created product via amortization, except for cases when, like intangible assets, a specific period of their use can be set. If there is a need to reflect digital assets with an indefinite useful life as part of long-term assets, then for it one can use the approach practiced to account such a capital asset as land.

The key to stable functioning and development of cryptocurrency platforms is the desire of users to create new structural units (blocks) in the blockchain. Users' reward consists of new cryptocurrency units issued as a result of mining, forging (minting) and ICO (Initial Coin Offering), and commissions for maintaining the network. In addition to the various possibilities of using cryptocurrencies, the reflection in the accounting of transactions with crypto assets requires the development of a specific mechanism for applying fair value valuation for the cryptocurrency acquired by the company as a result of various processes of financial and economic activities (generation with its own computing capacity; receiving it in exchange for products, goods or financial tools; buying for fiat money; receiving in the form of commission fees for confirming transactions on the network), as well as approaches to its revaluation.

The technological features of organizing and conducting operations in the decentralized systems like «bitcoin» cause the emergence of specific transaction costs. The order of their reflection in the accounting system should be differentiated taking into account the current intentions of the enterprise in relation to the basic crypto asset and the relative assessment of the rationality of the reasons for the appearance and the validity of the amount of such costs. So, to validate each transaction with a cryptocurrency within the distributed ledger technology, it is assumed to be confirmed by miners who receive a commission fee for that. The size of the commission fee is determined by the program automatically, but users can change its size on their own. At the same time, miners are not obliged to confirm user transactions, and they can also refuse to confirm, despite the fact that they have initially agreed to do that, due to the appearance of more attractive operations.

As a result of the increased number of users and transactions with cryptocurrency, the load on the networks has increased, while the processing time for transfers has slowed down. To speed up the receipt of confirmation of transactions, users increase the size of the commission fee due to which the order of processing of their transactions by miners can increase. However, if an unpredictable surge in the activity of market participants of this cryptocurrency occurs at this moment, the increased commission fee will not achieve its goal, the user's transaction will remain unconfirmed, and the cryptocurrency will be temporarily blocked. As a result, the question may arise about the justification of such additional costs for operations with digital assets from the standpoint of the effectiveness of their management or their taxation.

Non-crypto assets become one more item of the objective inability of the accounting to reflect the elements of intellectual capital of the company and emphasize the absence of positive changes in solving the problem of determining its components and the mechanism for their valuation. The intrinsic value inherent in such components of structural capital actively brings economic benefits to the company by attracting the attention of potential customers and enhancing their interest in the digital environment with the extraordinary audio, video and visual effects of various electronic products, as well as using the content of databases and electronic spreadsheets. However, the measurement of such a value and the procedure of its accounting when determining

the financial result within the framework of the application of traditional accounting valuation models has not been fully implemented yet.

4.4. Deanonymization of Participants in Cryptocurrency Transactions

The increased use of digital technologies by the companies to improve competitiveness, productivity and efficiency lies not only in introducing conceptually new products, but also in adapting traditional tools for using them in the digital environment. Thus, the era of anonymous transactions, which began thanks to blockchain technology and its application for the transfer of cryptocurrency, marks a practical embodiment of the desire for privacy in the possession and movement of funds, which was secured only by cash. Unlike cash, the exclusive right of the nations to centrally issue it is protected by law enforcement agencies, cryptocurrency is issued by users in a decentralized manner with their own computing power, and its volume is usually limited algorithmically.

The downside of the lack of information about the owners of the cryptocurrency is the impossibility of proving and/or restoring the right of ownership of the cryptocurrency in case of loss and/or unauthorized acquisition of the private key. It casts doubts on controllability of the cryptocurrency, which is a key requirement for recognizing it as an asset in accounting, since the identification of the owner and the confirmation of their control over assets functioning in the digital environment only become impracticable.

Identification of owners of cryptocurrency assets is a key condition for the full-scale introduction of taxation of income received from transactions with them. Since the information about all transactions with cryptocurrencies is stored decentralized on the blockchain, it is possible to track them. This system cannot be considered completely anonymous, but in its current form it requires the tax authorities to analyse the entire chain of transactions to verify payers and to determine the tax base for income received from cryptocurrency transactions. In order to conceal the origin of money and the movement of cryptocurrency, anonymizers are used. They mix input transactions at the same address making it unclear at the output where specific coins came from. At the same time, thanks to the use of cryptocurrency to launder proceeds from crime, the anonymity of participants dealing with its transactions has ceased to be a purely accounting problem.

Now, there are some alternative methods used by law enforcement agencies in order to establish the identity of participants in cryptocurrency transactions. However, each of these approaches has disadvantages that limit their application in certain circumstances. Therefore, the issues of identifying persons who took part in the operations with cryptocurrency are generally resolved situationally, which does not contribute to the formation of a holistic approach to solving this problem.

Li et al. (2021) believe that the entire set of methods proposed for monitoring the metrics of cryptocurrency transactions can be assigned to three groups. The most effective of them in terms of conducting criminal investigations of violations can be considered the methods based on the analysis of transactions (Greenberg, 2021). They are based on statistical methods for collecting and researching information about the entire chain of transactions to identify cases of reuse of the same account or the simultaneous use of several accounts in one transaction and comparison with the transactions made from other accounts, which allows to identify real persons using them. At the same time, the use of transaction analysis methods brings the expected effect only in case of a significant statistical set of observations. Therefore, if a certain account is not used actively enough, the probability of identifying its owner with these methods is very low.

The methods based on the implementation of central structures to regulate the circulation of cryptocurrency systems are the adaptation of the existing rules for the organization and functioning of banking systems to the technological features of the virtual environment. The protocol for building such a system should ensure confidentiality of a player and a recipient under the conditions of assigning the functions of controlling the accounts and conducting transactions by several intermediary banks that will keep the registers. However, there are concerns that the introduction of such methods for identifying participants in cryptocurrency transactions may negatively affect the further development of the cryptocurrency market, since it will deprive them of their exceptional uniqueness - decentralized functioning.

The third smallest group consists of the methods based on the use of cryptographic tools to track coins and ensure user accountability. At the same time, their developers state that such methods do not violate the privacy policy of participants involved in cryptocurrency transactions

until a duly issued request is received from the authorized agencies to carry out selective tracking of users and coins which are suspected in illegal transactions (Garman, Green, & Miers, 2016).

5. Conclusions

The increased use of the existing methods and the development of new methods of deanonimization of participants involved in cryptocurrency transactions will ensure the identification level which is sufficient to confirm the controllability of the relevant assets in the process of recognizing and displaying them in the accounting system. In the context of emerging new ways of using crypto assets in business practice and increasing the volume of transactions with them, the simplification of the identification of participants engaged in cryptocurrency transactions will create real preconditions for building an adequate system of taxation of income from operations with cryptocurrencies.

Since under the conditions of the fourth industrial revolution information technologies are developing rapidly and the life cycle of digital assets tends to decrease, there is every reason to expect that the proposed taxonomy will be supplemented at least by their new types very soon. In case of the invention of an alternative to cryptography and distributed ledger technology and its practical implementation during the operations with digital assets, the approach to structuring their classifications will have to be revised.

Further digitalization of all spheres of human life will stimulate the emergence of new types of digital assets and the expansion of their application areas. Therefore, the issue of developing a separate standard with the norms regulating how digital assets are accounted and reflected in financial reporting is a key one in systematizing and solving the current problems of their recognition and valuation. It will contribute to a more complete and adequate reflection of the impact of digital assets on the peculiarities of functioning and performance of an enterprise in the context of transformation processes taking place in the global economy.

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