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APPLYING BLOCKCHAIN TECHNOLOGY IN ECONOMIC ACTIVITIES

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Abstract. The article examines the use of blockchain distributed ledger technology in various sectors of the economy. It was found that since 2008, blockchain has developed as a tool for cryptocurrency transactions and was later adopted by major transport companies for cargo transportation management, proving its efficiency.

The study is based on general scientific methods of cognition, including the dialectical method for understanding phenomena and the comparative legal method for analyzing approaches to the legal nature of distributed ledger technology. Using a systemic-structural approach, the author examined the benefits and risks of digitalization and blockchain application, leading to the article's conclusions.

Blockchain is applied in IT, energy, finance, agriculture, logistics, and other sectors, improving efficiency and transparency in business processes. However, Ukraine lacks legislative regulation of this technology. If implemented, blockchain could become a tool for promoting transparent business practices, reducing risks, and minimizing interference from government authorities.

Key words: Blockchain, distributed ledger technology, digitalization, digital transformation of the economy, globalization, Ukrainian economy, economic activity.

Introduction. Most analysts today say that the use of blockchain technology will only grow in the near future. However, an effective legal regulation mechanism has not yet been established at both the national and international levels. In Ukraine, 6 years ago, the Concept for the Development of the Digital Economy and Society in Ukraine for 2018-2020 was approved (CMU Resolution, 2018). This concept sets out a vector for the development of Ukraine's digital economy by creating market incentives, motivations, demand, and shaping the needs for the use of digital technologies, products, and services among Ukrainian industry, business, and society.

The issues of digitalization of the economy and the use of blockchain technology and legal regulation have been studied by the following scholars: A. Varnavskyi, O. Vynnyk, A. Zhorniak, O. Kud, M. Kucheriavenko, V. Pashkov, O. Soloviov, E. Smychok, O. Shapovalova, and others. Foreign

scientists B. Carson, D. Romanelli, P. Walsh, A. Economists: Popivniak Y.M., Shyshkova N.L., Kulyk V.A., Kryvoruchko G.V., Semenov K.L. However, there is a need for a comprehensive study of the legal regulation of distributed ledger technology in the context of the prospects for state regulation of domestic and foreign economic activity by reducing the interference of state bodies in the introduction of economic activity by private business entities. Legislative regulation of the use of this technology will reduce the risks of doing business, create comfortable conditions for doing business and improve the attractiveness of the investment climate in the country.

The purpose of this article is to define the main approaches to the content of the "blockchain" category and the procedure for its application in various types of economic activities.

Materials and research methods. The methodological basis of the study is formed by general scientific methods of cognition: the dialectical method of cognition of the phenomena of the surrounding reality and the comparative legal method for comparing the main approaches to determining the legal nature of distributed ledger technology. In accordance with the systemic-structural approach, the author managed to investigate the benefits and risks of digitalization and blockchain application, and to formulate the conclusions of this article.

Results and discussion. Some scholars note that, despite martial law, the processes of digital transformation and development of the digital economy in Ukraine continue. Work is underway to institutionalize these processes and create favorable conditions for the introduction of managerial innovations. An important role in this is played by Ukraine's participation in the Digital Europe program, which aims to accelerate economic recovery and digital transformation of the participating countries. Studies have shown that in the context of the digitalization of the economy, businesses must invest significant resources in the creation and development of digital platforms (Bashlai, S., Yaremko, I., 2023). In this regard, the issue of creating an effective legislative mechanism to regulate investments in the digitalization of the economy with the use of innovative technologies is becoming relevant. When using blockchain technology in business, businesses face issues of protecting confidential information and corporate secrets, as public access to data may negatively affect relations with partners and competition in the industry.

Blockchain, as a distributed open-source database using modern cryptography, facilitates transaction tracking and cooperation. According to Don Tapscott, co-author of the book "The Blockchain Revolution," this technology is able to protect privacy and become a platform for trust (How blockchains can change the world, 2016). Despite the active use of blockchain over the past 8 years, the issue of privacy remains a key challenge that restrains business entities from fully implementing the technology of distributed ledgers both in cooperation with partners and with state control bodies.

Today, blockchain is becoming an important component of the fourth industrial revolution, which is based on the development of Internet communication technologies and significantly changes business processes, forming the digital economy (Digital economy: trends, risks and social determinants, 2020:11). First introduced in 2008, this technology has experienced both ups and downs within the framework of bitcoin's existence, but over time it has been actively tested in various sectors of the economy. The legal aspects of blockchain application are also considered. Leading international companies are developing pilot projects to integrate this technology into their operations.

The rapid changes taking place in the world require the introduction of innovative technologies that would promote transparency and reduce administrative pressure on business. Blockchain allows all participants in the supply chain to track the quality of goods and services, which emphasizes the need for a comprehensive study of the use of this technology in internal and external business activities, as well as in government control.

However, there is a need for a comprehensive study of the legal regulation of distributed ledger technology in the context of the prospects for state regulation of domestic and foreign economic activity by reducing the interference of state authorities in the introduction of economic activity by

private business entities. Legislative regulation of the use of this technology will reduce the risks of doing business, create comfortable conditions for doing business and improve the attractiveness of the investment climate in the country.

Today, it is impossible to imagine that any services of public authorities, both for the private sector and the public sector, will be provided (registered) in paper books (paper registers). Thus, in recent years, virtually all states, regardless of their level of economic or social development, have been moving to the use of electronic databases. It is the use of electronic databases that has great advantages over paper books, but at the same time, it is not without drawbacks that need to be considered when maintaining them.

This is confirmed by scientists who have studied the relations arising from the use of the public registry system, who noted that the unity of the methodology for creating, maintaining, administering, registering and interacting with the registries of the countries that have joined the Global Registry requires a more detailed mechanism for legal regulation of control over public registries by each country. In fact, the recognition of countries as civilized actors in the global information space is possible only if there is institutionally justified and effective control over relations in the system of public registries. In particular, we are talking about the functions of control over the implementation of uniform requirements for the creation, exchange, storage, correction and implementation of the format of information of the relevant basic registers of each country that joins the Global Register of Beneficial Owners (Vinnyk, Shapovalova, 2023:145). Without denying these arguments of scientists, at the same time, it should be emphasized that it is the internal control over the maintenance of public registers in which the entry, use, change of existing information is carried out by private entities (i.e., the responsibility for the accuracy of the information entered is assigned to the latter) that may be a factor in the failure to fulfill obligations to the state.

This is especially important when several business entities (private law) are involved in this process, and government agencies will act as controlling authorities (acting as an active observer with the ability to intervene in the event of a situation where there is no confirmation of any actions or data that would indicate a violation of the law). And here there is a need to turn to the blockchain distributed ledger technology, which received a significant impetus in the regulation of actions related to cryptocurrencies, but then, given the convenience (trust and transparency in the process of performing actions), gradually began to be used in other sectors of the economy.

Recently, the key function of blockchain technology has been expanding, allowing its implementation in many areas: healthcare, transportation and logistics, insurance, public finance and public administration, cryptocurrencies and payment systems (including international ones), financial and banking financial and banking, identification of individuals and assets, legal services, crowdfunding, e-commerce, software sales, travel management, gambling and casinos, charity and donations, education, energy, capital markets, retail, technology, construction, media and telecommunications, as well as taxes, accounting and auditing. At the same time, the feasibility of using blockchain for each type of activity also depends on the technological maturity of the enterprise, existing standards and government regulation, and the characteristics of the ecosystem (Carson, 2018:9).

The need to use blockchain distributed ledger technology by business entities in their activities requires both a subjective approach and objective preparation of society and public authorities in the field of control over business activities. This will lead to the use of this technology as an incentive legal regime for business. The subjective approach will consist of: training of entities that will use this technology; training of personnel who will use this technology in conducting business activities; purchase of special equipment and connection to the technology. The objective one includes the creation of a legislative framework that should encourage business entities to work with the use of blockchain distributed ledger technology. The use of this technology creates opportunities for more transparent business activities, which allows all interested parties (private and public law) to legally monitor the

conduct of business activities, but at the same time prevents unlawful interference in business activities by both society and government agencies.

The advantages of cryptocurrencies and blockchain technology, such as decentralization, no costs and speed in making payments, reliable security, and transparency of payments (the history of any payment can be traced back to the moment of generation) could have a positive impact on the development of the electricity sector. This would help simplify the existing multi-level settlement system that exists between electricity producers, distribution network operators, metering operators, payment banking providers, traders, and consumers themselves. All transactions for the receipt and payment of energy will be carried out directly in a network that brings together equal participants – energy producers and consumers. This may reduce the cost of electricity (Ustymenko, Polishchuk, 2019:65).

Another popular use case, which occupies a significant part of the blockchain technology market, is the area of data storage, reproduction and provenance research related to the necessary business processes of organizations specializing in B2B software, in particular, IT business and computer services. Such technologies allow verifying the origin and authenticity of product components in the value chain management system, in other words, it acts as a family tree of the product. In this area, blockchain technology becomes a key to compliance with regulatory requirements and prevents counterfeiting of end product components (Balaziuk, Pyliavets, 2022:5).

The research of scientists in the field of blockchain technology application in the pharmaceutical industry makes it possible to conclude that this technology will allow: 1) improve clinical trials of medicines; 2) improve the procedure for licensing pharmaceutical products; 3) track the amount of pharmaceutical products from the manufacturer with its subsequent sale; 4) track the sources of origin of pharmaceutical products and the procedure for their use; 5) monitor the registration period, shelf life, transportation and storage conditions of pharmaceutical products; 6) restrict the activities of Internet pharmacies that do not have permission; 7) minimize possible shortages of pharmaceutical products; 8) ensure openness to the public. The system provides for simplification of audit and control of pharmaceutical products, including by specially authorized bodies (Pashkov, Soloviov, 2019:5).

The need for the use of blockchain technology in the pharmaceutical industry is confirmed by the Order of the Ministry of Health № 677, where, according to subparagraph 3 of paragraph 2 of the section "On Approval of the Procedure for Quality Control of Medicines in Wholesale and Retail Trade": "The authorized person has responsibilities for the quality of medicinal products in electronic and paper form with the possibility of forming registers of movement of medicinal products at the request of the central executive body that implements the state policy in the field of control (Order of the Ministry of Health of Ukraine, 2014). Thus, the needs of the present time, the prevention of low-quality medicines from entering the retail trade through the use of electronic registers, are fixed at the regulatory level.

An analysis of the prospects for the use of blockchain technology reveals that the objects of legal relations in this technology are: 1) computer software; 2) telecommunication networks; 3) information resources, productive services; 4) patients' rights to health; 5) information security (Pashkov, Soloviov, 2019:5).

Exploring the prospects for the use of blockchain technology in agriculture, scientists note that blockchain technology allows to optimize and simplify the process of moving products from the place of production to the place of consumption, to track the cultivation, harvesting, processing of the product and payments for it in real time. It has obvious benefits for all participants in the food supply chain. Having passed the necessary testing in various sectors of the economy, this technology is quite capable of becoming commonplace not only for Ukrainian agricultural holdings, but also for small farms producing specific or organic products. At the moment, information about blockchain should be disseminated among our producers to demonstrate its practical use, on the basis of which a final deci-

sion on its economic feasibility will be made. Under favorable conditions, blockchain can become a powerful factor in the accelerated development of Ukrainian agriculture (Hrybyniuk, Dukhnytskyi, Sheremet, 2018:79).

Some scholars studying blockchain technology point to its development in the food industry and the financial sector, namely payment systems based on the use of cryptocurrencies as a specific payment instrument. The authors emphasize that the main feature of blockchain technology is its high innovative potential, which is not limited to the financial sector, but is able to optimize and ensure a high level of security in key areas of enterprise activity, regardless of the scope of their operation (Lapko, Solosich, 2019:81).

When studying the application of blockchain in space activities, scientists note that blockchain technology, integrating into economic sectors, qualitatively transforms them, and the new relations that develop on this basis require a new comprehensive legal regulation that should cover the following legal institutions:

– Property: depending on the legislator's approach, the category of digital rights can be defined either as a property right to a digital asset, i.e., the right to own information (an entry in a register) about a civil right;

– contractual law regarding compliance with the conditions under which a smart contract is recognized as concluded and valid;

– electronic digital signature, including cryptographic keys;

– protection of the rights of consumers who enter into smart contracts and must have a good understanding of the nature of their obligations;

– protection of personal data, which in the blockchain network can be open to everyone and are not deleted during the life of the network;

– Securities and financial regulation, in particular in accordance with the rules on the prevention of money laundering;

– taxation and administration (licensing, granting permits for activities related to the use of blockchain technology, including cloud services) (Hurova, Kirpachova, 2021:272).

Blockchain technology can protect state registers from unlawful interference, thereby increasing their transparency and reducing the level of corruption in the agencies to which they belong. In summary, blockchain is a promising technology for many areas of business, including law, the financial sector, insurance, banking, real estate and many others due to certain advantages of the “block chain”, namely, public accessibility, distribution and full reliability of the database. The increasing use of blockchain and virtual assets necessitates the creation of a legal framework to regulate relations in the field of using systems based on this technology.

When studying the impact on existing legal relations when using blockchain technology, scholars note that there are few legislative acts that are directly intended to regulate blockchain technologies, while existing regulations are not aimed at legal or technical-legal regulation, but mainly at technological regulation. In fact, the rules of various branches of law, including information law, can be applied to blockchain. However, the rapid development of social relations significantly outpaces the state of legal regulation by analog law, and this creates a significant imbalance. The problem of the lack of legal regulation of blockchain at the level of laws leads to the creation of highly specialized regulatory systems and their generation of local bylaws, such as draft regulations for comment, recommendations, industry standards and norms, orders and instructions of individual enterprises and institutions, etc (Kostenko, Radutnyi, 2022:502).

Other scholars note that the legislative framework in Ukraine regarding the regulation of modern financial technologies has positive dynamics, although there is still no comprehensive legislative regulation of fintech, blockchain, and related technologies. Currently, the legislative system of Ukraine is facing an urgent problem – building an enabling infrastructure to stimulate the development of the

system in order to ensure the availability of financial technologies for users (Popova, Hordiienko, 2023:150).

Studying the legislative regulation of blockchain technology, A. Zhorniak noted that there is no single standard of legislative regulation for this technology in the world and models of legal regulation are being developed, which are gradually being introduced into various spheres of public life. Ukraine's state policy on legal regulation of blockchain technology is quite dynamic and is undergoing a stage of development.

The development and implementation of effective legislative regulation of blockchain technology requires balanced decisions and participation of all parties, including government agencies, business representatives and the public, considering transparency, clarity, as well as practical and ethical aspects of blockchain technology in various industries. Moreover, an important aspect for the development of a unified regulatory methodology is the effective joint international cooperation of all participants (Zhorniak, 2024:73, 84). The Law of Ukraine "On Virtual Assets" (adopted but not yet enacted) should become the basic legislative act that will regulate legal relations in this area at the level of law, as expected by both scholars and practicing lawyers.

By studying the use of blockchain technology in the activities of global enterprises through clustering, researchers have shown that the introduction of blockchain technology is only becoming widespread among foreign companies. Businesses are beginning to evaluate the value of storing their own information and ensuring transparency in building a customer-centric approach with the help of high-level databases such as blockchain technology. Those companies that started implementing the technology in the early stages of its development have the opportunity not only to use the existing algorithm but also to modify it, creating a new, more advanced product that can compete in the market. Using clustering, it was proven that companies that have implemented blockchain technology demonstrate a high level of profitability and can be more stable in the market under existing or potential crises. Thus, Ukrainian enterprises should adopt the experience of foreign companies and develop in this direction, which will significantly improve the quality of company operations and eliminate major risks of information loss, particularly in the area of security (Koibichuk, Rozhkova, 2021:122).

Globally, blockchain technologies are actively being introduced to monitor the movement of goods, including at the international level with the involvement of customs control authorities. For example, between 2018 and 2022, IT giant IBM and the leading container shipping company Maersk used the blockchain-based TradeLens platform for freight transportation. According to its creators, the new blockchain-based delivery solution is designed to promote more efficient and reliable global trade by bringing together various stakeholders to support information exchange and transparency while fostering innovation across the entire industry. TradeLens uses IBM Blockchain technology as the foundation for digital supply chains, enabling multiple trade partners to collaborate and create a unified view of transactions without compromising confidentiality. According to the developers, the TradeLens blockchain platform can accelerate freight transportation by 40%.

At the same time, Maersk's competitor, OOCL – a major integrated international company specializing in container shipping, logistics, and terminal operations with offices in 70 countries – began work on the eBL Blockchain service (China COSCO Shipping Corporation Limited).

On the OOCL website, in the e-Services section, it is stated that the eBL Blockchain service was developed by the digital solutions provider IQAX Limited and is built on the blockchain technology platform Global Shipping Business Network (GSBN). This service not only provides the issuance of online bills of lading but also enables various logistics stakeholders, such as shippers, cargo owners, freight forwarders, and banks, to manage eBLs, transfer ownership, complete delivery acceptance, update statuses, and review transaction histories (OOCL). As of now, the GSBN service continues to operate.

In 2018, the legendary World Economic Forum took place in Davos, Switzerland. Ukraine was represented at the forum by two major topics: agriculture and blockchain technology. One of the participants, leading blockchain expert and author of the bestseller *Blockchain Revolution*, Don Tapscott (Canada), presented a map featuring 14 countries leading in the adoption of this breakthrough technology (Ukraine has become one of the leaders in blockchain innovation, 2018).

Independent sources highlight a relatively high level of crypto-activity and crypto-literacy among Ukrainians. According to the Chainalysis platform rankings, Ukraine ranked 4th globally in cryptocurrency adoption in 2021 (The 2021 Geography of Cryptocurrency Report, 2024).

Considering this, the regulation of blockchain technology usage in Ukraine is a pressing issue. At the time of writing, Ukraine does not have specific legislation in place to regulate blockchain technologies or the use of virtual assets (cryptocurrencies). However, the Verkhovna Rada has adopted the *Law of Ukraine "On Virtual Assets"*. This law governs legal relations connected to the circulation of virtual assets in Ukraine, defines the rights and obligations of market participants, and outlines the principles of state policy in the virtual asset sector. Although signed by the President on February 17, 2022, the law has not yet come into effect. It will become active once the *Law of Ukraine on Amendments to the Tax Code Regarding the Taxation of Transactions Involving Virtual Assets* is adopted, which is still under consideration by the Verkhovna Rada.

At the same time, the legislative definition of blockchain was included in the draft *Law of Ukraine "On the Circulation of Cryptocurrency in Ukraine"*. Article 1, Section 1, Clause 1 of this draft defined blockchain as a decentralized public ledger of all cryptocurrency transactions conducted by cryptocurrency operation entities. However, this draft law was withdrawn on August 29, 2019 (Draft Law on Cryptocurrency Circulation in Ukraine, 2017).

Researchers studying centralized and decentralized data storage have noted that traditional infrastructure relies on centralized databases that connect all supply chain partners. However, centralized systems are vulnerable to manipulation, which undermines data reliability. By using blockchain technology, organizations can create a decentralized platform for recording transactions that is resistant to manipulation. This approach will undoubtedly foster a favorable environment for the adoption of digital technologies across various sectors of human activity (Balakrishnan, Lal, 2020:2).

Conclusions. The application of blockchain distributed ledger technology as a tool to stimulate business activities based on transparency and openness while preserving corporate information about participants is currently in its developmental phase. The use of this technology in business activities represents a promising direction, provided effective legislative regulation is established for blockchain technology applications.

Implementing this technology will serve as a stimulating tool for conducting business activities built on self-regulation, granting regulatory bodies access to operational data without unnecessary interference in internal activities (unless legislative norms are violated). Additionally, this technology will help reduce the share of shadow business and make the national economy more attractive for investment.

Looking ahead, Ukraine could adopt blockchain technology based on the practices of the aforementioned international logistics and IT companies. It could be used to create a system that generates electronic documents in real-time, combining the features of an invoice and a waybill. Governmental regulatory authorities should be integrated as one of the users of this technology, allowing them to participate directly in the process from the moment the electronic document is created. They will be able to track the legality of specific goods' movement and related documentation, ensuring maximum transparency in business activities. Effective application of this technology by businesses could also reduce the burden on regulatory authorities.

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