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ВИКОРИСТАННЯ ІННОВАЦІЙНОЇ ТЕХНОЛОГІЇ БЛОКЧЕЙН В ЛОГІСТИЦІ І УПРАВЛІННІ ЛАНЦЮГАМИ ПОСТАВОК

Анотація. Сьогодні технологія блокчейн є однією з найбільш перспективних серед сучасних інформаційних технологій, що розвиваються, і саме ця технологія має найбільший вплив на управління ланцюгами поставок.

У статті представлений огляд практики використання технології блокчейн в процесі трансформації інформаційних потоків у ланцюгах поставок світових компаній. Розкрито значення технології блокчейн та практика її використання у сфері логістики. Наведено приклади перевезення продукції за допомогою використання інноваційної технології блокчейн та загальний досвід світових компаній, що переважно працюють у сфері роздрібної торгівлі. Досліджено значення даної технології для оптимізації витрат, скорочення часу на організацію бізнес-процесів, спрощений документообіг усередині компанії при перевезенні вантажу, запобігання можливих ризиків в системі. Зауважено, що в наш час інтеграція бізнес-процесів в ланцюгах поставок потребує відповідної інформаційної підтримки, яка забезпечується за допомогою технології блокчейн, що формує прозорість та наскрізність інформації.

Ключові слова: ланцюги поставок; логістика; блокчейн; цифровізація; бізнес-процеси.

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APPLICATION OF BLOCKCHAIN INNOVATIVE TECHNOLOGY IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Annotation. Today, blockchain system is one of the most promising system among modern information technologies in the developing world, and it is a technology that has the greatest impact on the supply chain management.

The article presents an overview of the practice of using blockchain technology in the process of transformation of information flows in supply chains of world companies. The importance of the blockchain technology and the practice of its use in the field of logistics are revealed. Examples of products transportation with the help of the use of the innovative technology and the general experience of the worldwide companies, which mainly work in the field of retail trade, are presented. The significance of this technology for cost optimization, reduction of time for organization of business processes, simplified document flow within the company during transportation of goods, prevention of possible risks in the system are investigated. It is noticed that nowadays, integration of business processes in the supply chain requires appropriate information support, which is provided with the help of blockchain technology, which generates transparency and comprehensiveness of information.

Key words: supply chains; logistics; blockchain; digitalization; business processes; logistics operations.

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ПРИМЕНЕНИЕ ИННОВАЦИОННОЙ ТЕХНОЛОГИИ БЛОКЧЕЙН В ЛОГИСТИКЕ И УПРАВЛЕНИЕ ЦЕПОЧКАМИ ПОСТАВОК

Аннотация. Сегодня технология блокчейн является одной из наиболее перспективных среди современных информационных технологий, которые развиваются, и именно эта технология имеет наибольшее влияние на управление цепями поставок.

В статье представлен обзор практики использования технологии блокчейн в процессе трансформации информационных потоков в цепях поставок мировых компаний. Раскрыто значение технологии блокчейн и практика ее использования в сфере логистики. Приведены примеры перевозки продукции посредством использования инновационной технологии блокчейн и общий опыт мировых компаний, преимущественно работающих в сфере розничной торговли. Исследовано значение данной технологии для оптимизации расходов, сокращения времени на организацию бизнес-процессов, упрощенный документооборот внутри компании при перевозке груза, предотвращение возможных рисков в системе. Замечено, что в наше время интеграция бизнес-процессов в цепях поставок требует соответствующей информационной поддержки, которая обеспечивается с помощью технологии блокчейн, что формирует прозрачность и сквозной поток информации.

Ключевые слова: цепи поставок; логистика; блокчейн; цифровизация; бизнес-процессы.

Introduction. Nowadays, functioning of logistics systems constantly demonstrates the trend of increasing the blockchain technology usage. Information flows are becoming more and more decisive in ensuring the competitiveness of enterprises that is why they are given considerable attention and resources. Especially, it becomes important in supply chain management, as they cover business processes from the purchase of raw materials to final consumption, which includes a large number of operations, and can significantly delay the transfer of relevant information between the participants, thereby reducing the efficiency of the entire logistics system. Therefore, the problem of mismatching of informational flow to material and financial aspects, affects the organization of all activities of enterprises and logistics. The introduction of innovative information technologies in logistics of the enterprise is a complex issue, especially due to the problem of their adaptation to business processes and coordination between the participants of the logistics process [2, p. 113]. The change-over to digital production and e-Commerce takes a fresh look at logistics as a supply chain management tool for added value creation, so it

determines the focus of changes are necessaried in logistics under the impact of the transition to cyber production. If we take into account changes already caused by IT technologies – changes in the structure of companies, company boundaries, economic sectors, a set of key competencies, business models and business strategies, the digital technology and logistics in these realities obtain strategic importance for consolidation business processes into a single infrastructure of the digital economy.

Analysis of recent researches and publications. Scientific work of A. Taypkott, M. Casey and P. Vigna, M. Swan, K. Skinner, which examines the blockchain technology and its use in enterprises, brings a significant contribution to the development of theoretical and practical application of blockchain technology. The primary source, where the concept of «blockchain» appeared, is a White Paper of Satoshi Nakamoto, who provides the term "blockchain" — as a distributed database that serves as a ledger of all transactions in the network [2, p. 113]. Nathaniel Popper's work «Digital Gold» was included to the list of the best business books of 2015 in Financial Times. The author reveals the idea of creating a bitcoin payment system, which gradually attracted the attention of the whole world. Alex Fork, the head of the «Blockchain.community» in his book «Bitcoin. More than money» describes the history of bitcoin development and its distribution around the world, highlights the technical features, gives examples of application in some theoretical financial hypotheses. Andrea Antonopolous, a member of Executive Board, in his work «Mastering Bitcoin: Unlocking Digital Cryptocurrencies», describes a payment system bitcoin and other cryptocurrencies. [4, p. 66-68]. However, a number of problems related to the use of blockchain technology in logistics systems remain unresolved. The complexity of the problem and the need of technology adaptation in Ukrainian enterprises cause its in-depth study and define the goals and objectives of the study.

The aim of the article is to determine the place of modern technologies in logistics and supply chain management, to study the advantages and disadvantages of innovative blockchain technology, to review the main trends and promising opportunities for its application in the field of logistics.

Results. Blockchain – a new technology that gives you the opportunity of decentralization and consistent storage of validated data. Over the past few years, it has increasingly attracted the attention of various industries. Logistics is slowly becoming aware of how deeply blockchain can affect their performance.

Blockchain is a distributed digital ledger of transactions that can't change due to the use of cryptography. It is a brief explanation that includes three important properties of the blockchain: decentralization, reliability and immutability. The technology is decentralized because the network is fully managed by its users without relying on a centralized infrastructure that creates trust. To add a transaction to the general ledger, the transaction must be shared within the blockchain peer-to-peer network. The technology is reliable as participants sign transactions through public and private keys before distributing all over the network. Therefore, they can only be initiated by the private key owner. However, users can remain anonymous because the keys are not connected to the real world. The technology is immutable by its consensus algorithm: one or more transactions are grouped together to form a new block. All members inside the network can verify transactions in the block. If there is no consensus on the validity of the new block, the block is rejected. Each block not only stores transaction records, but also the hash of the previous block. It creates a block interdependence associated with the chain – blockchain. [1, p. 5-6].

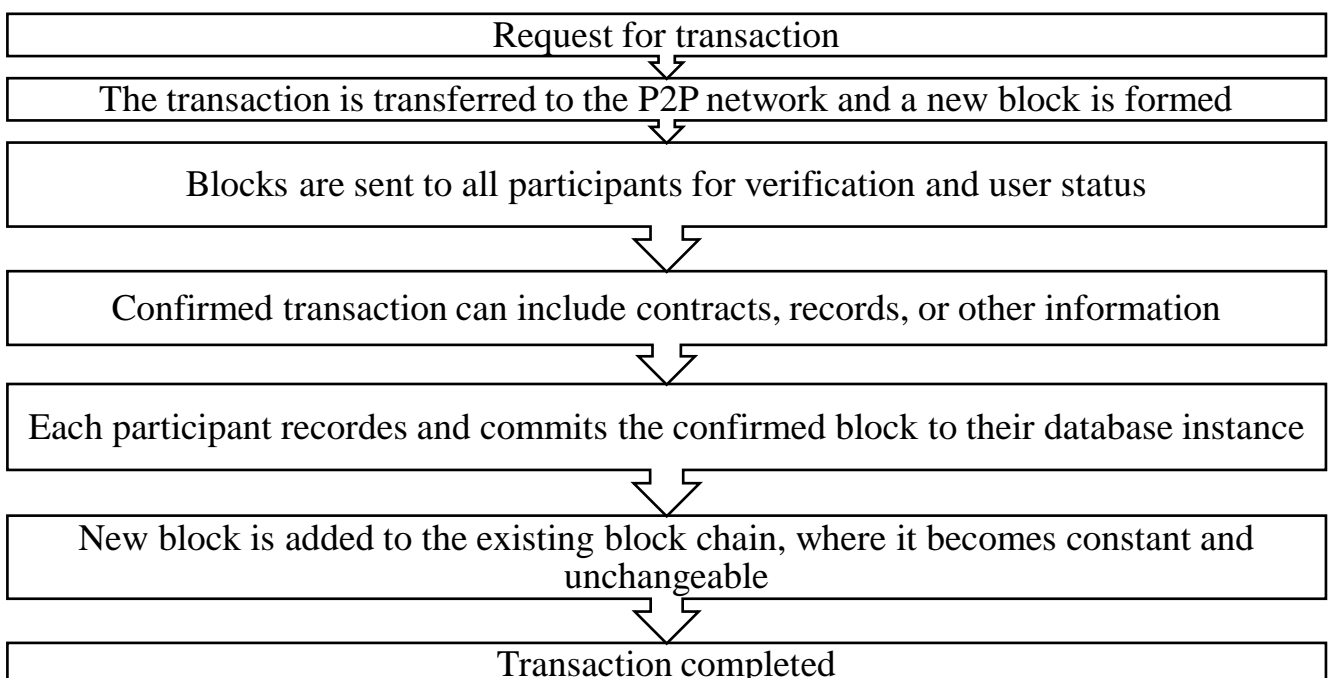


Fig. 1. Scheme of blockchain technology running

As we can see, blockchain technology is able to perform one of the key function of banks faster and more accurately – to identificata a person and registre of a transaction. Summarized scheme of blockchain technology can be represented as a set of interrelated stages (see fig. 1) [3, p. 159].

Today blockchain represents a great potential for improving processes and business models in logistics. However, according to a recent study of trends in the development of logistics, blockchain technology is known only to some experts in this field and is even less used in enterprises. Analysis of technology effectiveness in logistics is necessary to begin with an overview of global trends in the areas of commercial activity and scientific research for understanding the prospects for the introduction of digital logistics (table 1).

Table 1

Global trends in the use of blockchain technology in logistics

№	Trend	Specificity
1	New digital technology	Digitalization allows to accelerate the implementation of business processes in the supply chain (hereinafter – SC), providing greater reliability and transparency of information for making informed decisions. It can reduce costs, prevent risks and eliminate operations that do not multiply added value to customers.
2	Supply chain segmentation	Segmentation of SC allows to solve wants and needs of customers, so customer orientation is becoming a reality. Leading companies such as Bayer and BMW actively use the strategy of segmentation of their SC.
3	Service orientation	Closely related to the segmentation trend described above. It undertakes important planning and controlling functions of SC (ideology of 4PL-outsourcing). The main objective is to ensure that the level agreements agreed between the supply chain counterparties are implemented.

4	Software tool	Supply chain optimization is already widely supported by software tools (in particular, system integrator companies such as SAP, Oracle). These tools are able to apply scenario modeling and simulation to determine the best SC.
5	Improving the resilience of supply chains	This trend is the main trend among company managers, logistics directors and department managers in SC. More effective return management, reverse logistics, the focus on reducing energy consumption and "green logistics" are the result for a significant reduction of costs.

Source: [5, p. 126-128].

As an example of the blockchain technology usage, a group of large retailers and manufacturers of consumer goods, including Unilever, Nestle and Walmart, joined the IBM project on the development of blockchain technology. Such companies as meat producer Tyson Foods, the supermarket chain Kroger Co, the producer of fruits and vegetables Dole, a manufacturer of seasonings McCormick & Company, supplier of food products Golden State Foods, a seller of fresh berries Driscoll's and transport operator McLane Co have joined the project too.

Table 2

Advantages of using blockchain technology in logistics of enterprise

Easy document processing	Global container traffic still involves a lot of documents – it takes a lot of time and money. In addition, paper cargo documents (e.g. consignment) are prone to falsification and fraud.
Determination of counterfeit products	For example, counterfeit drugs are a problem for pharmacy supply chain. It especially refers to expensive, innovative drugs such as cancer drugs.
Traceability of products	In the supply chain, the presence of food contamination and delay are problems for retailers. They should have brief information about food origins, product damaging, and what should be removed from stores.

Internet of things	More and more logistics facilities are equipped with sensors that generate data on the supply chain – for example, the status of the cargo.
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Source: formulated by the author on the basis of [1].

On the basis of international experience, table. 2 shows four main ideas, which are currently being studied both in theory and in practice. They are also four separate ideas, emerging from the possibilities of blockchain introduction. It is possible to compare the broad picture, which is subsequently used to study the prospects of blockchain for logistics.

Also, for better understanding the work of blockchain in the logistics of the enterprise, let's consider the process by example: meat is delivered from Ukraine to Libya including multimodal transportation. Delivery of products is made using several warehouses. The route starts from Ukraine, where the truck loads the meat and delivers it to the distribution center. For the fact that all participants of the blockchain process can track all transactions in the system without approval, payment is made immediately after the system displays the delivery of products to the warehouse. The cargo is then loaded onto another type of transport and sent to Libya. As the type of product requires certain temperature conditions and transportation rules, the system defines penalties for non-compliance, which are monitored by special sensors. Sensor data can be monitored by all participants. This example demonstrates how to speed up the organization and execution of business processes and reduce the time of data reconciliation.

These global trends and benefits of use can usually be accompanied by a large number of barriers for gaining effectiveness of technology implementation within enterprises – the complexity of combining different parties/departments to achieve the result, the lack of technological maturity, the problem of data security, the incomprehensibility of the benefits. In addition, a lot of workers believe that technology providers will benefit when consultants (intermediaries) pay attention more on supply chain, as senders and recipients do. In public administration – the lack of support from the law (regulatory uncertainty), the prohibition of legalization of blockchain registries and departments of control over the storage of information through this technology.

Conclusions. So, it is worth to notice that despite the stable commitment of companies to traditional methods of supply chain management and logistics organization in general, increasing the speed of calculations and transparency in logistics can give the company a huge competitive advantage, we can expect the rapid development of blockchain technology for logistics. In today's global competitive landscape, abandoning the introduction of a new great technology can have devastating consequences. This opens up space for startups and entrepreneurial coalitions of unrelated companies engaged in hardware, software and processes to become pioneers in the supply chain space. Based on this, doors can be opened for faster, smarter and safer processes throughout the supply chain. Therefore, without this, suppliers, manufacturers and sellers will continue to suffer losses and, at least now, lose the chance to become more efficient and competitive.

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