DIGITAL LOGISTICS: POSSIBILITIES OF SMART CONTRACTS IN THE ORGANIZATION OF INTELLECTUAL TRANSPORT SYSTEMS

Ekhsonov Jasur Rustamovich

Head of the Department of Quality control of education, Kokand branch of the Tashkent State Technical University named after Islam Karimov

ehsonov_j@tdtukokand.uz

Abstract: The article is devoted to the review and analysis of the blockchain technology used in operating systems during the revolutionary transformation of logistics 4.0. It is noted that blockchain technology is the conceptual and technological basis of the Fourth Industrial Revolution; On its basis, many modern technologies are being introduced that determine the vector of transport and logistics development. The main areas of implementation of blockchain in the field of transport logistics are given: asset management, supply chain management, smart contracts, supply chain, data exchange, creating charts and tables, cargo certification. The integration of blockchain technology and smart contracts will be considered. A step-by-step structure of the transition of the transport logistics system to the blockchain is presented. The main principles that must be followed in the introduction of blockchain in the transport 4.0 revolution have been identified.

Keywords: *digital logistics, smart contracts, 7R, blockchain, strategy, transformation, talent for 4IR, Industry 4.0.*

RAQAMLI LOGISTIKA: INTELLEKTUAL TRANSPORT TIZIMLARINI TASHKIL QILISHDA AQLLI SHARTNOMALAR IMKONIYATLARI

Exsonov Jasur Rustamovich

Islom Karimov nomidagi Toshkent davlat texnika universiteti Qo‘qon filiali “Ta’lim sifatini nazorat qilish” bo‘limi boshlig‘i

ehsonov_j@tdtukokand.uz

Annotatsiya: Maqola logistikaning to‘rtinchi inqilobiy o‘zgarish davrida operatsion tizimlarda qo‘llaniladigan blokcheyn texnologiyasini ko‘rib chiqish va tahlil qilishga bag‘ishlangan. Qayd etilishicha, blokcheyn texnologiyasi To‘rtinchi sanoat inqilobining kontseptual va texnologik asosi hisoblanadi; Uning asosida transport va logistika rivojlanish vektorini belgilovchi ko‘plab zamonaviy texnologiyalar joriy etilmoqda. Transport logistika sohasida blokcheynni amalga

oshirishning asosiy yo‘nalishlari berilgan: aktivlarni boshqarish, ta’minot zanjiri boshqaruvi, aqlli shartnomalar, ta’minot zanjiri, ma’lumotlar almashinuvi, jadvallar va ularni yaratish, yuklarni sertifikatlash. Blokcheyn texnologiyasi va aqlli shartnomalar integratsiyasi masalalari ko‘rib chiqiladi. Transport logistika tizimi blokcheynga o‘tish jarayonining bosqichma-bosqich tuzilishi taqdim etiladi. Transport 4.0 inqilobida blokcheynni joriy etishda amal qilinishi kerak bo‘lgan asosiy tamoyillar aniqlandi.

Kalit so‘zlar: *raqamli logistika, aqlli shartnomalar, 7R, blokcheyn, strategiya, transformatsiya, iste’dod, Sanoat 4.0.*

ЦИФРОВАЯ ЛОГИСТИКА: ВОЗМОЖНОСТИ СМАРТ-КОНТРАКТОВ В ОРГАНИЗАЦИИ ИНТЕЛЛЕКТУАЛЬНЫХ ТРАНСПОРТНЫХ СИСТЕМ

Эхсанов Джасур Рустамович

Начальник отдела «Контроль качества за образования» Кокандского филиала Ташкентского государственного технического университета имени Ислама Каримова

ehsonov_j@tdtukokand.uz

Аннотация: Статья посвящена обзору и анализу технологии блокчейн, используемой в операционных системах в ходе революционной трансформации четвёртой революции логистики. Отмечается, что технология блокчейн является концептуальной и технологической основой Четвертой промышленной революции; на его основе внедряются многие современные технологии, определяющие вектор развития транспорта и логистики. Приведены основные направления внедрения блокчейна в сфере транспортной логистики: управление активами, управление цепочками поставок, смарт-контракты, цепочка поставок, обмен данными, создание диаграмм и таблиц, сертификация грузов. Будет рассмотрена интеграция технологии блокчейн и смарт-контрактов. Представлена пошаговая структура перехода системы транспортной логистики на блокчейн. Определены основные принципы, которых необходимо придерживаться при внедрении блокчейна в транспортную революцию 4.0.

Ключевые слова: *цифровая логистика, смарт-контракты, 7R, блокчейн, стратегия, трансформация, талант, Индустрия 4.0.*

INTRODUCTION

Time is one of the most precious resources available to mankind. Everyone has the same amount of time. It is not possible to aggregate, divide, or transfer it. Time, apart from information, is a driving force for constant changes in humans, organizations and the environment. Thanks to time, the present fate of the world is

shaped by the forces and achievements of technology, which only a few decades ago was just a matter of futurologists' deliberations [1].

Currently, one of the main reasons for the acceleration of the processes of radical transformation of the logistics system is the need for technologies that bring the communication between the manufacturing company and the customer to a modern interface, which is about to step into the 5th industrial revolution in the era of globalization.

When discussing Logistics 4.0, system automation is understood. Operators and devices will communicate with each other, vehicles will move autonomously from one place to another, and the goods selected by the customer will be sorted from the shelves using artificial intelligence technology. Of course, it is natural that such situations seem futuristic in most cases. Digitization increases the efficiency of processes in transport logistics, prevents the shortage of qualified personnel and saves time. However, digitization only supports logistics rather than replacing entire operations. More importantly, changing workloads make it difficult to meet increasing demand with technology alone. In the near future, logistics will play a central role as a continuous source for customers, but skilled employees will always be the most important asset.

LITERATURE REVIEW

The main reason for the appearance of digital logistics is [5].

1. Lack of perfect technical skills. Product innovation is the driving force behind today's national economy, but in order to monetize this product innovation, organizations must exploit the market, which only happens when consumers attach value to these products that are worth buying. Therefore, in today's competitive business environment, organizations need employees who not only have the scientific knowledge to create product innovations, but also understand human nature to help them recognize the needs of consumers. That is, to take advantage of Industry 4.0 and adapt to the changing nature of innovation, organizations need employees who can understand, use and develop new work designs. The latest digital transformation is creating a number of new roles in organizations, which will require new employee skills. Therefore, it is not only about developing a “digital workforce” for the future, but it must be able to develop a future workforce that can see the “big picture”, adapt immediately, think and work innovatively [2].

2. Challenges in infrastructure development. In the transport system, business models are management tools that facilitate the creation, expansion and maintenance of its value. In recent years, there has been a great interest in smart and connected business models, especially IoT business models, as they increase competitive advantage. There are many challenges in these business models. For example, connecting different devices and developing standards or ensuring information security

are some of the challenges of smart and connected business models. Business models in the field of transport logistics are a tool to help overcome these challenges [3].

3. Collaboration and team work. The era of Transport 4.0 requires all employees, even those employed in low-skilled jobs, to have a set of ICT skills. However, Transport 4.0 requires key employee skills to include more than basic skills; In fact, for hard skills to be successful, employees must have soft skills such as collaboration, communication, and autonomy to perform their jobs in hybrid operating systems [2].

Today, digitization should create great opportunities for increasing the efficiency of services provided by companies and reducing costs. The first direction of digitalization of transport is computerization of transport companies and automation of processes. Digitization is mainly manifested in transport management systems, customer relationship management, and enterprise resource planning systems that allow for the automation of administrative processes. Robotic process automation is also a growing technology. It is an advanced software-based technology used to automate repetitive activities, such as the preparation of transport documents. About 78% of representatives of global transport and logistics companies plan to take steps to automate tasks and positions to ensure the effective implementation of company goals [3].

MATERIALS AND METHODS

Digital logistics

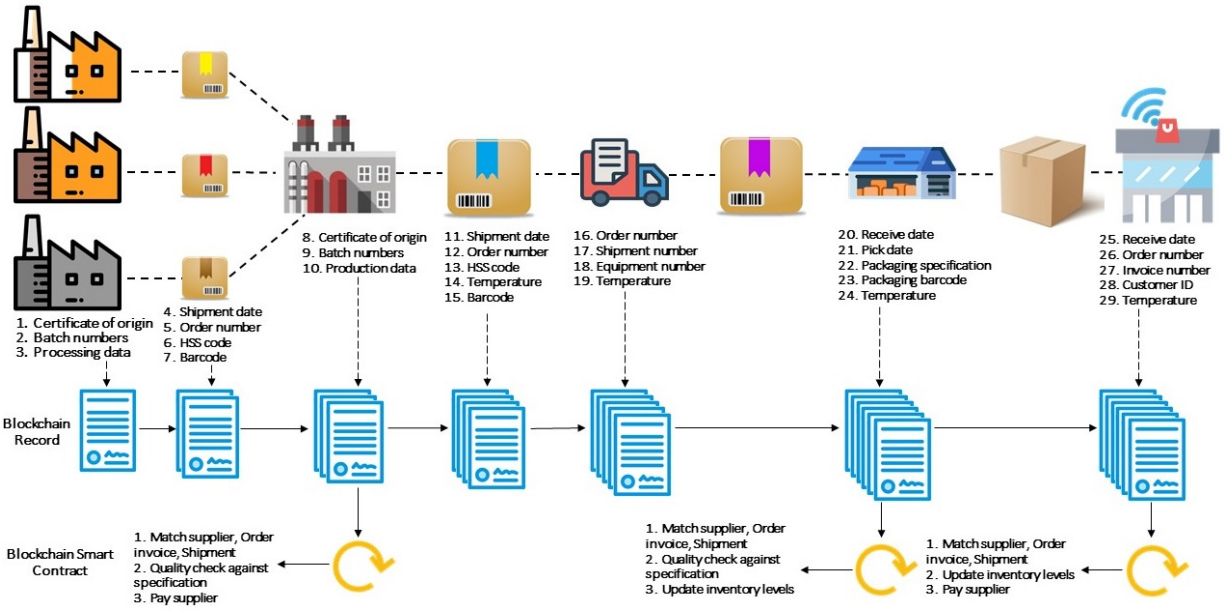
The field of logistics allows you to manage a company, including a number of activities such as demand analysis, sales planning, supply requirements, inventory management of goods, and distribution of finished goods. The need for technological and strategic development for logistics and the emergence of the fourth industrial revolution have created a number of problems. These can accelerate the integration of technology into all logistics processes. This leads to the emergence of a new concept called "digital logistics" or "logistics 4.0". According to Yassine Issaoui, smart/digital logistics emphasizes that planning and control with smart tools and methods is one of the key factors. He confirmed that the intelligence level will find solutions through applications and methods to identify the products traceability and elements of its environment, until the level of problem identification, selection and resolution is done automatically. On the other hand, Uckelmann builds on the concept of smart product and smart service to define smart/digital logistics. For example, it discusses the use of technology to obtain information about the flow of material, and then process it for monitoring, control and other purposes. With smart asset tracking tools and equipment, entire supply chains are becoming more efficient and profitable by recording various changes. Because significant end-to-end visibility, improved product direction, control and replenishment of inventory and mobile assets, and detailed management of the

marketing experience pave the way for complete system management. It makes the above changes to ensure companies have clear visibility into product information when purchasing, storing, manufacturing and shipping. In most cases, this requires the use of asset tracking tools supported by sensors that provide real-time information [12].

Blockchain

During the fourth industrial revolution, Blockchain technology is included among smart and digital technologies. This technology aims to store and transfer data in a secure, more transparent and decentralized manner. It is a distributed database or public/private ledger of all digital events managed and shared among the agents/agents participating in the blockchain. Technically, Blockchain is a distributed system that stores all the transactions made since its inception in the form of blocks. These consist of information submitted by users. These data transactions are protected by cryptographic algorithms. Blockchains can be generalized and used to enforce an agreed set of rules that cannot be broken by anyone, neither users nor system operators. They rely on a single platform of system architecture for multipart applications that do not require mutual trust. Blockchain technology is characterized by decentralization of data by ensuring a high level of data security. Trust is one of the main results of decentralization, there is no need to evaluate the trustworthiness of an intermediary or other network participant, so the data is easy to use and verifiable. Also, adding a new transaction involves more interactions with other nodes in the chain. As shown in Figure 1, the operation of inserting a new block is characterized by the non-localization of nodes, the consistency of the operation, and the security of the records [10].

Blockchain technology has a significant impact on various systems in the era of globalization. Notably, it is being utilized in the transportation industry for digitizing services and implementing similar operations, leading to positive socio-economic outcomes. This technology aims to achieve mutually beneficial results by minimizing human intervention, which can lead to transparent and unbiased decision-making, minimize errors, and reduce costs.



Picture 1. The sequence of smart contracts in the logistics system through blockchain technology[21]

If we consider the economic aspects, it's important to question the amount of money spent on the traditional method of signing contracts and hiring experts to study the bilateral demands or offers. If an expert is allocated 1.0 million soums in national currency in the traditional method, the costs in the proposed method, including the electronic platform, network, and financial resources allocated to the expert, is about 0.50-0.70 million. In most cases, lawyers are required. Ultimately, this method justifies its economic benefits for 0.3 million soums. For example, the need for logistics services (highway, railway) in the Fergana Valley is significantly increasing, with an average of 60-80 contracts per day on 25.01.2024. If the entire process is covered, it could save 24.0 million soums per day. It is recommended to study the social and economic aspects of the process, analyze the new generation of contracts and deals to avoid corrupt situations, and acknowledge the uniqueness of digital technologies.

RESULTS

Today, visualization technologies are mainly used in industries as diverse as video games, tourism, and recently the topic is starting to be considered in the context of building quality management systems, planning assembly lines, and organizing logistics and supply chain activities for smart factories.

Transport 4.0 is defined as an increasingly autonomous transport because it is strongly based on automation and autonomization, and at the same time, focused on a gradually decreasing negative impact on the environment, the process of movement along with all accompanying activities, taking place in a networked environment. In present world increasingly dependent on safe, economical, and environmentally

[21] Performed by author

friendly transport, companies have to face many new challenges related to technological progress. According to the results of the PwC “21st CEO Survey,” presented in the report “Transport of the Future” (PwC), “As much as 68% of CEOs of global transport and logistics companies expect changes in key service delivery technologies to have a breakthrough impact on their business” [3].

If we consider smart contracts as a technology that covers the entire process cyclically, it is necessary to analyze the decision-making panels involved in the development of this sequence.

The process starts with the customer sending a signal indicating their need for a product or service. This signal is used to assign a unique order number, and the first block of data is created to reflect the customer's choice. The following steps involve assembling the item, packaging it, and controlling its temperature. The item is then delivered to the warehouse, where it is given another unique identification number and undergoes quality control checks. The item is then packaged again, and its temperature is checked once more before being assigned to the customer's order number, customer ID, and date of receipt. Finally, an invoice number is generated and provided to the customer. Quality control checks are conducted at every third step of the process to ensure that the supplier receives payment as per the prescribed terms.

DISCUSSIONS

If we pay special attention to the fact that the "Digital Logistics" system provides an opportunity to control the execution of contracts, it connects the approaches of intermediate and final events related to the execution of the contract. In addition, it includes processes such as the initiation of transportation, transportation of agreed consignments, dispatch and adherence to the transportation schedule. As a result, the transparency of decisions to fulfill the terms of the contract and close/cancel the contract by the involved participants is ensured. Consumers of services can evaluate the quality of services provided by suppliers by criteria (conditions, quality, price/quality parity) that allow to create a service quality assessment system together with performance indicators through contracts. By suppliers - the ratings of service providers and their consideration when choosing offers are an important factor. The service organizes rating indicators for customers (similarly to Uber, Ebay, AliExpress systems). Ratings make it possible to identify unscrupulous companies and reduce losses due to their activities, without reducing the work efficiency of diligent participants of the "Digital" system. Blockchain is a distributed file store designed to store large volumes of data (documents, contracts, etc.). External information systems (shipping, logistics, unloading - loading terminals, ports, etc. - through which cargo tracking is carried out) ensure the division of the selected microservice architecture space into cooperative sets between microservices [9].

The outcomes obtained from these phases hold significant importance for the reorganization and improvement of logistics processes in the future. In reality, the evolution of the logistics industry does not rely on a single factor. It is influenced by several factors which include human resources, selective adoption of advanced technologies, analysis of market segments, application of an analytical approach, and fostering a positive social environment within the team.

In today's era of globalization, it is the responsibility of every responsible individual to enhance existing systems and explore new strategies. This momentum will eventually create an impact. Additionally, it would be beneficial to define risk management by maintaining a unique statistical and dynamic record.

If we categorize the digitalization of logistics processes influenced by smart contract and blockchain technology into generations, the sequence of advancement is reflected as follows:

Blockchain 1.0 refers to the emergence of cryptocurrencies, which are a type of digital currency used for the creation, confirmation and control of transactions through cryptographic methods. Cryptocurrencies have a high liquidity and up-to-date exchange rate, and can perform all the functions of traditional money. They are also widely used in various applications, money transfer systems, and digital payments.

Blockchain 2.0 refers to the advancement of smart contracts. This technological innovation has led to the emergence of a new class of economic and financial applications that are based on a distributed ledger. This allows for the handling of smart assets and smart contracts in managing bills, stocks, futures, bonds, collateral, and other related areas.

Blockchain 3.0 is a type of application that has a broad range of uses, including government, healthcare, science, education, culture and arts, services, manufacturing, commerce, and transport and logistics.

In the digital accounting system designed for transport and logistics operations, each completed transaction is automatically recorded in the registry using a unique code that includes information about the date, time, price, and participants involved. This detailed record keeping helps to solve several problems at once, including reducing the level of corruption and minimizing the impact of the human factor in supply chains. All parties involved in the transaction can access up-to-date information about any changes and updates to logistics processes, and any inaccuracies and deviations from planned key indicators can be easily traced.

CONCLUSION

The aim of our research was to identify Blockchain trends and the role and resulting applications of smart/digital logistics services. It was an important digital transformation strategy in providing concrete examples of this process. This research

work was done by cluster classification. As for smart logistics, blockchain-based technology is still the subject of several researches. In fact, there is a lot of interest in Blockchain technology and that is why many companies are working on it. Blockchain can facilitate logistics tasks: it can be used to track purchase orders, order changes, shipping documents, and help share information about the logistics process and delivery. Blockchain technology has great potential for development and application in the field of smart/digital logistics, creating challenges for further research. Thus, more research is needed. For example, the study and design of blockchain, IoT, and AI technology integration and interaction schemes in smart logistics require the development of recommended standards and communication APIs between blockchains. In addition, there is a great need for criteria such as financial evaluation of the application of blockchain technology in smart logistics, energy consumption level, energy-efficient transactions and block production time. Blockchain trends and applications have several limitations and prospects for improvement when applied in the field of smart logistics. That is: to simplify the exchange between different channels, it is necessary to develop data standardization standards. In addition, the preparation and implementation of regulatory laws to have an environment of trust will lead to the rise of the system.

The old linear thinking paradigm, with short-term corrections, is inadequate in solving the ever-changing and complex stability issues encountered in the logistics system. It only treats the symptoms without addressing the root cause. By using systematic thinking, policymakers and stakeholders can grasp the link between various interconnected subsystems of the transport-logistics sector and how they affect its long-term dynamic behavior. This approach focuses on each component of the system and how it interacts with the other components within broader systems over time.

REFERENCES

1. Kolasińska-Morawska, K., Sułkowski, Ł., Morawski, P. New technologies in transport in the face of challenges of economy 4.0. Scientific Journal of Silesian University of Technology. Series Transport. 2019, 102, 73-83. ISSN: 0209-3324. doi: https://doi.org/10.20858/sjsutst.2019.102.6.

2. Ustundag, A., & Cevikcan, E. (2017). Industry 4.0: managing the digital transformation. Springer.

3. Mazur, M., & Urban, G. (2019). Transport of the Future: Report on Prospects for the Development of Road Transport in Poland in 2020-2030. PwC.

4. Gąsiorek, K. (2022). Key competences for Transport 4.0 – Educators' and Practitioners' opinions. Open Engineering, 12(1), 51-61. https://doi.org/10.1515/eng-2022-0009

5. Fertsch, M., & Toboła, A. (2021). Intelligent Transport Solutions of Logistics 4.0 in the Context of Changes in Driving Style: A Systematic Literature Review. European Research Studies, 24(2B), 850-859.

6. Khoshimov PhD, E., & Makhmudaliev, F. (2020). Digital transformation of corporate governance in Uzbekistan: current state, challenges and perspectives. International Finance and Accounting, 2020(6), 30.

7. Ekhsonov, J., & Khoshimov, E. (2023). Establishment of transport logistics hub. International Journal Of History And Political Sciences, 3(10), 34-46.

8. Суюнов, Д., & Хошимов, Э. (2018). Методологические аспекты оценки эффективности корпоративного управления в акционерных обществах. Экономика и инновационные технологии, (2), 213-225.

9. Gulamov, S. S., Svirin, M. N., & Shermukhamedov, A. T. (2019). Digital logistics and blokchejn-systems-the basis on development of transport services. Theoretical & Applied Science, (11), 249-254.

10. Issaoui, Y., Khiat, A., Bahnasse, A., & Ouajji, H. (2020). Smart Logistics: Blockchain trends and applications. J. Ubiquitous Syst. Pervasive Networks, 12(2), 9-15.

11. Bottoni, P., Gessa, N., Massa, G., Pareschi, R., Selim, H., & Arcuri, E. (2020). Intelligent smart contracts for innovative supply chain management. Frontiers in Blockchain, 3, 535787.

12. Issaoui, Y., Khiat, A., Bahnasse, A., & Ouajji, H. (2019). Smart logistics: Study of the application of blockchain technology. Procedia Computer Science, 160, 266-271.

13. Junge, A. L., Verhoeven, P., Reipert, J., & Mansfeld, M. (2019). Pathway of digital transformation in logistics: best practice concepts and future developments (Vol. 8). Universitätsverlag der TU Berlin.

14. Shadibekova, D., & Ismoilov, N. (2021, December). Development of digital logistics and transport in the process of globalization. In The 5th International Conference on Future Networks & Distributed Systems (pp. 688-692).