Improving The Use of Blockchain Technology in The Finance of Economic Entities

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Abstract. The article describes the analysis of the current situation of using blockchain technology in the finance of economic entities, in particular, in banking and finance, insurance, state administration, industrial enterprises, in the process of accounting for intellectual property, and in the implementation of the contract system of producers and users. In addition, the use of blockchain technology in smart corporate financial management, the use of IoT, Cloud technologies, blockchain technology in drawing up smart contracts was developed. A comparative analysis of blockchain technology evaluation methods was performed

Keywords: Blockchain, digitization, smart contract, "cloud" technologies, IoT, artificial intelligence.

Introduction. The global blockchain industry in 2022 is estimated to be worth $11.54 billion. The annual growth rate is 73.2 percent. This industry estimate is projected to reach $162.84 billion by 2027. Notably, the value of the global blockchain market in 2022 is 100 times larger than in 2018 ($1.57 billion). Therefore, it is predicted to increase by 100 times in the five years between 2022 and 2027 [1].

World's 81% of the largest companies are using blockchain. Of the 100 largest publicly traded companies in the world, 81 have begun to implement blockchain technology in their operations, and 65 of them have passed the research and planning stage and started to implement it.

The number of companies of all sizes using blockchain is expected to continue to grow, with organizations forecast to spend a total of nearly $19 billion on blockchain technology in 2024. For comparison, it can be said that in 2017 this figure was only 750 million dollars. 90% of large banks in the USA, Canada and Europe plan to incorporate blockchain technology into their businesses [2]. The legal environment for blockchain must support continuous innovation and experimentation. UNDP research shows that incorporating blockchain into government functions will require compliance with legal and regulatory requirements in a variety of areas. These include crypto asset regulation, smart contract enforcement, digital identity regulation, data protection, privacy and data integrity. Uzbekistan has also taken initial steps in this regard. The need to create a policy environment that supports such digital innovations in the public sector has already been defined in the "Digital Uzbekistan 2030" strategy. But if we take into account the work being done in this regard, undeveloped legal regulations, deficiencies in infrastructures, problems related to the Internet and electricity create serious obstacles in achieving the set goal. In particular, the implementation of Blockchain requires flexibility, scientific research to maintain a balance between its application, compliance with existing laws and continuous updating of the technology [3]

Analysis Of Literature On The Subject.

Blockchain and smart contracts have already proven their ability to advance processes that require transparency and clear evidence-based record keeping. By establishing strong trust, a smart contract ensures that the necessary logic and rules are implemented automatically without human manipulation or third-party intervention [4].

On the other hand, IoT devices provide excellent technical support in process monitoring by collecting and sending data over the network. This section reviews the extensive literature on blockchain, smart contract, and their ability to track, monitor, and generally develop real-world operating modes [5].

Blockchain has its own characteristics, which are suitable not only for the provision of digital payments, but also for the abolition of trust models based on third parties (banks, insurance, brokers, etc.) of enterprises and organizations [6].

Research by a number of scientists has shown that transparent, fault-tolerant, immutable and voice tracking can be implemented using blockchain and IoT devices [7]. Blockchain is one of the safest ways to handle electronic transactions. It has been proven that significant security has been achieved in the mobile cloud data of Electronic Patient Record Systems (EPRs) using blockchain technology [8].

With blockchain, middlemen can be eliminated, but contracts and trust boundaries between contributing parties are often called smart contracts [9].

The idea of smart contracts has been around since the 1980s, but the only thing missing was the removal of middlemen. Nick Szabo first shared his research on smart contracts in 1996. According to Szabo, the main idea of "Smart Contracts" is that many types of contract clauses (for example, collateral, binding, assigning property rights, licensing) can be embedded in hardware and devices [10].

Research methodology.

Blockchain transaction algorithm, IoT, MQTT server and smart contract implementation model using blockchain technologies, blockchain technology evaluation methods, and blockchain usage evaluation indicators were used to improve the use of Blockchain technology in the finance of business entities

Materials and Methods.

When using blockchain, no third party intervention is required as a financial processor. The process is automated through "smart contracts", and the history of each transaction is included in the blockchain and can be accessed at any time. Research is underway to apply this technology to real-world problems that require more complexity in the transaction and payment process. Blockchain has great potential for digital transactions in future use cases such as insurance and banking.

Replacing online payment systems with blockchain often poses a scaling problem in terms of the number of transactions and computing power. Research shows that the implementation of blockchain-based systems with the number of payments and computing power can reduce the problem of scale by reducing the block weight and ledger size in global partners.

It showed the process of restructuring the supply chain using blockchain technology while reducing the payment time in the digital payment system. Thus, blockchain offers great opportunities for

online transactions in terms of security and transparency, eliminating the difficulties inherent in digital payment systems (Figure 1).

In general, the areas and industries that do not include blockchain digital payments are the characteristics of the blockchain model, such as type differences (public, private, permissioned), access control (centralized, decentralized), persistence, authenticity, identity control, transparency With the use of control and a high level of security, it is possible to achieve great prospects in economic sectors.

The main idea behind blockchain was to create a robust online transaction system. The fundamental aspects of blockchain have provided many strong prospects for excellent technical support for distributed systems in terms of security and transparency. However, blockchain does not have an integrated system for automatically processing data in a distributed system. We can achieve this by integrating smart contract with blockchain.

Like traditional contracts, a smart contract is a set of organizational conditions and requirements that govern the trust between the parties involved in this contract. The only difference is that the smart contract is coded with a programming language. The terms, conditions, and requirements are implemented through controlled codification that reflects a clear agreement approved by all parties [11].

Thus, the main purpose of a smart contract was to embed the rules of the contract into a combination of hardware and software, so that it becomes more difficult to breach and the cost of breaching the contract increases, thereby increasing the security of contracts and reducing the likelihood of attack. The idea of smart contracts and its implementation in real life was popularized in 2016 by the Ethereum blockchain. Ethereum is a decentralized blockchain with integrated tools and environment for implementing smart contracts.

Efirium has made Nick Szabo's statement a reality. Szabo described smart contracts as a "mechanism for increasing the costs of breaking a contract" that mimics a real contract. Since Ethereum itself is a blockchain, keeping the contract inside the blockchain makes it difficult to hack the contract.

A smart contract, in other words, is a mechanism for automating blockchain technology. The idea of storing a contract inside a blockchain has opened the door to several other possibilities for blockchain implementations in real-world problems. It uses smart contracts as the basis of system design to automate processes in the system. Automation includes real-time tracking of products in the supply chain and overall control of all stages.

The critical need to establish trust between parties can be achieved through smart contracts by securing the contract within the blockchain. Today, it was proposed to introduce a car insurance system based on a smart contract called CAIPY, in which smart contracts will automate insurance processes and implement insurance policies step by step. Also, these smart contracts interact with IoT devices to store vehicle status information.

In addition, management of intellectual property rights can be done using smart contracts. In foreign experience, a music copyright management system called BMCProtector, which uses blockchain and smart contracts, has been put into practice. The smart contract in this system performs the necessary functions from music creation to royalty distribution. Since the contract is distributed within the blockchain, it is almost impossible to break and change it, which ensures absolute security when establishing a smart contract in the blockchain environment.

A smart contract combined with the integration of blockchain and IoT devices has proven to be a smart, secure and reliable course of action for monitoring and analyzing processes and operations. Without these technologies, there is no well-proven tool for monitoring systems in current management, which, at the same time, contributes significantly to the development of process quality control and robust safety. Smart contracts have opened the door for development with all the necessary digital support tools that aim to automate the tracking process and create a reliable fixed contract between the participants. One of the main disadvantages of traditional process control and monitoring is that data can be manipulated at any stage, resulting in a loss of confidence that business rules will be strictly followed. In order to protect the data inside the blockchain, it must first be collected. IoT devices have proven to be an excellent technology for monitoring and collecting data with low power and minimal cost.

It is important to use smart technologies based on IoT for a convenient mechanism of necessary data flow throughout the system. IoT devices are used to monitor the quality and condition of products stored in large warehouses. In addition, IoT technology monitors and provides information about the prices of products and services in different periods. Blockchain is used to securely store this tracked data, while a smart contract is used to automate the process, trigger events, and ensure that the terms of the contract are met for all parties within a specified time frame. MQTT (message queuing telemetry transport) is a simplified network protocol that runs on top of TCP/IP and focuses on exchanging messages between devices on a publisher-subscriber basis (Figure 1).
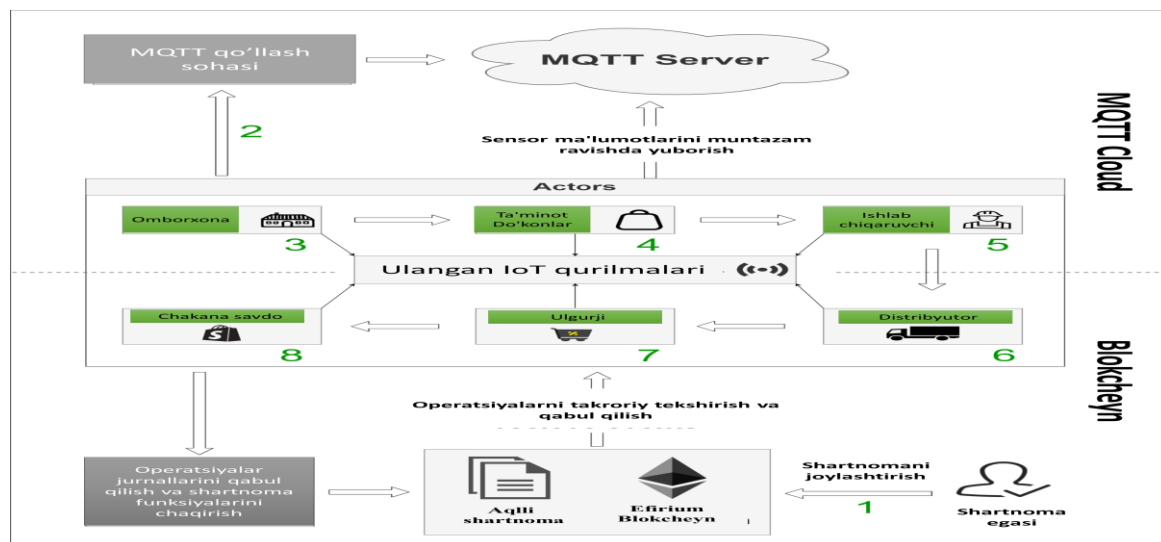

Figure 1. Description of smart contract implementation model using IoT, MQTT server and blockchain technologies

Storage warehouses, supply stores, manufacturers, distributors, wholesalers and retailers are the main participants in the system. At the very beginning, the management staff posts the contract on the blockchain network, which is designated as step 1. In the next step 2, the subscription mechanism is activated and the contract is stored and implemented along the distribution chain. It allows IoT devices to connect to the server. In subsequent steps starting from step 3 and ending at

step 8, data is collected from IoT devices and stored on the MQTT server. And some complex data is stored in the blockchain. Periodic inspections, security, traceability and quality assurance are performed by smart contracts. System participants are connected to the cloud storage of Message Queue Telemetry Transport (MQTT). A standard HTTP connection requires a connection to be established each time a request is sent to the server, but MQTT does not. MQTT is faster than HyperText Transfer Protocol (HTTP) in collecting IoT sensor data and has more convenience compared to standard HTTP.

In order to assess the necessity and objectivity of using blockchain technology, it is recommended to study methodological approaches to evaluating the effectiveness of using this technology. Certain methods and criteria are used to evaluate the effectiveness of using blockchain technologies. Below is the Russian, Japanese and TEI (USA) methodology most commonly used in practice to evaluate the effectiveness of using distributed ledger technology (DLT).

Table 1
Comparative analysis of blockchain technology evaluation methods

Russian methodology [12]	Japanese methodology [13]	TEI (USA) methodology [14]
It is aimed at determining the dynamics of demand for blockchain technology and forecasting the use of blockchain technologies	Designed to evaluate projects in various technology use cases	Leveraging technology for predictive analytics and determining performance: Level of return on investment with IBM Blockchain Platform and Services
Indicators		
The number of people registered with the blockchain for income generation among the largest Russian companies	Quality indicators: efficiency, compatibility, extensibility, reliability, security degree	Customer survey
The number of regulatory legal documents in the field of digital economy and the level of compliance with legal requirements	Level of contract guarantee	A risk-based financial model
The number of publications published by Russian researchers on this topic	R&D - implementation and maintenance cost estimates	Estimates and projections for a hypothetical organization

Number of Google results for "blockchain technology".	Transaction indicators before and after the introduction of blockchain: transaction time, the number of transactions per second	Implement program development using four criteria - benefits, costs, flexibility and risks

The final conclusion can be made that the selection of these methods for comparative analysis is due to the fact that Russia reflects the developing identity and economic situation, while Japan and TEI cover all the nuances of blockchain technology evaluation. Their use makes it possible to draw conclusions about the most appropriate use of technology in the financial sector. In addition to these methods, other evaluation criteria and indices that adequately evaluate the capabilities of the blockchain have not been developed. The following information provides indicators that allow us to assess the positive or negative impact of distributed ledger technology (DLT) when blockchain technology is used in various industries (Figure 2).
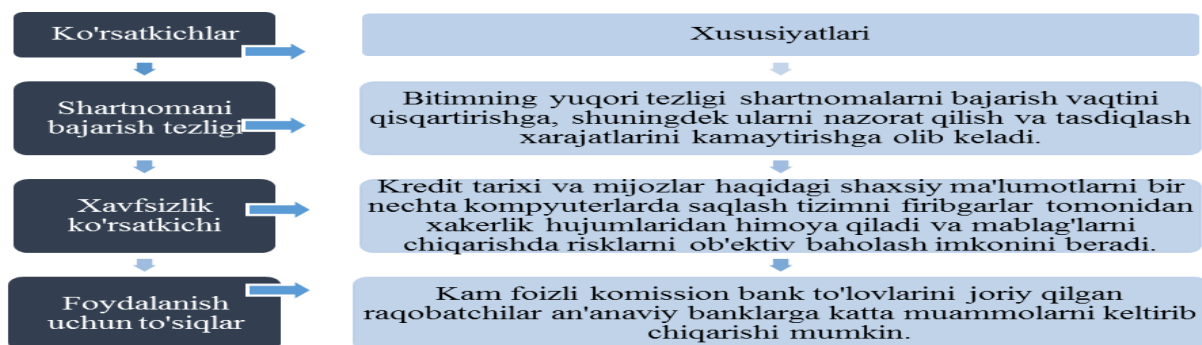

Figure 2. Description of Blockchain Usage Evaluation Metrics

Blockchain technology with these features can perform various functions and be used in various directions and fields of activity. Blockchain technology includes the functions of registration of each transaction, decentralized data storage, transmission, management and encryption. The functional characteristics of the studied technology allow us to clearly define the areas of financial services in which it can be used:

1. Financial sector - increasing the efficiency of cash operations by speeding up transactions, reducing transaction costs in the implementation of business plans, eliminating duplicate transactions, simplifying transaction verification and data reliability.

2. Banking sector - ensuring high level of security and reliability in data and money exchange, simplifying the transaction process, reducing intermediaries, reducing risk identification and settlement time, reducing counterparty risks, human errors and costs.

3. Insurance - secure data verification, speed up the efficiency of the process of accepting new clients, detect fraud and increase economic efficiency, automate payments for insurance events, reinsurance, and solve identification problems.

Conclusion.

Today, media pressure is increasing, the demand for transparency is increasing, and the number of qualified professionals is increasing. It is blockchain technology that is emerging as a technology that guarantees transparency not only in the process of corporate financial management, but also in all aspects of society. Blockchain technology is a revolutionary technology that changes many business models, makes corrections to the structural structure of the economy and society, and can rapidly apply science and technology innovations.

In the process of financial management, the communication between the participants participating in the system during the implementation of blockchain technology is based on the principles of creating an inter-civil payment system with the ability to perform electronic transactions bypassing financial organizations - intermediaries, such a task can be partially solved with the help of a digital signature however, it only required a fiduciary to oversee bilateral spending. Therefore, a decentralized solution is described based on the ideas of the public system, cryptocurrency, mathematical rules of proof-of-work and general rules of transactions between system participants. This solution is called Bitcoin's blockchain.

One of the advantages of the principles of operation of blockchain technology in the financial management process is that any information uploaded to the system can be instantly viewed by every user connected to the system, as well as ensuring that this uploaded information is stored or deleted. to prevent decay; the possibility of ensuring a high level of transparency in the process of database distribution; availability of the possibility of setting up specific targeted surveillance in the exchange of data and information; low cost of data storage and processing; the duration of the information storage period; is in the availability of data processing, targeted description and categorization capabilities.

The main condition for the transition to the digital economy is the rapid application of blockchain technology to all aspects of society, the identification of possible problems in this process and their timely elimination.

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