# THE FUTURE OF THE DIGITAL ECONOMY: CONCEPT AND ROLE OF BLOCKCHAIN TECHNOLOGIES

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**ABSTRACT:** Blockchain technology has a huge potential and significant advantages, namely: anonymity, integrity, decentralization and transparency. However, integrating blockchain on a large scale is not easy due to some technical, social, economic, and regulatory barriers. The article deals with the implementation of blockchain technologies in all areas of the economy. All types of blockchain technologies are described. There are several examples of using blockchain technologies in various countries, such as the United States, Denmark, Argentina, Russia, and others. Barriers in the application and development of blockchain technologies were identified and ways to solve them are proposed.

**KEYWORDS:** Information technologies, Database, Cryptocurrencies, Blockchain, Big data, Data mining, Distributed ledger technology, Digitalization of the economy, Blockchain technologies in the financial sector.

## I. INTRODUCTION

Drivers of growth in the digital economy are modern information technologies, often called innovative or breakthrough. The effects they bring can sometimes be overwhelming. Before our eyes, certain branches of human activity are changing beyond recognition. For example, the use of the latest achievements in the field of Big Data and Data Mining has led to the emergence of a new applied science – bioinformatics, which has opened completely new horizons in medicine. With the help of big data analysis tools, the decoding of the human genome, and not only it, has begun. Effective tools have been developed to combat genetic and hereditary diseases, the process of developing new medicines has significantly accelerated, and so on.

No less hope is placed on the technology of building a decentralized, distributed registry – the blockchain. Less than eleven years have passed since the launch of the Bitcoin network and the publication of the first articles signed by Satoshi Nakomoto, and the ideas of decentralizing applications and data have firmly captured the best minds. Many analysts bring to the blockchain the future of the rainbow. The IT community considers various applications of distributed registries, analyzes existing platforms, and assesses the technological and economic effects of their implementation.

The blockchain is a distributed and decentralized database formed by participants, in which it is impossible to falsify data due to the chronological record and public confirmation of the transaction by all participants of the network. The only and main feature of the blockchain is the use of mathematical calculation algorithms, as well as the exclusion of "human" and the human factor when deciding by the system [Kolesov, 2017].
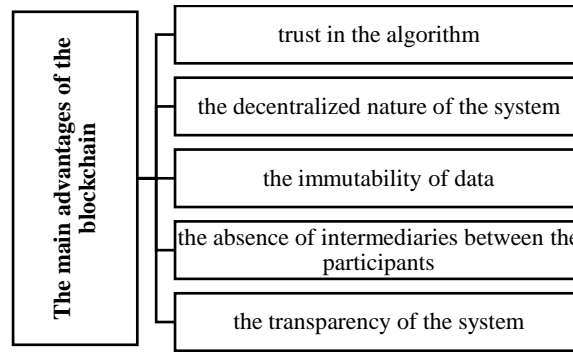
**Fig. 1:** Main advantages of blockchain [2]

Although currently most blockchains process financial transactions, in general, the latter can be considered simply as atomic changes in the state of some system. For example, the blockchain can be used to register documents and protect them from changes.

## II. LITERATURE REVIEW ON THE TOPIC

Digital society and the digital economy are born in Uzbekistan due to the intersection of the interests of the state, regional administration, big business and the growth of public interest in information services. This is confirmed by regulatory documents, research by scientists and is widely distributed in the business literature.

According to general opinion, the most important problem area in the development of digital society and the digital economy is virtual currencies (cryptocurrencies), the production and circulation of which is based on blockchain technology [Namiot, 2016].

The report of the world economic forum (WEF) gives the following definition of blockchain technology or distributed ledger technology (DLT): it is a technological protocol that allows the exchange of data directly between various Contracting parties within the network without the need for intermediaries. The use of encryption ensures that users can change only those parts of the blockchain that they "own" in the sense that they have private keys, without which writing to the file is impossible. Besides, encryption ensures that copies of the distributed blockchain are synchronized for all users.

The blockchain technology is initially based on security at the database level. The concept of blockchains was proposed in 2008. Satoshi Nakamoto [Nakamoto, www...].

With further development, the blockchain was defined as a separate technology that can be used outside of cryptocurrency. However, there is a very contradictory situation when blockchain technologies are used by banks to increase their operational efficiency and thus indirectly contribute to the popularity of cryptocurrencies, which creates an alternative to the existing financial infrastructure [Pryanikov, 2017].

Blockchain technology implies a fundamentally new approach to data management and use, which, in particular, will inevitably contribute to deep transformations in the financial market. [Karimov, Saydullaev, 2019]

As shown by the bibliographic analysis, to date, all the features of the blockchain and indicators of its effectiveness have not been sufficiently studied. However, at the moment, it is safe to say that the verified cases of using block technology have so far concerned about the management and provision of digital relations only as part of the data storage system.

## III. DATA SOURCE AND RESEARCH METHODOLOGY

Analysis and synthesis, scientific abstraction deduction, classification, generalization, comparative, theoretical interpretation, and analytical methods were used in the methodology of this article, as a result of the bibliographic study, the direct and indirect factors affecting them and the prospects for further development were identified.

## IV. ANALYSIS AND RESULTS

A blockchain is a continuous sequence or chain of blocks containing certain information and built according to special rules. Each block is a kind of array that stores encrypted data about transactions and their participants, as

well as information about all previous blocks. The new block is placed at the end of the chain, and the information contained in it is encrypted and passed to the array of the next block. Copies of block sequences are stored on tens of thousands of computers connected to the blockchain network. This creates a decentralized distributed system of registries, where it is impossible to change data without the consent of all participants in the system.

Blockchain is not limited to the sphere of electronic money and can be successfully applied in such areas as:

- Financial sector. Investments, exchanges, and banking operations.
- Land registry and real estate transactions.
- Identification systems.
- Education and medical services.
- Global registries for recording, storing and processing information.

In the first case, a decentralized registry, that is, blockchain technology can solve the following financial problems:

- Full control of the economy belongs to the states and banks.
- High costs and low speed of international transactions.
- The lack of transparency at all levels of functioning of the financial system.
- Widespread bureaucracy and corruption.
- Public distrust of states and the financial system.

The World Economic Forum (WEF) published a report with an optimistic view of the future of the world economy. If the forecasts outlined in it are correct, the introduction of blockchain technology can have a huge impact on the development of the global trading industry in the next ten years, bringing up to $1 trillion. to the world economy by 2028 [7].

At present, a large part of the trading industry still relies on outdated methods. Thanks to the introduction of blockchain technology, this sector can be rebuilt by modern requirements.

The main obstacle to trade development remains the lack of financing. Experts from Bain & Company, which prepared the report jointly with the WEF, believe that the trade finance deficit could reach $2.4 trillion by 2025 if the industry does not take the necessary steps. Consultants Bain & Company believe that the introduction of blockchain will help solve this problem. The report states: The main obstacle to the development of trade is outdated methods that require manual management and paper registration.

Paper transactions make it difficult for the global trading industry to develop, and moving away from this slow and expensive system is expected to save a huge amount of time and money. Regular trading requires a large amount of paper to maintain communication between brokers, freight forwarders, logistics service providers, and government agencies.

As noted in the WEF report, the transition to a digital transaction processing system will take traditional processes to a qualitatively new level:

Manual management and document management methods for certifying transactions that were created many centuries ago lead to difficulties and delays, increasing the number of errors and increasing risks. This prevents reliable collection, storage, and tracking of real-time information that is necessary for making informed financial decisions.

It is not difficult to understand that blockchain technology can optimize these processes, bringing benefits to all interested parties. With the current number of participants in trade chains, it is difficult to track and verify the necessary information, especially if it is transmitted in paper form.

This is where the advantage of distributed registry technologies lies. Interested parties provide confidential information that is only available to the participants of the transaction, in turn receiving the necessary data in real-time.

Regardless of what stage the transaction is at — at the initial stage, when the payment takes place, at the stage of delivery of goods, or any other, the blockchain allows all participants to constantly access data.

All transactions in the blockchain are stored in a single registry. Since transactions are completely ordered by time, the current state of the system (the set of user balances in the case of a financial blockchain) is determined solely by this transaction register. Storing a complete history of changes to the system state has its advantages, for example, the ability to determine the state of the system at any time, simply "playing" the corresponding transactions again.

Using digital signatures solves not only the problem of authorization but also the problem of the changeability of transactions. If digital signatures are used for all transactions in the blockchain, an attacker who gained internal access to the system (for example, a hacker or former employee) cannot change these transactions.

Immutability and finality of transactions in a blockchain-based system are achieving by dividing transactions into blocks ordered in time and calculating a cryptographic hash function for each of the blocks.

Blockchain can be divided into the following types: open, closed, and combined. Their comparative characteristics presented in Table 1.

**Table 1:** Comparative Characteristics of Blockage Types

| | Type of blockchain | | |
|---|---|---|---|
| | **Open** | **Closed** | **Combined / exclusive** |
| **Description** | There is no identification | Identification of network participants | Identification in the network |
| | There is no restriction on user participation | Access to the network is restricted to a narrow circle of participants (i.e. access to data is completely restricted and not transparent to customers) | Access to the network, stipulated by certain rules (for example, the network client can only view their transactions) |
| | The status of the process is not assigned to the participants | The status of validators is assigned to certain contractors | The status of validators is assigned to certain contractors |
| | There is no supervision | There is a controlling authority | There is a controlling authority |

An open blockchain is a type of blockchain where there is no restriction on reading blocks, and where there is no Supervisory authority (a "liberal" type of system management).

A closed blockchain is a type of blockchain in which there is direct access to data by ecosystem-forming organizations, where there is a controlling authority. The essence of the blockchain as a distributed registry is absent, which creates vulnerability of the network from hacker attacks and "distortion" of transaction blocks (information), which levels the main principle of the blockchain — trust in the system. This type of system control is inherent in dirigisme.

However, we can distinguish a third type of blockchain technology, in which you can take all the advantages and disadvantages of the other types — combined.

Thus, a combined blockchain is a type of blockchain in which identification occurs in the network, as well as allowing network clients to certain groups of information disclosure, for example, the client can view their own and/or other people's transactions and/or only the headers, while there is a controlling authority that will see the full information about the transaction. The advantages of this type are that it has an element of a distributed registry, it is more reliably protected from hacker attacks, and it has a controlling authority, which is very important for the state, as it helps to counteract the receipt of proceeds from crime and the financing of terrorism.

**Application of blockchain technology**

Here are some striking examples of the use of blockchain in various countries:

1. Taxes, land and document management (for example, the USA, Georgia).

The useful qualities of blockchain have found their application in public administration [8]. For example, the Florida Department of tax collection announced a collaboration with BitPay, which aims to collect taxes, driver's licenses, license plates and other documents in Bitcoin and Bitcoin Cash cryptocurrencies. The national public registry Agency (NRA) of Georgia has added blockchain options that allow you to find and get a statement about real estate objects.

2. Elections and voting (for example, the USA, Denmark).

Blockchain technology guarantees the impossibility of falsification, accessibility and anonymity, which will allow States to use a transparent electronic voting system. Blockchain voting has already been used in municipal

elections in West Virginia, USA. Also, this type of voting was used by the Danish Liberal Alliance party in the internal vote and the libertarian party of Texas for candidates for internal party positions.

3.  Finance and business (for example, Argentina, Malaysia, Russia).

Most countries consider blockchain as one of the means to transition to a digital economy in the future and are looking to introduce blockchain technology to the banking sector. The transaction, which was conducted by HSBC Bank and Dutch ING WPC to deliver cargo from Argentina to Malaysia, illustrates the use of blockchain in the banking sector. These banks issued a letter of credit through the R3 Corda platform and avoided paper documents. It is worth noting that transfers are inter-currency with a Commission lower than usual. M. Video, Alfa-Bank and Sberbank factoring did not miss the advantages of blockchain technology and within the framework of the consortium launched a blockchain platform for factoring operations, which was based on the Ethereum platform.

4.  Smart contracts.

A smart contract ("smart" contract) is an electronic Protocol written using computer code, the operation of which is based on blockchain technology. Its purpose is to transmit information and ensure that the terms of the contract are fulfilled by both parties.

Smart contracts allow you to securely exchange money, shares, property, and other assets directly, without intermediaries. Created by Vitalik Buterin in 2013, the Ethereum network allows users to create "smart contracts". The payment method for concluding such contracts is the network's own currency, ether.

These are just some examples of blockchain applications in various sectors. Every year, distributed registry technology is being introduced into more and more areas of public life [9].

**Barriers to the implementation of blockchain technology**

1.  Technical barriers.

Blockchain technology is not perfect and has its disadvantages, and its advantages are ambiguous. Consider the disadvantages associated with decentralization. All participants in the system perform identical work, storing and processing the same constantly growing amount of information [10]. As a result, a number of problems arise:

- The more transactions in the network, the more memory they take up. Since the number of transactions is constantly increasing, sooner or later the amount of memory that stores data may not be enough. Also, when a node appears in the network, a situation occurs when a new participant has to synchronize all the previously processed information;
- The mining process consumes a large amount of electricity, and only one user receives remuneration for the work done. So the rest of us are wasting energy.

There is also a risk of a "51% attack", which can be implemented if you have more than half of the mining capacity. It becomes possible to write your own financial transaction history, which will become real. This way, you can spend the same money several times.

Low throughput and slow transaction processing rate: the blockchain processes and records a limited number of transactions during a certain period (bitcoin processes a maximum of 7 transactions per second, transactions are recorded every 10 minutes, forming a block). The requirements of certain projects may exceed the performance of the blockchain, which can lead to interference in the network.

2.  Economic and social barriers.

Social and economic adaptation is a complex obstacle to the implementation and development of blockchain. There are thousands of businesses that perform the function of trusted storage, transmission, and verification of information. Such organizations benefit from the need to trust third parties [9].

3.  The problem of regulatory regulation of technology development and organizational barriers.

In our opinion, one of the main problems of blockchain implementation is a lack of awareness about the technology, a lack of understanding of its real capabilities and how it works.

Blockchain is a relatively young project, so there are no laws that define the rules for using this technology. Thus, with the development of the blockchain, there is an increasing need to develop regulatory documents regulating its application. In addition, the lack of specialists who understand the technology also hinders the implementation and use of technology by organizations.

Blockchain technology in the future will become the basis of the economy of the future. In the related literature, you can read about a decentralized financial system that is free of intermediaries, predatory commissions, state influence and corruption.

But how realistic such ideas are debatable. For example, many dreams of freeing the economy from the control of banks and corporations. But these institutions are now developing solutions based on distributed registry technologies themselves.

For example, Google intends to use blockchain to improve the security of user data. Facebook has a division that will develop solutions in the field of distributed technologies. The company, part of the Alibaba Group conglomerate, has launched a service for international transfers on the blockchain. IBM, Salesforce, Microsoft, Amazon, Samsung, Fujitsu, Baidu, Ford, Walmart and many other companies also work in this industry.

Corporations are not far behind the big banks that cryptocurrencies were designed to destroy. For example, the British Barclays joined the CLS Group consortium and together with other participants is going to create a decentralized competitor to the world payment system SWIFT. In 2017, 12 Chinese banks integrated solutions based on distributed ledger technology. In 2018, Spanish Bank BBVA issued the first corporate loan using a private blockchain.

They are looking for areas of use of technology and the state. Blockchain is going to be used in a number of areas, starting from document management to voting.

All this indicates that the blockchain economy is not as far away as it seems. At the same time, it is not a fact that it will be as many dreams: how blockchain can change the economy is an ambiguous question. If governments and banks themselves start creating and integrating solutions based on distributed technologies, the current system will change, but it will not become decentralized and independent.

## V. CONCLUSION

Ideally, the blockchain economy will allow to:

- Get rid of corruption and bureaucracy.
- Develop and implement innovative methods of managing the country, corporations, and other institutions.
- Ensure transparency of transactions.
- Simplify and reduce the cost of financial transactions at the international and local levels.
- Create a worldwide independent cryptocurrency.
- Engage in business investment for everyone.
- Free yourself from the control of the centralized banking system.
- Implement a secure transaction system based on smart contracts.

The risk that the blockchain economy will remain a utopian concept is high. Factors that may lead to this result include the following:

- Lack of a well-developed regulatory system — even in leading countries, the cryptocurrency industry suffers from legislative uncertainty.
- High volatility of cryptocurrencies-this attracts speculators to the industry and causes dissatisfaction with regulators.
- Development is possible only with the participation of the whole society, but the technology remains incomprehensible and uninteresting to many.
- It is impossible to implement the tasks set without the help of States and banks in a short time.
- A high level of fraud in the ICO sphere, which may lead to a ban on using this method of attracting investment.
- Cryptocurrencies should become the new money of the blockchain economy, but they are still used as a cumulative or speculative asset.

Uzbekistan needs to take advantage of the current scientific and technological situation in the world economy to ensure a globally competitive position in the rapidly developing digital economy market.

Directions for further research are seen in the monitoring of the cryptocurrency market and the development of blockchain technology, as well as in the development of proposals for regulating the ICO market, taking into account its peculiarities of functioning.

The blockchain is able to make an economic system of decentralized, transparent and free from control. You can use it to build a new financial system, get rid of intermediaries when conducting transactions, and change public administration.

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