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Blockchain technology use in economic practice

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Abstract. This paper discusses the application and impact of blockchain in economic models. An economic model is a group of relations, rules, and models reflecting economic relations in society. They are formed at the stage of production activity formation, exchange, consumption of economic goods. It allows one to focus on the main elements of the system and their interrelationships. The economic model has many classifications and patterns applied in macroeconomics. Blockchain is a computer paradigm represented by a chain of consecutive blocks. This technology is based on peer-to-peer networks. According the model, trust to the participants is embedded at the level of the protocol, which initially builds economic relations between the participants. The use of distributed registry technologies in a wide range will effectively expand economic models.

Keywords: blockchain, distributed data ledger technology, decentralisation, distributed data, digital technology, information technology, digitalisation.

JEL codes: O33, G29

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Introduction

This research paper is based on both Russian and foreign researches in the field of blockchain technology, and distributed data registries application in various industries. Among them we can mention the following:

1. https://www.tadviser.ru/
2. https://www.finam.ru/

Over the past decades, the next stage in the development of the economy will be a step towards digitalisation and distributed economic systems both in the scientific and economic environment. The new economic paradigm – the introduction of blockchain and distributed ledger systems – will be followed by an undeniable increase in efficiency in all economic models (Aksenov, Kuprikov & Saakyan, 2018), which can fully impact the development of economic patterns and structures.

Notably, with the beginning of the fourth industrial revolution, one can see the active introduction of distributed registries. The one of the most popular of this technology, blockchain, began to penetrate not only into economic relations, but also in recent years even into the socio-economic environment (Safiullin, Sharapov & Elshin, 2021). The introduction of such technologies becomes a useful tool for further forecasting and development of economic models in the Russian Federation. However, despite all the positive aspects of using this technology, there are certain risks that need to be controlled and regulated by the government of major countries.

The purpose of the paper is to investigate the types of distributed ledger technologies (DLT), their application, and efficiency in economic models.

Main part

In this paper authors considered various research sources and articles. At the first stage of the research

the authors study different types of distributed ledger technologies. At the second stage of the research the authors give an assessment of the application efficiency of such technologies for economic models.

The current economy is a post-industrial one. However, it concerns other appropriate names, reflecting some aspects of the coming changes in economic models. Networking is often used and referred to it. This undoubtedly characterises one of the many key technologies may emerge in this period of economic development.

Blockchain is not fundamentally new technology. Nevertheless, the use of blockchain network operating model consists of various tools, technologies, and paradigms combining to form a logical and secure structure for distributed data storage. In fact, it can be compared to a large ledger, on the page of which transactions between two users are displayed and recorded. Everything recorded in this ledger remains and cannot be deleted by any of the transaction participants or other interested parties (Kuzmenkova, 2022).

Privacy is blockchain core capability. Transactions are conducted on decentralised databases, provide the transaction anonymously, instantaneous, and without the involvement of special persons or regulators. The introduction of such distributed data ledger technology requires a complete study of the market and economic sectors, and a complete analysis of the infrastructure's readiness for the new stage of economic development.

At the moment, solutions based on DLT (distributed ledger technologies), blockchain technology is the most well-known one, are used in decentralised information storage. It is also used to ensure efficient and fast electronic document flow, multiply the speed of data exchange, increase the overall security and level of trust of Internet users in the use of information systems and business processes (Stukalin, 2019).

Currently, there are several blockchain concepts (see Table 1).

Table 1 – Blockchain Concepts

Operation	Centralized	Decentralized	Distributed
Governance/Business Model	Centrally Controlled	Community Controlled	Autonomous
Stability/Resilience	Unstable	Bounded Stability	Stable
Scalability	Large Throughput/ Small Number of Nodes	Small Throughput/ Medium Number of Nodes	Infinite
Speed of Enterprise Development	Fast	Medium	Very Slow
Architecture Evolution/ Diversity	Permissioned/Private	Hybrid	Permissionless/Public
Tokenization	No	Possibly	Yes
Trust Control	High Traditional/Low Algorithmic	Medium Traditional/ Medium Algorithmic	Low Traditional/High Algorithmic

Source: composed by the authors

Table 1 shows advantages and disadvantages of each concept. They can include different architectural management, business model, and implications. But despite the risks, by the business community data, 84% have started working with blockchain technology, and 62% have announced their own blockchain initiatives, according to research by PricewaterhouseCoopers (PwC)[1].

PwC surveyed economic leaders from 15 countries and found that 84% are adapting blockchain technology to their business processes. At the same time, 62% of respondents have launched their own blockchain projects, but only 25% of companies have reached the stage of launching a pilot version of a blockchain network. It is also reported that representatives of almost all known sectors of the economy are

[1] *Blockchain is already here. What's your next move? Available at: https://www.pwc.com/kz/ru/publications/publications-new/blockchain-in-business.html. (accessed 14.10.2023).*

trying to move their businesses to blockchain.

According to MarketsandMarkets[2], the global blockchain technology market is expected to reach $ USD 39.7 bn by 2025, with an annual growth rate of 67.3%.

A Deloitte study[3] shows that 53% of organisations have implemented blockchain technology reported improved productivity and efficiency.

A large number of companies are already successfully using blockchain technology in finance, healthcare, logistics, energy, retail, etc. For instance, JPMorgan Chase and Santander banks use blockchain to process international payments; Walmart uses blockchain to track and monitor grocery deliveries.

Originally created for the Bitcoin cryptocurrency, use of blockchain technology is is increasingly being applied to achieve its potential. DLT demonstrates visibility and transparency of the entire transaction to all consumers and owners of certain business processes.

Table 2 – Areas of research on blockchain technologies and DLT

Rank	Technologies	Effects	Significance index	Dynamism level	Timing of mass implementation
1	Non-interchangeable tokens	Uniqueness	1.00	Fast growing	1-2 years
2	Cryptoassets	Safety	0.89	Fast growing	2-3 years
3	Decentralised applications	Efficiency and transparency	0.42	Fast growing	3-5 years
4	Smart contracts	Safety	0.28	Fast growing	2-3 years
5	Distributed hash tables	Safety	0.20	Growing	3-5 years
6	Digital tokens	Uniqueness	0.17	Growing	3-5 years
7	Tokenised assets	Uniqueness	0.15	Fast growing	2-3 years
8	Smart property	Safety	0.12	Stable	3-5 years
9	Decentralised Autonomous System (DAS)	Efficiency and transparency	0.11	Growing	3-5 years
10	Open source blockchain platforms	Efficiency and transparency	0.03	Growing	3-5 years

Source: composed by the authors

Moreover, cryptoassets and tokenisation are among the listed research areas of blockchain and DLT in the financial transactions segment, including NFT's non-interchangeable tokens.

Conversion to NFT (№1) all legal and other significant documents, as well as other files, will be digitally unique, preventing falsifications. The range of technology applications will be used not only in supply chain security. It will also be widely demanded in stock markets and in the insurance, medical, creation of unique digital attributes, which will have value equally to the physical analogue. Now non-interchangeable tokens are on a downward trend after the Bitcoin and Ethereum market crashes. Major NFT marketplaces are downsizing (OpenSea). In contrast, Disney and Dapper Labs will launch their mobile platform on the Flow blockchain. Payment system PayPal filed a patent to create its NFT-marketplace[4].

Public sector implementations are important. The government system itself combines both centralised

[2] *Blockchain Market by Component (Platforms and Services), Provider (Application, Middleware, and Infrastructure), Type (Public, Private, and Hybrid), Organization Size (SMEs and Large Organizations), Application, and Region – Global Forecast to 2027. Available at: https://www.marketsandmarkets.com/Market-Reports/blockchain-technology-market-90100890.html (accessed 14.10.2023).*

[3] *Available at: https://www2.deloitte.com/kz/ru/pages/strategy-operations/solutions/blockchain-services-and-solutions.html (accessed 14.10.2023).*

[4] *#NFT. Available at: https://forklog.com/tag/nft-news (in Russian) (accessed 14.10.2023).14.10.2023).*

structure responsible for management and service delivery, and a segmented and largely disconnected organisational system capable of sharing data.

This technology facilitates a number of time-consuming tasks for the government in various areas. They include tax collection, issuing benefits, registering and re-registering citizens by identifying, and assigning unique identifiers to them.

Crypto-assets (№2) represent the process of supplanting fiat currency and other securities, replacing them with another type of financial value. They will be electronic money, digital currencies, cryptocurrencies, and tokenised assets. The regulators (Central Banks) are in charge of the development and implementation of this technology; they have launched projects to issue national digital currencies.

The digitalization of Russia's national currency began in 2020. Eventually, the ruble will have a unique identification token for access – the money will be stored in the Bank of Russia. By March 2023, the first preparation stage for the use of the digital ruble and the introduction of a third money form in Russia was completed (Safiullin, Abdukayeva & Elshin, 2019). The mass introduction of the digital ruble in 2025 was announced in autumn 2023. The VTB bank has provided prototypes of withdrawing such kind of money through ATMs and transfers to other people. Implementation of digital ruble also has negative consequences for banks. Losses may amount to 8-10% of net profit (45-95 bn rubles). A study of the educational platform Moscow Digital School[5] (the part of Ultimate Education) revealed possible risks when introducing the digital ruble into mass circulation. Among them are insufficient preparing the population to use the new currency, problems with data protection, loss of bank clients, etc. More than 78% of respondents noted insufficient preparation of the population, and more than 50% highlighted problems with data protection during transactions in the new form of national currency. In addition, almost half of the respondents (47.5%) fear the loss of some customers by banks due to transactions will be performed not by the bank itself, but by the Central Bank of the Russian Federation. Since 15 August, the digital ruble has been tested with the participation of 13 banks and a limited number of their clients[6].

Tokenized assets (№7) allow the rights to financial securities and shares to be digitally secured. There are a number of advantages to adopting such technologies. However, there are challenges that may slow the active adoption of blockchain technology and DLT. Among them are the emerging debate on the application of such solutions to various systemically important structures of states and enterprises, the emphasis on computing power, and the weighty investments in infrastructure for scalable digital assets[7].

Table 3 – Areas of blockchain applications in various fields

Rank	Technologies	Effects	Significance index	Dynamism level	Timing of mass implementation
1	Supply chain and logistics monitoring systems	Transport and logistics	1.00	Fast growing	1-2 years
2	NFT applications	Creative industries	0.83	Fast growing	1-2 years
3	IoT - applications with decentralized data management	Trade, telecoms and communications	0.75	Growing	1-2 years
4	Digital platforms for real estate transactions	Real estate transactions	0.62	Growing	3-5 years

[5] *MDS expert Maria Telegina on the new – digital – ruble. Available at: https://mosdigitals.ru/media/ekspert-mds-mariya-telegina-o-novom-tsifrovom-ruble. (accessed 14.10.2023).*

[6] *Digital ruble. Available at: https://www.rbc.ru/crypto/tags/?tag=%D0%A6%D0%B8%D1%84%D1%80%D0%BE%D0%B2%D0%BE%D0%B9%20%D1%80%D1%83%D0%B1%D0%BB%D1%8C. (accessed 14.10.2023).*

[7] *Top 10 blockchain technologies. Available at: https://www.finam.ru/publications/item/top-10-blokcheyn-tekhnologiy-20230705-1254/. (accessed 14.10.2023).*

Rank	Technologies	Effects	Significance index	Dynamism level	Timing of mass implementation
5	Electronic voting system	Telecoms and communications	0.61	Growing	1-2 years
6	Anti-money laundering systems	Finances	0.53	Growing	2-3 years
7	Cryptocurrency exchanges	Finances	0.52	Growing	2-3 years
8	Platform for cross-border deliveries	Trade, finance	0.51	Fast growing	2-3 years
9	Personal identifiers on the blockchain (DIDs)	Information technology, telecoms and communications	0.31	Growing	3-5 years
10	Copyright royalty tracking system	Trade	0.27	Growing	3-5 years

Source: composed by the authors

E-voting systems (№5) are increasingly used by states to conduct remote elections (Australia, Belgium, France, Estonia, etc.). In Russia, the blockchain voting system was used for the first time in the 2019 elections. In March 2022, a law unifying the rules and procedures for remote electronic voting was adopted: citizens can now vote via the Internet or a special mobile application.

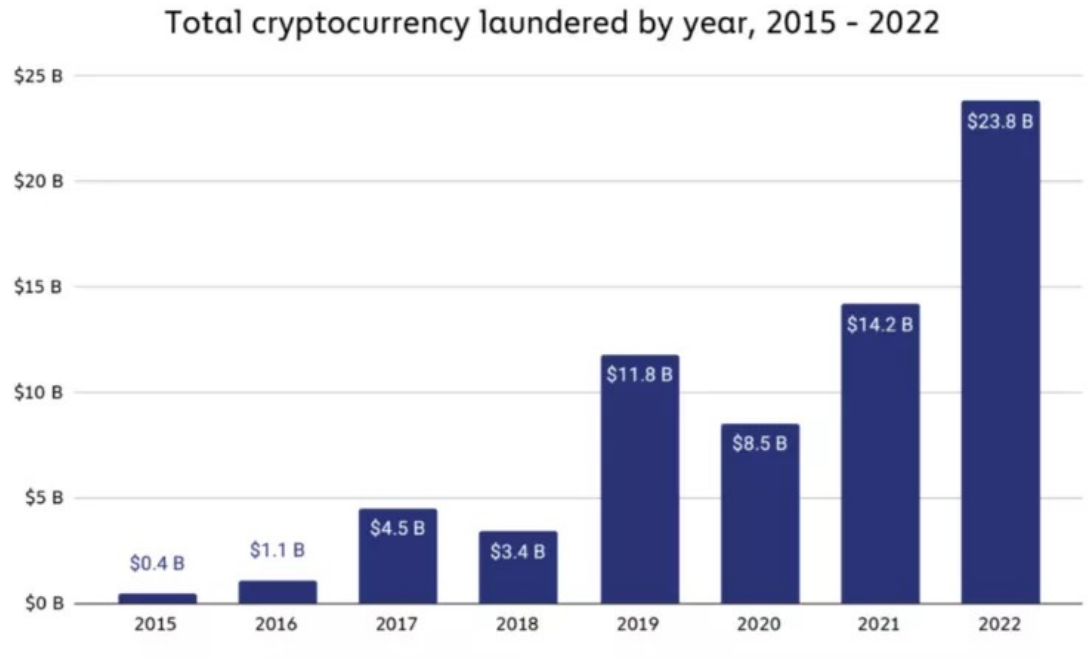

Figure 1. Volumes of laundered cryptocurrency by year

Source: "Bitcoin's share is minimal": how money is being laundered through blockchain today, 2023[8]

Anti-money laundering systems (№6) is one of the important issues in the modern world. Cryptocurrencies were used to legalise $ USD 23.8 bn in 2022, 68% more than in the previous year. The main recipient of criminal funds were centralised exchanges (CEX) – about 50% of the total "dirty" cryptocurrency

[8] *Available at: https://forklog.com/exclusive/dolya-bitkoina-minimalna-kak-segodnya-otmyvayut-dengi-cherez-blokchejn. (accessed 14.10.2023).*

turnover for the year[9]. Trading platforms provide a direct opportunity to convert digital assets into fiat money. For example, P2P serves as an almost perfect tool for fraudsters. Anti-Money Laundering (AML) systems and a host of measures such as KYC, freezing user assets, tracking transactions, and liaising with law enforcement are now in use.

Digital platforms for Real Estate Transactions (№4). On 21 June 2022, there was published a report on blockchain ability to tokenise real estate and trade transactions similar to cryptocurrencies by incorporating smart contracts into blockchain platforms[10]. There are several regulatory and administrative challenges in implementing real estate tokenisation on blockchain as of June 2022. If implemented, this could greatly simplify and speed up the process of buying, receiving dividends, and the financial benefits of owning property around the world. Another use case for blockchain that experts believe could help the real estate sector grow is the issuance of no-objection certificates (NOCs), and other compliance certificates that can be registered using blockchain technology. This will promote trust and transparency.

Conclusions

Therefore, having conducted a study on the application of blockchain in economic models, the authors found the following:

1. The use of blockchain systems has great potential in all spheres of life – for large companies, businesses, and government.

2. The application of distributed ledger technology (DLT) is revolutionising the economic environment by prioritising reliability, openness, and decentralized transaction chains.

3. The application of blockchain technology prevents money laundering.

4. Digital identification will be of equal value to its physical tax. Any owner will have ownership not only on the physical level but also on the digital one.

5. Converting important legal documents to a non-interchangeable token will be important in an environment where counterfeiting is actively fought.

6. The technologies described in this paper have a major impact on the economy of states. These technologies also providing new opportunities for criminal offences related to economic money laundering and fraud. In order to prevent potential risks, governments must be able to regulate the use of blockchain and distributed ledger technology.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

Alexander S. Pryakhin – writing – original draft
Maxim S. Komarov – writing – review & editing
Oksana V. Kosnikova – conceptualization, project administration

[9] *ForkLog – a media company in the field of cryptocurrencies, blockchain and artificial intelligence. Available at: https://forklog.com/exclusive/dolya-bitkoina-minimalna-kak-segodnya-otmyvayut-ndengi-cherez-blokchejn. (accessed 14.10.2023).*

[10] *Blockchain in the real estate sector. Available at: https://www.tadviser.ru/index.php/%D0%A1%D1%82%D0%B0%D1%82%D1%8C%D1%8F:%D0%91%D0%BB%D0%BE%D0%BA%D1%87%D0%B5%D0%B9%D0%BD_%D0%B2_%D1%81%D1%84%D0%B5%D1%80%D0%B5_%D0%BD%D0%B5%D0%B4%D0%B2%D0%B8%D0%B6%D0%B8%D0%BC%D0%BE%D1%81%D1%82%D0%B8. (accessed 14.10.2023).*

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