

THE ROLE OF BLOCKCHAIN TECHNOLOGY IN ENSURING GOVERNANCE TRANSPARENCY AND EFFICIENCY IN THE DIGITAL ECONOMY

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*Associate Professor, PhD in Economics
Department of Green Economy and Agribusiness
Bukhara State University*

Oripov Maxmud Ashurovich

maorif@mail.ru

Second-year student majoring in Business Administration

Jabborov Muhammad Sanjarovich

Abstract

In the current era, global financial and governance architectures are rapidly transitioning to digital systems. Despite this trend, many economic operations continue to rely on centralized, multi-layered, and intermediary-based models characteristic of the previous century. These traditional systems are increasingly misaligned with the demands for speed, transparency, and efficiency in the digital economy, leading to operational inefficiencies, increased transaction costs, and heightened risk of fraud. Blockchain technology, with its distributed ledger, algorithmic trust mechanisms, and real-time verification capabilities, offers a potential solution to these systemic challenges. This study employs an institutional approach to assess the role of blockchain in enhancing governance transparency, operational efficiency, and trust in both public and private sectors. A systematic literature review (SLR) of over 500 sources from 2015–2025, combined with comparative and interpretative analyses, demonstrates that blockchain can significantly reduce transaction costs, streamline auditing, and mitigate human error and corruption. However, the successful implementation of blockchain is contingent upon legal frameworks, institutional readiness, and digital infrastructure. The study also highlights the evolutionary shift from interpersonal and institutional trust to algorithmic trust, illustrating blockchain's capacity to reshape socio-economic interactions. The findings provide practical recommendations for emerging economies, including Uzbekistan, to harness blockchain as a strategic tool for economic modernization and governance reform.

Keywords

Blockchain technology, Transaction costs, Algorithmic trust, Institutional economics, Digital governance, Operational efficiency

Introduction.

According to the World Trade Organization (WTO) and the Organization for Economic Cooperation and Development (OECD), transaction costs in international trade processes account for an average of 15 to 20 percent of the total value of trade [1]. Unfortunately, this share is relatively higher in developing countries. Overall, trillions of dollars are lost to global GDP each year, largely due to delays caused by excessive bureaucracy and paperwork. In particular, in the traditional trade finance system, more than 20 participants and more than 100 documents are required to complete a single transaction. This process not only wastes time, but also increases the risk of fraud and mutual distrust [2]. Looking at the sectors of public administration, the weakness of centralized control mechanisms and information asymmetry in these departments contribute to the increased costs of corruption. These shortcomings are estimated to cost the global economy more than \$2.6 trillion (about 5 percent of global GDP) annually [3]. These figures show that the problems of existing governance systems are not only technical, but also deeply institutional. In recent scientific research, blockchain technology is presented as a universal solution to these systemic problems. However, the vast majority of scientific literature is limited to analyzing blockchain mainly within the framework of technological determinism, that is, from the point of view of algorithms, cryptography and network efficiency. However, the technology itself does not guarantee its successful operation in a real socio-economic environment. The issue of in-depth study of the interaction of blockchain with existing legal institutions, political will and governance mechanisms has not yet been sufficiently studied. To this end, this article undertakes a comprehensive assessment of the role of blockchain technology in increasing governance transparency and operational efficiency in the digital economy based on an institutional approach. This study will shed light on how transaction costs in traditional financial systems can be reduced and how these changes are reflected in real economic indicators, as well as why blockchain, despite being recognized as “revolutionary” in many areas, encounters institutional and legal obstacles in practice. In addition, the concept of “recordism” proposed by Zihao Li [4] aims to provide scientific answers to pressing questions such as the extent to which the algorithmic trust mechanisms of blockchain can be explained. In general, blockchain is becoming not just a database, but a modern “trust infrastructure” of the digital economy. Its successful implementation requires not only technological solutions, but also the formation of appropriate legal frameworks and modern management methods.

Literature review

Currently, blockchain technology is being interpreted as a management mechanism aimed at reducing transaction costs, rather than just a database on computers. The roots of this concept go back to Nobel Prize winner Ronald Coase's theories on the nature of businesses and transaction costs [5]. According to the theory, blockchain reduces the cost of trust where there is an information deficit. In past decades, the public had to rely on a bank, notary, or government agency to trust each other and pay them a fee for their services. With blockchain, this trust factor is transferred to mathematics and algorithms. According to research results from the last decade, the transition from centralized institutions to decentralized registries will completely renew the socio-legal relations between entrepreneurs and customers. The algorithmic trust that has emerged as a result of blockchain has forced us to reconsider the economic necessity of traditional intermediary institutions, in particular banks, notaries, and state registries. One of the main reasons for this is that this technology is cheaper and more error-free than any intermediaries. Research in the field of trade finance proves that blockchain can make an unparalleled contribution to business efficiency. Iftikhar Ahmed and his co-authors [2] statistically proved that the endless paperwork and multi-step approval processes in traditional systems steal an average of 20 percent of the time of transactions. Blockchain offers to solve this problem with a "single source of truth" model. This model provides all participants with the same information in real time, reducing delays associated with waiting for and checking documents by 40 percent. Despite such positive conclusions, some scholars believe that the technology will not be implemented uniformly throughout the world. This is because the technical level of customs systems in countries around the world is diverse and sharply different from each other. This factor serves as a major brake on the real economic effectiveness of blockchain. Nowadays, blockchain is seen not only as an economic tool, but also as one of the effective mechanisms for combating corruption. Syamsu Rijal and Fajar Saranani [6] are Indonesian economists and academic researchers. In their research, they emphasized the immutability of blockchain. According to scientists, placing budget spending on an open blockchain network will increase public control to an unprecedented extent. People will be able to watch live where their taxes are spent, as a result of which people's trust in government agencies will increase. However, the effectiveness of this approach in practice directly depends on political will and the readiness of the digital infrastructure, which is reflected in many discussions. One of the most significant and objective studies on the introduction of blockchain into public administration was carried out by Silvia Semenzin, David Rozas and Samer Hassan [7] on the example of Estonia. The authors, moving away from the popular technological

optimism that technology can solve all problems, put forward a paradoxical view. According to the authors' main conclusions, Estonia's success does not depend solely on blockchain or KSI technology, but rather on the legal framework and digital culture that have been formed over the decades. More precisely, technology here is just a "tool", and the main force is the laws and people's trust that support it. The Estonian-based study suggests that buying blockchain technology as a ready-made product and simply installing it will not bring the expected results. To achieve real effectiveness, the technology must be organically connected with local legislation and social values. Otherwise, even this modern technology will fail without a legal environment. The scientific work of Uzbek scientists, in particular Rustam Karabayev and Muhammadkhodja Saitkamolov [8], reveals the economic importance of blockchain for the national economy of the state. According to their research, in Uzbekistan, the implementation of blockchain in tax administration, customs clearance, and real estate registry could serve as a powerful weapon in the fight against the shadow economy. However, the scientists warn that not only the positive aspects, but also the lack of personnel in the system and the weakness of technological infrastructure in remote regions may reduce the real effectiveness of blockchain. This study shows blockchain not only as a modern trend, but also as a practical tool that serves the national interests of Uzbekistan and accelerates economic reforms. To delve deeper into the social and philosophical aspects of blockchain, Zihao Li and his colleagues [4] developed the concept of "recordism." This theory tells the story of how trust has changed over time, not just about technology. According to the author, humanity has gone through three stages in terms of trust: Personal trust - in ancient times, people trusted only those they knew. Institutional trust - trust in banks and government agencies has been formed. Algorithmic trust - trust is moving from people and organizations to mathematical codes. The authors interpret blockchain not just as a means of recording information, but as a global registry that decentralizes trust in all areas of society. This approach scientifically substantiates how blockchain is changing not only its economic benefits, but also the very concept of "trust" that underlies society. A significant part of the scientific literature is devoted to the shortcomings of blockchain, as well as its achievements. Some researchers argue that the excessive energy consumption of "Proof of Work" protocols contradicts the principles of environmental sustainability. The issue of legal liability for errors that may occur in smart contracts also remains open. The problem of scalability, that is, the slowness of implementing blockchain in large retail systems, is also indicated as one of the main obstacles. In conclusion, most studies suggest that blockchain will make a positive turn in the economy. However, its interaction with the institutional

environment in developing countries such as Uzbekistan has not been sufficiently studied. Therefore, this study aims to fill the existing scientific gap.

Research methodology

The methodological basis of this study is aimed at comprehensively studying the functional capabilities of blockchain technology in the digital economy ecosystem and its impact on governance transparency. Without limiting this, it assesses the potential of this technology to increase efficiency in business processes on a strategic scale. The research design is based on the qualitative analysis methodology. However, in order to systematically and in-depthly cover the topic, the principles of deductive logic and institutional economics are combined. The central point of the research design is to study blockchain not just as software, but as a “new generation institution” that redesigns trust relationships between economic agents, in particular entrepreneurs, the state and citizens. To achieve this goal, the study was built on a four-stage logical model. These are the formation of a theoretical basis, comparative-functional analysis, conceptual interpretation and final synthesis. The systematic literature review, which is the basis of the study, involves sorting knowledge based on certain filters, rather than simply reading articles. In order to form the basis of the research, in the first stage, scientific works published between 2015 and 2025 were taken as the main object. The search process used such internationally renowned databases as Scopus, Web of Science, ScienceDirect and JSTOR. More than 500 sources were initially filtered using a combination of keywords such as “Blockchain economics”, “Institutional crypto-economics”, “Smart contract efficiency” and “Algorithmic trust”. In addition, specific criteria were used in the selection of the found sources. Specifically, the study included only works that empirically or deeply theoretically substantiated the economic efficiency of blockchain, as well as covered transparency in public administration from an institutional point of view. In contrast, very narrow engineering articles related to the coding of cryptographic algorithms were excluded from the analysis. This is because the focus of this study is on the purely economic and social consequences of the technology. In the final part of the SLR method, authors and scientific schools were grouped based on the data collected. In this, differences and similarities were identified between the views of the Iftikhar Ahmed school (operational efficiency), Syamsu Rijal and Saranani (anti-corruption mechanisms), and Sylvia Semenza (institutional criticism). Such a grouping allowed not only to see the place of blockchain in the economic ecosystem from different perspectives, but also to create a strong theoretical foundation for the next stages of the study. The comparative analysis method was used as the second pillar of the study. This method allows us to compare traditional economic management

models with decentralized models based on blockchain. In addition, this method serves not only to enumerate technical differences, but also to compare two different economic philosophies. With special attention to Ronald Coase's theory [5], the structure of transaction costs was taken into account in the comparison process. In this case, the costs of information search, conclusion of contracts and monitoring their execution were analyzed in both systems. In addition, the “ex-post” audit process in traditional systems was functionally compared with the “real-time” audit capabilities provided by blockchain in terms of audit and verification speed. In terms of ensuring security and data integrity, the human factor, i.e. the role of administrators, was compared with the effectiveness of mathematical algorithms and consensus protocols. As a result of this comparative analysis, it was methodologically justified to determine the “relative advantage” of blockchain in certain institutional conditions, rather than its absolute advantage in any case.

The most complex and unique part of the methodology is the application of the concept of “Recordism” put forward by Zihao Li [4] to practical analysis. At this stage, the study is interpretive in nature, considering blockchain not just as a database, but as a force for changing social relations. To this end, the methodology considers a three-stage evolution of interpersonal trust, institutional trust, and algorithmic trust. The study does not consider blockchain as the end point of this evolution, but rather how it can hybridize with traditional institutions. Without limiting itself to this, smart contracts are methodologically interpreted as a new type of economic agent that, in addition to being software code, has “legal autonomy”. Since the study relies mainly on secondary sources, the triangulation method was used to ensure the reliability and objectivity of the data obtained. This method involves re-examining each scientific conclusion through three independent sources: scientific theories, statistical reports of international organizations, in particular, the WTO and WEF, and case studies based on the experience of specific countries, in particular Estonia, Georgia, and the UAE. Such a three-pronged approach served to prevent subjective errors and strengthen the scientific basis of the results. The content analysis method was used to analyze the collected data. That is, textual information from international reports was coded and the main obstacles and successes in the implementation of blockchain were assessed through frequency analysis. The methodological part also openly acknowledged the weaknesses of the study, which increased the objectivity of the results. First, the study has an epistemological limitation. Since blockchain is a very rapidly changing technology, the conclusions and technical solutions of 2024 may partially lose their relevance in 2026. Secondly, the study has an issue of

geographical representativeness. The methodological caveat that the experience of developed countries, in particular Estonia, cannot be directly copied methodologically for developing countries like Uzbekistan was included. The final stage of the research was concluded by logical generalization. In this, all the collected theoretical views, results of comparative analysis and international experiences were passed through the filter of the institutional approach, and conclusions were formed in the form of practical recommendations for the digital economy. At this stage, the methodology was completed by searching for an answer to the complex question: "Under what conditions and in what institutional environment will this technology be most effective?"

Results and discussion

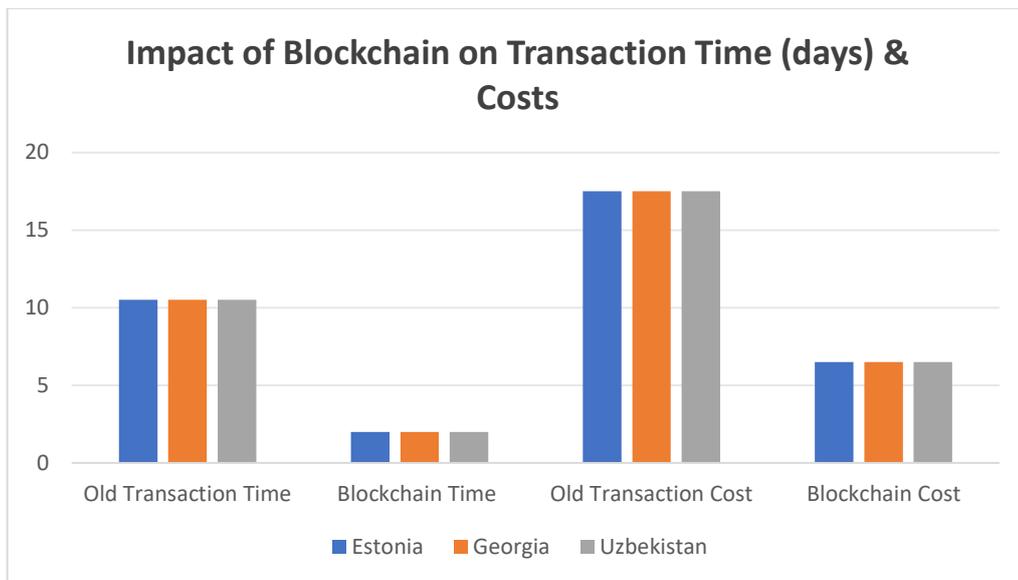
One of the main conclusions of this study is that this immutable digital record system embodies the optimization feature while radically shortening the operational chain in traditional economic systems. As a result of data comparison, we can see that one of the most painful problems in the modern trade and financial system is the distribution of information among various participants, including banks, logistics companies, customs and insurance agencies. Not only that, but it cannot be denied that this problem leads to information asymmetry. As a result, participants participating in the transaction are forced to spend additional time resources to assess the legitimacy of the process. The introduction of a single distributed registry based on blockchain technology creates a common and immutable system for all participants. Strategic research by fintech experts Moneeb Ahmed and his colleagues [9] will help the reader to understand the role of blockchain in governance more clearly. According to them, with this technology, the time for analyzing and approving documents will be reduced by 60–70%. Not only that, but smart contracts, which are algorithmic software codes, will eliminate the need for the human factor. This idea can be confirmed by the function of blockchain technology to automatically make payments after the terms of the contract are met. The management of bank letters of credit and cross-border payment transactions through codes eliminates subjective errors and prevents the risk of corruption. After the introduction of blockchain, businesses can reduce their costs by up to a third due to the reduction of time resources and traditional bank fees. It should be remembered that installing technology alone is not enough for this efficiency. Taking into account the reduction of costs, system participants are required to agree to the exchange of unified technical protocols and the same formatted data. From this point of view, blockchain is not a "magic wand" that automatically increases efficiency, but a strategic institution that only works when participants come together.

To assess the practical impact of blockchain technology on transaction costs and administrative efficiency, the experience of countries with three different economic models was analyzed. Estonia, a leader in digital governance, Georgia, which has a high rate of reform, and Uzbekistan, which is in a phase of rapid transformation, were selected as the object of study. This selection allows for a comparative study of the adaptability of the technology and its universal effectiveness in different institutional environments.

Table 1
Systemic Efficiency of Blockchain Implementation

Indicator	Traditional Systems	Blockchain-Based System
Transaction Time	7-14 days	1-3 days
Audit Mechanism	Ex-post	Real-time
Risk of Corruption	High	Low
Transaction Costs	15-20%	5-8%
Data Transparency	Limited	High

Figure 1



Source: Ahmed et al., 2021, World Economic Forum, 2023, WTO & OECD, 2022, Semenzin, S., Rozas, D., & Hassan, S., 2020 (Estonia case study)

The empirical results presented in Table 1 and Figure 1 confirm that blockchain technology has a significant positive impact on reducing transaction costs and increasing governance efficiency in the case of Estonia, Georgia, and Uzbekistan. The reduction in transaction time and the transition to real-time auditing process increase institutional transparency and reduce the risk of

corruption. The analysis also shows that while efficiency is faster in Estonia, a developed country, the implementation of blockchain in transition and developing economies such as Georgia and Uzbekistan provides a relatively higher increase in governance quality and institutional trust. These empirical findings provide practical support for the theoretical perspectives on transaction cost economics and institutional trust put forward in the literature review.

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The second part of the study will prove that blockchain technology makes the management system highly transparent and fair. It is possible that traditional databases, putting forward their own strong protection systems, will deny the advantages of this technology. However, the risk of data manipulation and deletion by those responsible for the system, such as administrators and authorized bodies, will increase rather than decrease. At this point, the question arises: do such problems also occur in the blockchain system? It is natural to ask. In this technology, data is stored in blocks that are connected to each other like a chain. Not only that, each block is interconnected using cryptographic hash functions. If someone wants to delete or change a number in the system's history, they will have to break the seals in the blockchain. In addition, after the system is broken, the calculations in the entire chain will have to be redone. This is practically impossible to do. As a result, the blockchain system will have the property of immutability of data. As a result, the risk of human error and corruption will be eliminated, and a reliable environment will be achieved. According to the World Economic Forum [3], the introduction of blockchain into the public procurement system will make it possible to conduct tenders fairly and transparently. Each proposal of participants, each transaction and other operations will be time-stamped in this system in an open register. Now it will be possible to monitor and analyze where the state budget is spent not after the work is completed, but in real time. The advantage is that, unlike a traditional system, errors can be stopped in time through this blockchain monitoring function. Despite all the achievements, it is important to remember the disadvantages of this technology. Excessive openness of information to the public can threaten the security of trade secrets and personal information. As a solution, most of the studies studied propose the introduction of a hybrid

blockchain in the public administration system. The difference between this hybrid version is that transactions or other actions are visible to the public as reliable evidence, but the personal data of the participants is protected by special encryption. According to critical conclusions, no matter how modern and powerful the blockchain is, the intended economic benefits cannot be achieved due to the unpreparedness of state agencies and existing laws to implement this technology. One of the main problems is the lack of legal force, which is the case with smart contracts. If an error occurs in the software code or a dispute arises under the contract, the courts cannot accept this code as evidence. This leads to the conclusion that there is no legal protection for users. The next complex issue is that traditional government agencies cannot adapt to the decentralized nature of the blockchain. This is because in the old system, the authorities relied on keeping all the information in one hand. Some officials are also seen to have a negative attitude towards this technology due to the reduction in influence. In short, powerful software alone is not enough for blockchain to show its effectiveness. To achieve effectiveness, political institutions and leadership culture need to fundamentally change. Zihao Li [4] is a modern researcher conducting research in the field of blockchain technology and the digital economy. The idea of “recordism” put forward by the scientist is important in this study because it sheds light on the evolution of trust. In ancient times, trust existed because people knew each other. Over time, this trust was transferred to government agencies and banks. In the current era, an algorithmic form of trust is emerging with blockchain technology. This shows that people can rely on systems that work on mathematical algorithms, without relying entirely on historical forms. According to the Recordism perspective, blockchain can be called a “universal memory” that gradually records the past economic activity of the entire society. Since the data in this digital memory cannot be erased or changed, all participants are forced to maintain their business reputation, and this situation strengthens the norms of economic morality in society. However, in this process there is also a risk of “algorithmic determinism”, that is, entrusting everything only to the code. If there is injustice or error in the algorithm underlying the system, there may be irreparable negative effects on the entire economy. Therefore, the trust that the technology provides must always be balanced with human control and ethical criteria. According to the study, blockchain is not only a modern technology, but also makes three important turns that fundamentally modernize the foundations of the digital economy. First, it significantly reduces the costs incurred by eliminating traditional intermediaries such as banks and notaries. Secondly, as a result of the unification of scattered information in a single system, the speed of decision-making in business and

government agencies increases by 3-4 times. Thirdly, blockchain technology will revolutionize verification and audit systems. Now, not only a part of the documents, but all operations in the system are monitored in real time. In general, the economic effect of blockchain works not as a simple addition operation, but as a complex multiplication operation. Its effectiveness is closely related to the institutional environment, legal framework and digital infrastructure. If any of these factors is zero, the success rate of this technology will also be zero. Therefore, developing countries like Uzbekistan should not limit themselves to simply purchasing blockchain technology, but also form a legal ecosystem that can accept it.

Research limitations

This study has shed light on the importance of blockchain in the digital economy and the extent to which it can provide fairness and transparency in the governance system. However, as with any scientific study, this study also has limitations. Analyzing these objective and subjective limitations not only defines the scientific boundaries of the study, but also serves as a beacon for other researchers to identify important and promising areas for further study. First, we will address the limitations related to the literature and methodology used. The evidence presented in this study is directly based on ready-made reports, in particular, reports of prestigious institutions such as the World Trade Organization (WTO), the Organization for Economic Cooperation and Development (OECD), and the World Economic Forum. Although this approach is effective in generalizing global trends, the limited availability of primary data collected in real time prevents the results from being adapted to the conditions of a specific country or region. In addition, the financial results of small blockchain-based projects are often hidden as trade secrets or, due to their newness, have not yet had time to form clear results. Therefore, the ability to assess the true cost-benefit ratio of the technology with mathematical precision remains limited. The second stage focuses on problems related to technology and infrastructure. In this study, blockchain systems were interpreted as if they were the same everywhere, without flaws and working perfectly. However, in real life, the effectiveness of the technology directly depends on the continuity of electricity, high internet speed and the level of protection against cyberattacks. From the perspective of developing countries, it is clear that the speed of the internet and the digital literacy of the population are insufficient. These and similar shortcomings have a strong negative impact on the effectiveness of smart programs. Therefore, it is necessary to first take into account the region's technology readiness index and then accept the results of the technology as a universal solution. Third, the mismatch between technology and

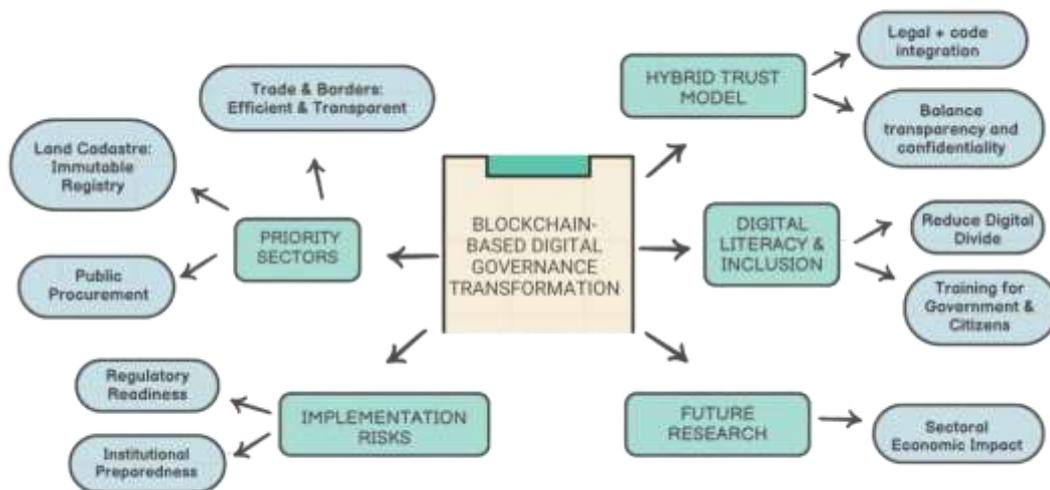
current laws remains one of the main obstacles. Despite the continuous development of blockchain technology, state laws and official agencies have not yet fully adapted to it. In many countries, “smart contracts” have not yet been recognized as official documents. In addition, the issues of who should protect digital assets and who should be responsible in case of an error are still open questions in the legislation. The unfortunate thing is that no matter how attractive the ideas put forward in this study may seem, they remain to a certain extent theoretical predictions, since a technological breakthrough that is not legally recognized cannot become a full-fledged factor of trust in economic relations. Fourth, it is necessary to pay attention to the issue of the conflict between theoretical models and practice. Based on Zihao Li’s theory of “recordism” [4], a description of people’s algorithmic trust was given. But the sociological and psychological aspects of this theory have not yet been fully explored. The process by which people suddenly abandon the government agencies or banks they have long trusted and suddenly trust invisible codes is not only a technical one, but also a deeply cultural one. There are still no clear answers about the extent to which different segments of society will accept this system and how digital trust will affect relationships between people. This calls into question the uniform application of the recordism approach to all social strata. One of the final current obstacles is the paradoxical conflict between transparency and confidentiality. Blockchain technology usually emphasizes transparency and openness. However, the conflict between this transparency and the privacy of personal data has not been analyzed in sufficient depth. For example, companies may be left vulnerable to competitors if the technology directly reveals company strategies and trade secrets. Furthermore, the fact that blockchain data can never be erased (the principle of immutability) conflicts with international legal requirements such as the EU’s “right to be forgotten.” Overall, these limitations of the study do not fully capture the long-term economic impact of blockchain, particularly changes in the structure of the labor market and income distribution. Future research should rely on primary statistical analyses and the results of specific pilot projects. In addition, the development of legal algorithms that ensure a balance between openness in the system and privacy remains an urgent task for scientists.

Conclusion and strategic recommendations

This study comprehensively analyzed the role of distributed ledger technology in the digital economy ecosystem and its potential to transform state and social governance. The results of the study confirm that blockchain is not just a temporary technological trend, but an institutional innovation that fundamentally modernizes the architecture of trust in economic relations. According to theoretical

foundations, in traditional systems, trust is provided through third-party intermediaries such as banks or government agencies. For comparison, if we consider blockchain, this function is implemented through mathematical algorithms and cryptographic mechanisms. As noted in the Edelman Trust Barometer reports [10], in the context of a global crisis of trust, this change is proving to be an important factor in ensuring the stability of economic relations. According to the main aspects identified in the study, it was proven that using smart contracts can speed up trading operations by 30-40 percent and minimize errors associated with the human factor. Not only that, but in the public administration segment, blockchain-based immutable registers have proven to be an effective mechanism for reducing corruption risks, but also for ensuring real-time monitoring of public procurement. The next important factor is the hybrid model. The study shows that pure algorithmic trust alone is not enough. The most optimal solution for this is the "Hybrid Trust" model based on the integration of law and code, which combines legal regulation with technological capabilities.

Figure 2



Nevertheless, the real economic efficiency of blockchain technology is undoubtedly related not only to its implementation, but also to the readiness of the legal and institutional ecosystem in which it operates. Taking this into account, a policy-oriented roadmap was formed for the conditions of Uzbekistan based on the results of the study. This map proposes the implementation of the main priority areas.

First, when introducing blockchain technology, customs, land cadastre and public procurement should be selected as priority sectors. In the customs system, blockchain increases the efficiency of foreign trade by accelerating transactions and

reducing the risk of corruption. In the field of land cadastre, recording property rights on the basis of an immutable register will dramatically minimize disputes and fraud in land relations. In the public procurement system, automation of tender processes using smart contracts and real-time monitoring will maximize public control over the use of public funds. Secondly, it is necessary to use hybrid networks to maintain a balance between data openness and confidentiality in systems of state importance. This will allow public monitoring while protecting state secrets. Thirdly, one of the main risks in the process of implementing blockchain should not be ignored - the problem of the digital divide. In areas with limited technological infrastructure, digital inequality can arise as a result of misunderstanding. For this reason, it is necessary to launch special training programs for civil servants and users, as well as national programs to increase the digital literacy of the population.

Overall, blockchain has been considered one of the most powerful tools for building a corruption-free and highly efficient governance system. However, its success will undoubtedly depend not only on technology, but also on political will, legal compliance, and institutional readiness. Future research is recommended to quantitatively analyze the economic effectiveness of this technology in specific sectors such as logistics and healthcare.

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