S. Zhamburbayeva[*] ⓘD, G.A. Ilyassova ⓘD

Karaganda Buketov University, Karaganda, Kazakhstan
(*E-mail: sabisha_zh@mail.ru*)

[1]*ORCID ID: 0009-0005-3531-8216, Scopus Author ID: 58988421900*
[2]*ORCID ID: 0000-0002-8843-2515, Scopus Author ID: 57197811182*

The realization of the "Concept of digital transformation, development of the information and communication technologies and cybersecurity industry for 2023–2029" by implementing blockchain in the technologies of the Republic of Kazakhstan and the problems of its legal regulation

In the scientific article, the implementation of the "Concept of digital transformation, development of the information and communication technologies and cybersecurity industry for 2023–2029" was considered, which, according to the authors, is possible through the prism of the introduction of blockchain technologies in the Republic of Kazakhstan. The main focus is on analyzing the current state of the digital infrastructure, identifying potential applications of the blockchain and identifying regulatory issues related to its use. The article begins with an overview of the strategic objectives of the Concept and an assessment of its impact on the economic development of the country. The authors discuss blockchain as an innovative tool capable of ensuring transparency, security and reliability of data in various sectors, including finance, healthcare and public administration. In this aspect, an overview of existing technologies that have already been applied in practice was conducted; accordingly, the Republic of Kazakhstan can adopt them for the future. Special attention is paid to the analysis of the problems faced by Kazakhstan in integrating blockchain technologies into the existing legal system. The authors explore the need to develop new legislative acts, as well as adapt existing regulatory documents to create a favorable legal environment for blockchain. The potential risks and benefits that may arise as a result of the large-scale introduction of blockchain technologies in Kazakhstan are also discussed. In conclusion, the article offers recommendations on improving the legal framework for blockchain, emphasizing the importance of international cooperation and exchange of experience in this area.

Keywords: the concept of improvement, country development, digitalization, digital security, blockchain, personal data protection, information and communication technologies in law, legal regulation.

Introduction

The Concept of digital transformation, development of the information and communication technology industry and cybersecurity for the period 2023–2029, approved by the Government, is a strategic plan for the introduction of digital technologies into all spheres of public life of citizens of the Republic of Kazakhstan [1]. In this context, blockchain technology, as the authors of this scientific article dare to suggest, acts as a potential catalyst for change, bridging existing gaps and providing six main directions.

To begin with, the introduction of blockchain leads to the strengthening of cybersecurity. According to available research, we have come to the conclusion that turning to the proposed innovative technology increases the security of our data due to distinctive properties, including decentralization and encryption. This is naturally important for the protection of infrastructure and personal data.

At the same time, we would like to note that other components are equally important: transparency and observability. Technically, blockchain makes it possible to create systems that increase the transparency of transactions and simplify the tracking process. These indicators are especially useful in the field of public administration and property control.

The third aspect that creates the logical need for this technology is to increase efficiency and reduce costs. The reason for this is that smart contracts based on the blockchain system allow you to automate processes, reduce time and operating costs, and reduce risks that are directly related to the human factor.

The next direction is that the financial sector needs innovation. Blockchain promotes financial innovations such as digital currencies, which can accelerate the transition to electronic payments and thus make fi-

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nancial services more accessible. Many countries are digitizing their national currency — our tenge expects the same.

The use of blockchain to implement the concept of the Republic of Kazakhstan is naturally attractive for investment. The blockchain in our system can stimulate investment flows, create jobs and increase budget revenues, and this, in turn, contributes to economic growth.

Last but not least, it involves the development of human capital. The training of specialists in the field of blockchain technologies improves their qualifications and prepares them for work in the field of high technologies.

Blockchain can be an important mechanism for achieving the goals explicitly stated in the concept, including improving governance, developing the digital economy and strengthening cybersecurity, which will certainly lead to the preservation of personal data. The introduction of blockchain technology requires coordinated actions on the part of the state, business and educational institutions to create the necessary infrastructure and train qualified personnel.

Methods and materials

In the context of the Concept of digital transformation of Kazakhstan, within the framework of scientific work aimed at analyzing the implementation of blockchain technologies and studying legal regulation issues, it is proposed to use the following set of methodological techniques and information sources.

Main methodological approaches: case studies: analysis of specific examples of the use of blockchain in public and private structures; legal analysis: study of current legislation related to blockchain technologies and identification of possible obstacles to the development of law; statistical analysis: assessment of the impact of blockchain on the modernization of the life system.

The sources of information are: the regulatory framework: the main legislative documents, including the conceptual text; scientific work: published articles and research on blockchain and its application in various fields; analytical reports: documents prepared by government agencies, international institutions and research centers related to digital transformation; media: articles in the press and others media reflecting public debate and opinions about blockchain and digital transformation; practical examples: concrete examples of the implementation of blockchain technologies.

The use of the methods outlined by us and the analysis of these materials will allow us to thoroughly study the process of implementing the Concept of digital transformation with an emphasis on blockchain, as well as assess current problems and opportunities for improving the legal framework, which contributes to the support and development of the digital transformation of the Republic of Kazakhstan.

Results

Based on the identified characteristics of the blockchain technology, it was logically revealed that this particular technology is able to play a successful role in the implementation of the "Concept of digital transformation, development of the information and communication technologies and cybersecurity industry for 2023–2029". The positive features inherent in the blockchain are a reliable guarantee for ensuring confidentiality and, at the same time, transparency. This, in turn, is quite attractive and necessary in conditions of frequent leakage of our personal data that we contribute to global networks, and the transparency of blockchain technology is a real way to realize our constitutional rights in all areas that we use daily.

Effective blockchain regulation in Kazakhstan requires an interdisciplinary approach involving technical experts, economists, lawyers and members of the public, including international cooperation, along with an interdisciplinary approach involving academia.

Particular attention should be paid to the legal mechanism governing blockchain technology, which is constantly evolving depending on the dynamics of this innovative new field around the world. Some important information about the current legislation is listed below:

1. Many countries are creating guidelines and standards for blockchain technologies to help entrepreneurs and lawyers understand distributed registries and crypto assets [9].

2. The EU is committed to creating a unified regulatory framework for blockchain to prevent regulatory fragmentation and provide legal certainty for blockchain applications. The Commission has presented a wide range of legislative initiatives on the management of crypto assets, which are expected to stimulate investment and protect consumers and investors.

3. The EU has proposed a pilot market infrastructure regime that would allow trading and transactions in financial instruments in the form of crypto assets, as well as proposals for "freer, fairer and more inclu-

sive" regulation. Using blockchain, it becomes possible to experiment with innovative solutions and deviate from established rules, as regulators and companies seek to apply innovative ideas in blockchain-based models [10].

4. Countries and international organizations cooperate in developing common approaches to blockchain regulation that comply with international standards and prevent litigation.

Legal norms related to blockchain are currently under development, and many countries and regions are involved in the development of reliable legislative systems that can promote innovation and protect the rights and interests of market participants in the development process. Kazakhstan should start learning from its mistakes, as it is gradually moving forward and can make appropriate adjustments in the future.

Discussion

In 2023, the relevant regulatory act approved the strategy for digitalization, ICT development and strengthening cybersecurity for the period 2023–2029. In accordance with the National Plan until 2025 and other strategic documents, the strategy we are putting forward for discussion is aimed at identifying the most effective methods of solving urgent problems in the provision of public services to the population and enterprises, transforming the public administration system and stimulating economic sectors through the integration of digital technologies.

The strategic goal is achieved based on the following key principles:

1. to improve the quality of life of citizens, which is a serious problem, accordingly, the upcoming plans include placing great emphasis on personal comfort. This implies that the services provided and the planned changes will be adapted to the needs and problems of citizens, including even the factor that the transition to public services will gradually be carried out within the framework of applications on the phone;

2. to ensure the openness of government agencies and public participation in decision-making and the use of digital tools for direct communication between subjects and authorities;

3. to strive for concrete changes through systemic innovation and digital technologies;

4. to put the quality of services first by providing citizens and businesses with tools to assess the functioning of public institutions;

5. to adapt to current trends and set goals in accordance with socio-economic priorities;

6. to avoid unnecessary duplication in information systems;

7. to move to more horizontal management structures;

8. to provide data for use by market participants and provide public services by private companies;

9. to protect privacy and personal data, ensure cybersecurity;

10. to provide access to information only to those persons who have the right to it;

11. to protect information from unauthorized modification or destruction;

12. to ensure open access to information, if necessary [2].

The implementation of the identified principles should contribute to the overall development of the country's innovation potential, strengthen the national innovation system and move to a qualitatively new level. This, in turn, will significantly increase the competitiveness of Kazakhstan's economy in the global market.

As a result of the realization of the provisions of the Concept, it is planned to create a Single e-government platform that will ensure the integration of interdepartmental processes and the creation of an integrated infrastructure for the provision of services and the functioning of the public administration system. The document notes that the platform model will allow creating an effective government system focused on solving everyday tasks of citizens, as well as using up-to-date online data to apply artificial intelligence tools in forecasting and decision-making based on artificial intelligence Smart Data Ukimet.

Data processing centers will be established in each region of the country. The 5G mobile communications infrastructure, operating on the principle of "always online" and characterized by low energy consumption, combined with big data analysis and the Internet, will become one of the main elements and driving force of the digital economy. Taking into account urbanization and economic feasibility, the issue of connecting to the Internet the remaining villages with a population of less than 250 people, who are experiencing corresponding difficulties and limitations in connection with proper quality assurance in this area, will be considered.

It is assumed that the ICT sector will be provided with highly qualified specialists, which will achieve a multiplier effect for the transition to a new "smart" level. This will reduce the number of public services

through the reengineering of business processes, the use of artificial intelligence elements, the use of technologies in economic sectors and the transition to the provision of public services taking into account life situations [2].

The Concept includes the following key areas that are of particular interest in this work:

1. The Smart Cities initiative aims to use ICT to improve the quality of life and efficiency of urban functioning. The strategic direction is to create urbanized areas where the resources of urban services and private initiatives cooperate for the sustainable development of the city. Accordingly, it is natural that digital technologies will be integrated into all aspects of urban life, including education, transport, housing and communal services, healthcare and others.

2. In the context of the growth of public Internet addresses (IP) and digital content, it is necessary to develop a "Cyber Shield of Kazakhstan" to protect against hacker attacks. Thus, a Malicious Code Research Center will be created to identify and neutralize cyber attacks.

3. It is important to consider joining the Convention on Data Protection, which will allow investigating violations of citizens' rights in the field of personal data protection.

Thus, we can note that comprehensive global work is planned. However, such actions, especially when personal data is exposed to open exposure, require competent support. With the advent of blockchain technology, many countries have adopted it as a means to achieve this goal.

Scandals in the financial industry and the global economic crisis that engulfed the country in 2009 led to a loss of confidence in people's ability to protect their personal finances. Satoshi Nakamoto and technical and mathematical experts were looking for new and decentralized approaches to financial transactions that could eliminate the limitations of traditional banking systems and provide direct payments and exchange of values.

Mike Schwartz compared the power of blockchain to the ability to communicate between machines and compared its impact on the world to devices such as the internal combustion engine, telephone, computer and the Internet, which have revolutionized our understanding of how technology works [3; 14].

Blockchain is, in fact, a database similar to a registry, which is decentralized and accessible to many computers on the network. Although it was originally used to protect cryptocurrency transactions, the technology has since been used in various applications. Blockchain can be used in various industries to create long-term data, which means that they cannot be changed after recording, which corresponds to the principle outlined in paragraph 11 above.

The blockchain works on the principle of dividing information into technical blocks, which are then connected in a chain, unlike traditional databases, which still have information in the form of tables. Each of the blocks generated contains programs or prescribed scripts that perform database functions that provide access to the necessary data. The information is loaded into the block and then processed by an encryption algorithm that generates a special hash from the incoming data. A sequence of unrelated blocks is formed by adding a hash to the beginning of the next block, which is a sequence of blocks.

The cyclical nature of this innovative technology, according to its logical chain, has the ability to store copies on multiple computers, and each existing copy requires coordination for complete protection. The data is then distributed among the various nodes of the network in a network distributed across all nodes of the network, which is used to ensure redundancy and accuracy of the data. If a node detects a data change, other nodes will block that change, thereby preserving data integrity.

The blockchain provides security and stability by storing new blocks in both linear and chronological order, with new blocks being stored accordingly. If the data in a block is changed by changing the hash of the data, it will affect its data if the network changes the hash and the data changes its data, but the changes will not be accepted because the hash is not in the correct position in the hash and the changes are not reflected by the network.

With the ability to store undated information and transaction history, this technology allows you to store various types of data, including legal documents and inventory data. Blockchain users can access Bitcoin in real time thanks to its distinctive feature that decentralizes transactions in the chain.

Although blockchains are not completely impenetrable and may contain vulnerabilities in the code, attacks such as "51 %" require control over most of the network and quick actions, which is difficult due to the high hashing speed in networks, for example, in the Bitcoin network, which on April 21, 2023, the hashing speed is 348.1 v a second (18 zeros) [4].

Architecturally, blockchains are divided into several types depending on access to reading and writing data.

Public blockchains are open for reading and possibly writing by all users. Public blockchains are useful for systems where there is no central authority to verify transactions and where full decentralization is required. Private blockchains are controlled by organizations that only allow their members to write data and can restrict or open read access. The consortium's blockchains are managed by a group of nodes belonging to different organizations and serve to exchange information between them. Private and consortium blockchains offer benefits such as reduced verification time and costs, reduced risk of attacks, and increased privacy because read access can be limited. They also allow users to adjust or cancel transactions if errors are found in smart contracts.

The choice of the type of blockchain depends on the required degree of decentralization, as well as time and cost constraints. Hybrid solutions can be used that combine public and private blockchains for various tasks, such as using a private blockchain for internal operations and a public blockchain for customer interaction.

When choosing a blockchain, it is important not to strive for decentralization for the sake of decentralization itself, which implies dispersion around the world. Many business processes are effectively managed using relational databases, and switching to blockchain may be unjustified. Private blockchains provide the benefits of cryptographic auditing and data validation, making data immutable and traceable. Blockchain may be preferable to a database if a company plans to expand its private business and use a public blockchain for additional verification, given the growing demand and volume of transactions [5; 58].

The analysis of blockchain technologies allows you to objectively assess their potential and identify areas in which they can most effectively contribute to innovation and improvement. Despite the significant opportunities, some functions of the blockchain may contradict the interests and practices of market participants. The immutability of the blockchain requires careful control over data entry, since correction will require significant computing resources compared to traditional accounting systems.

Blockchain guarantees confidentiality, integrity and availability of data, while ensuring transparency and traceability of transactions. The distributed nature of the blockchain allows the creation of decentralized ledgers that can contribute to the development of digital trading solutions in the field of intellectual property and other industries. Blockchain also speeds up information processing and transactions, eliminates the need for intermediaries, and increases the security of monetary transactions and supply chain tracking [3; 24].

Blockchain technologies are used in various fields, confirming their value in the context of digital transformation and the development of information and communication technologies for 2023–2029.

Blockchain can play an important role in the development of smart cities, which will require a more efficient allocation of resources. With the help of blockchain, it is possible to ensure that the system remains unchanged, reliable, which makes the use of assets more transparent and reduces operating costs [6; 33]. It can be used for a variety of purposes: creating unique identity cards, supporting local businesses, managing land and housing resources, monitoring resources and the environment, improving transport systems, integrating various intelligent devices, ensuring transport security, etc. This allows for reliable storage of large amounts of data and allows residents to actively participate in city management and influence decisions that affect their immediate environment, from the budget to elections [7; 20].

In the field of public services, blockchain can revolutionize taxation by ensuring the origin, transparency and traceability of a transaction. We believe that this fully meets the current needs of the tax system. Blockchain provides a guarantee to reduce administrative costs, especially in the segment of transaction taxes such as VAT and withholding tax at source. In a broad sense, this can contribute to compliance with tax legislation and transparency of payments by transferring responsibility for tax collection to market participants. However, the problem lies in the digitization of sellers who have not yet switched to digital technologies.

In the field of medicine, blockchain can ensure patient confidentiality when storing and sharing medical data.

Researchers Yue and his co-authors have proposed a medical data gateway (HDG) that accesses a private blockchain cloud to ensure the immutability of medical data. The indicator-based Data Model (ICS) provides a unified approach to storing various medical data, including digital, textual and graphical data. This model can be adapted for other blockchain applications that require the storage of various types of data and provide for the division of data into blocks based on the frequency of access.

Medshare, a system that was created by Xia specialists and his co-authors, provides a blockchain solution for the exchange of medical data between cloud services, which allows you to control access, data origin and auditing. Smart contracts that are included in this system include limited access to data and do not allow abuse.

The blockchain innovations discussed above open up new horizons for improving public services and healthcare within the framework of digital transformation [6; 33].

Voting is a key element of democracy because it gives citizens the opportunity to elect their leaders and form a government, and for the system to be fair, it must be independent and objective. But the old voting methods have drawbacks: they are not always transparent and secure, depend on intermediaries and may face problems such as illegal influence on voters, fake votes and poor control of the process [8; 2067].

In elections, there are often difficulties with organization: from choosing a place to vote to printing ballots and monitoring the integrity of the process. All this ends with the counting of votes and the announcement of the results. Blockchain can help solve these problems. Voters can "send" their vote as a virtual coin to a candidate, and the blockchain will record each such vote. This allows you to quickly summarize the results and guarantees the honesty of the results. In 2018, a test was conducted in West Virginia, where 144 voters from different countries voted through a blockchain application — this was the first project of its kind in the country that allows voting remotely and securely [7; 20].

With the significant advantages of the technology under discussion, there are weaknesses in this system. The lack of centralized control can lead to abuse and a decrease in legal certainty. Blockchain faces scalability and energy consumption issues, and also depends on the quality of external data. The variety of implementations and the need for standardization can make it difficult to widely implement the technology.

You can also pay special attention to the possibilities: by eliminating current weaknesses, blockchain opens up prospects for asset tracking and accelerating digital transformation through smart contracts and new trading platforms [11; 126]. Standardization and the development of common management practices can contribute to the creation of a digital commerce ecosystem.

Nevertheless, there are threats, namely, the rapid development of technology and the lack of international regulation create technological threats. First-timers need to be prepared to respond to security vulnerabilities. Organizations acting as intermediaries may feel threatened because of their position. It is also important to consider the legal acceptability and relevance of the data stored in the blockchain, as well as possible security issues such as 51 percent attacks, phishing, routing attacks and Sybil cyberattacks [3; 25].

Establishing legal regulation of blockchain technologies in the Republic of Kazakhstan, as in any other country, is a difficult task for several reasons.

To begin with, this is a relatively new technology, and many aspects are still being studied. This means that legislation must be flexible enough to adapt to the rapidly changing technological landscape.

However, technical complexity can cause even more difficulties, especially when there is not enough potential staff capable of understanding the technical details of the blockchain. This requires specialized knowledge, which may be lacking for legislators and regulators.

The use of blockchain for cross-border transactions makes it an ideal solution for controlling such transactions within a single jurisdiction. Decentralization, especially in terms of deregulation of the rules and laws governing blockchain technology, is not a viable solution, and various countries are creating their own laws and regulations to regulate blockchain technology, including intellectual property, contract law, taxation and other relevant areas is not a viable solution. We must be aware that there is an inherent problem of merging with existing legislation. In addition, different countries may lack a universal language to address this problem in relation to their respective legal systems.

Conclusions

Blockchain technology is a potential pathway to the digital economy, offering several important benefits such as increasing the legitimacy and security of transactions, reducing costs, facilitating decentralization, and increasing efficiency and transparency.

By 2027, analysts estimate that blockchain will account for up to 10 % of global GDP. Among other advantages, the blockchain is analyzed using various sources of information; one of the key advantages is the reduction of errors related to the human factor, which increases accuracy.

The use of blockchain technology, as we can observe, reduces costs by eliminating the need to involve third parties in the verification, for example, auditors, accountants; taking into account the fact that the func-

tions performed by these specialists are already included in the blockchain program. The very features of the system, including decentralization, distribution of transactions, etc., increase data transmission and security over the network. In addition, the blockchain accelerates transactions by making transfers in a fraction of a second, which is impossible in any bank's applications, and works around the clock. Blockchain is also attractive in that it preserves confidentiality by making transactions visible, but maintaining the confidentiality of personal information; provides security by keeping confirmed transactions unchanged; most codes are open for verification, which ensures transparency; guarantees access, allowing those who do not have bank accounts to participate in the financial system.

With such significant advantages that we have listed, it is impossible not to pay attention to the disadvantages. The system requires significant computing resources; due to the workload of the system, these innovative technologies can be slow and inefficient. Privacy, which we emphasized above, is no less catchy, it can facilitate illegal transactions; and moreover, there is a reasonable risk of government interference in cryptocurrencies.

In general, blockchain provides innovative technical solutions for the financial and other sectors, but, like any field and innovation, requires careful regulation and improvement to eliminate shortcomings.

Therefore, the upcoming research in this area and the development of functioning blockchain technology are an important step towards creating a more efficient, secure and inclusive global economic system. And the subsequent analysis is necessary beyond any doubt, because it is important and relevant to help the Republic of Kazakhstan in the successful implementation of the "Concept of digital transformation, development of the information and communication technology industry and cybersecurity for 2023–2029".

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С. Жамбурбаева, Г.А. Ильясова

Қазақстан Республикасының технологиясына блокчейнді енгізу арқылы «Ақпараттық-коммуникациялық технологиялар мен киберқауіпсіздік саласын дамытудың 2023-2029 жылдарға арналған цифрлық трансформациялау тұжырымдамасын» іске асыру және оны құқықтық реттеу мәселелері

Мақалада «Цифрлық трансформация, ақпараттық-коммуникациялық технологиялар мен киберқауіпсіздік саласын дамытудың 2023-2029 жылдарға арналған тұжырымдамасын» іске асырудың тетіктері қарастырылған. Авторлардың пікірінше, бұл Қазақстан Республикасында блокчейн технологиясын енгізу арқылы мүмкін болады. Цифрлық инфрақұрылымның ағымдағы жай-күйін талдауға, блокчейнді қолданудың әлеуетті салаларын анықтауға және оны пайдалануға байланысты құқықтық реттеу проблемаларын анықтауға басты назар аударылады. Мақала тұжырымдаманың стратегиялық мақсаттарына шолу жасаудан және оның елдің экономикалық дамуына әсерін бағалаудан басталады. Авторлар блокчейнді қаржы, денсаулық сақтау және мемлекеттік басқаруды қоса алғанда, әртүрлі секторлардағы деректердің ашықтығын, қауіпсіздігін және сенімділігін қамтамасыз етуге қабілетті инновациялық құрал ретінде талқылайды. Осы тұрғыда практикада өз орнын тапқан қолданыстағы технологияларға шолу жасалды, тиісінше Қазақстан Республикасы оларды болашаққа қызметке ала алады. Блокчейн технологиясын қолданыстағы құқықтық жүйеге интеграциялау кезінде Қазақстан алдында тұрған сын-тегеуріндерді талдауға ерекше назар аударылады. Авторлар жаңа заңнамалық актілерді әзірлеу қажеттілігін, сондай-ақ блокчейн үшін қолайлы құқықтық орта құру үшін ағымдағы нормативтік құжаттарды бейімдеуді зерттейді. Сондай-ақ, Қазақстанда блокчейн технологиясын кеңінен енгізу нәтижесінде туындауы мүмкін ықтимал тәуекелдер мен артықшылықтар талқыланған. Қорытындылай келе, мақала осы саладағы халықаралық ынтымақтастық пен тәжірибе алмасудың маңыздылығын көрсете отырып, блокчейн технологиясын қолдану үшін құқықтық базаны жетілдіру бойынша ұсыныстар беріледі.

Кілт сөздер: жетілдіру тұжырымдамасы, елді дамыту, цифрландыру, цифрлық қауіпсіздік, блокчейн, дербес деректерді қорғау, құқықтағы ақпараттық-коммуникативтік технологиялар, құқықтық реттеу.

С. Жамбурбаева, Г.А. Ильясова

Реализация «Концепции цифровой трансформации, развития отрасли информационно-коммуникационных технологий и кибербезопасности на 2023–2029 годы» путем внедрения технологии блокчейн в Республике Казахстан и проблемы его правового регламентирования

В статье рассмотрены механизмы реализации «Концепции цифровой трансформации, развития отрасли информационно-коммуникационных технологий и кибербезопасности на 2023–2029 годы». Как полагают авторы, это возможно через призму внедрения блокчейн-технологии в Республике Казахстан. Основное внимание уделено анализу текущего состояния цифровой инфраструктуры, определению потенциальных областей применения блокчейна и выявлению проблем правового регламентирования, связанных с его использованием. Статья начинается с обзора стратегических целей Концепции и оценки ее влияния на экономическое развитие страны. Авторы обсуждают блокчейн как инновационный инструмент, способный обеспечить прозрачность, безопасность и надежность данных в различных секторах, включая финансы, здравоохранение и государственное управление. В этом аспекте был произведен обзор действующих технологий, которые уже нашли свое место в практике, соответственно, Республика Казахстан может взять их на вооружение в будущем. Особое внимание уделено анализу вызовов, с которыми сталкивается Казахстан при интеграции блокчейн-технологии в существующую правовую систему. Авторы исследуют необходимость разработки новых законодательных актов, а также адаптации текущих нормативных документов для создания благоприятной правовой среды для блокчейна. Кроме того, обсуждены потенциальные риски и преимущества, которые могут возникнуть в результате широкомасштабного внедрения блокчейн-технологии в Казахстане. В заключение статьи предложены рекомендации по совершенствованию правовой базы по применению технологии блокчейн, а также подчеркнута важность международного сотрудничества и обмена опытом в этой области.

Ключевые слова: концепция совершенствования, развитие страны, цифровизация, цифровая безопасность, блокчейн, защита персональных данных, информационно-коммуникативные технологии в праве, правовая регламентация.

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Information about the authors

Zhamburbayeva, Sabina — Master of juridical sciences, Senior lecturer at the Department of Civil and Labor Law, Karaganda Buketov University, Karaganda, Kazakhstan;

Ilyassova, Gulzhazira Aktureevna — Candidate of juridical sciences, Full professor, Research Professor at the Department of Civil and Labor Law, Karaganda Buketov University, Karaganda, Kazakhstan; e-mail: *g.iliasova@mail.ru.*