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**BLOCKCHAIN TECHNOLOGIES IN MANAGING SOCIOECONOMIC SYSTEMS:
A STUDY OF LEGAL PRACTICE**

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Abstract

The paper addresses the possibilities of adopting the blockchain technology in socioeconomic management in the context of digitalisation of the economy. On the cards in the near future in Russia is the expansion of the digital revolution, including the transition to a knowledge-based economy, digital technology, intellectual systems and robotics. However, a radical change of socioeconomic systems would require new approaches, principles and concepts. The paper aims to assess all advantages and disadvantages of the blockchain technology for adoption and application in socioeconomic management. The evolution of blockchain is discussed with a focus on blockchain 3.0 characteristics potentially valuable for organisational and managerial decision-making in socioeconomic design. Deficiencies of the regulatory framework hindering blockchain integration in this segment are pointed out. An analysis of international practice is provided based on the cases of introduction of the blockchain technology in public administration and public and municipal services. Conclusions are drawn concerning the possibility of adopting international practices on Russian soil. A concept is proposed taking into account the potential of designing management technologies for major socioeconomic systems. A crucial observation concerns the difficulties of integrating digital technologies into major complex socioeconomic systems, which not only complicates digitalisation but may be fraught with new problems in case of inappropriate simplification of virtual and real systems.

Keywords

Digital technologies – Blockchain – Socioeconomic systems – Public administration – Transparency

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Introduction

At Russia's current stage of development, with signs of crises observed in nearly all spheres (both at the national and regional level), a key priority is innovation-driven development, i. e., economic development (in a country, region, organisation) shaped largely by digital technologies¹. In the current knowledge-based economy, traditional management technologies lose their efficiency for business systems². Global challenges call for full-fledged use of cognitive technologies in socioeconomic management³. The rapid development of innovative technologies, such as the Internet of Things, predictive analytics, blockchain, etc., has transformed the existing models of socioeconomic management⁴. A revised national sustainable development and competitive strategy should contribute to ensuring favourable conditions for adopting innovation, development of efficient management mechanisms, future planning and ensuring institutional flexibility⁵. Advanced international practices indicate the need for initiating innovation in the economy through the consolidation of an innovative socioeconomic system, development of a balanced stimulation and competition policy, arrangement of funding and building up new competences in the digital world, while maintaining adequate national security, privacy, consumer protection and intellectual property rights⁶. Blockchain potential substantiates the relevance of this topic, which is underscored by the profound interest in wide research circles⁷. The problem of adopting blockchain in the administration of complex socioeconomic systems has been addressed by researchers such as D.A. Pogonysheva⁸, D.M. Zhuravlev⁹,

¹ T. V. Deeva; G. Nikiporets-Takigawa; T. N. Lustina; E. N. Podsevalova y E. N. Didenko, "Blockchain Technologies and Smart Contracts: New Technological Methods to Regulate Transactions and Trade Operations", *International Journal of Emerging Trends in Engineering Research* Vol: 8 num 7 (2020): 3659 – 3664.

² N. M. Gorbov, *Bioadekvatnoe upravlenie: zhiznedeyatel'nostnyy podkhod, prirodosobraznaya metodologiya: monograph* (Bryansk: Novyi proekt, 2017)

³ I. Prigozhin, *Konets opredelennosti* (Izhevsk: RKhD, 2001).

⁴ O. N. Beketova, "Improvement of the System of Strategic State Regulation in the Tourism Industry", *Journal of Environmental Management and Tourism* Vol: 10 num 8 (2020): 1819-1824; I. V. Leskova, "Level and quality of life in the socio-cultural space of megapolis Moscow", *International Conference on Research Paradigms Transformation in Social Sciences (RPTSS)* Vol: 50 (2018): 704-714 y V. D. Sekerin; M. N. Dudin; A. E. Gorokhova; T. P. Danko y N. I. Nikolaykin, "Applying Interactive Marketing Methods to Improve the Quality of University Educational Services", *Quality - Access to Success* Vol: 19 num 163 (2018): 37-42.

⁵ A. Kiselev; T. Svetlichnaya; N. Petrov; L. Botasheva; K. Dolgoplov y E. Apolsky, "Information function of civil budget", *International Journal of Law and Management* Vol: 60 num 3 (2018): 798-803.

⁶ "Competing in the Digital Age: Policy Implications for the Russian Federation". Report. International Bank for Reconstruction and Development. World Bank. Available at: <https://www.vsemirnyjbank.org/ru/country/russia/publication/competing-in-digital-age>

⁷ T. V. Deeva; G. Nikiporets-Takigawa, T. N. Lustina; E.N. Podsevalova y E. N. Didenko, "Blockchain Technologies and Smart Contracts... y E. Kirillova; V. Bogdan; I. Lagutin y E. Gorevoy, "Estado legal de los contratos inteligentes: características, papel, significado", *JURÍDICAS CUC* Vol: 15 num 1 (2019): 285-300.

⁸ D. A. Pogonysheva, "Sovershenstvovanie upravleniya regionalnymi sotsialno-ekonomicheskimi sistemami na osnove tekhnologii blokchein", *Ezhegodnik NII fundamentalnykh i prikladnykh issledovaniy* Vol: 1 num 10 (2018): 128-130.

⁹ D. M. Zhuravlev, *Tsifrovye tekhnologii v upravlenii sotsialno-ekonomicheskimi sistemami*. Collection of papers: *Sovremennaya mirovaya ekonomika: problemy i perspektivy v epokhu razvitiya tsifrovyykh tekhnologii i biotekhnologii*, in: *Proceedings of international research conference*. MBA Graduate School Integral (Corporate university). 2019.

M.A. Mukovnin¹⁰ and many others. However, this is not a well-researched domain, the prospects of blockchain in this dimension require a much wider focus; new studies proposing original approaches, conclusions and ideas are welcome and relevant. Research hypothesis. The obstacle for the wide application of blockchain in socioeconomic management is the inadequate legal regulatory framework.

Methods

The method of dialectic makes the basis of the present study. Alongside, the statistical method was employed to present data describing the scope of the discussed concept and its role in socioeconomic management. The comparative legal method was used to study the international practice of adopting blockchain in socioeconomic management. The method of formal logic was applied to study various applications of blockchain in socioeconomic management in the Russian context. The research hypothesis was proved on an evidence base gathered from reliable websites, published research on similar subjects and statutory documents and drafts setting forth the applicable and projected legal regulations governing blockchain applications in management.

Results

The advance of the digital economy serves to address as much as possible its participants' requirements for information as a strategic resource through the development of information and communication technologies and availability of digital infrastructure¹¹. Efficient interaction between economic subjects and objects is contingent on the availability of digital components for the participants of the computing chain. The digital economy provides for direct information relations between its subjects, the use of personified service models, immediate contacts between the producers and consumers of material resources, the spread of the sharing economy, etc. Central to the digital environment is the blockchain technology. Blockchain was initially developed as a technology for managing cryptocurrencies. Blockchain refers to a database with a key characteristic. Data structure means a set of variables arranged together in a strictly specified way. In blockchain, data is structured in blocks linked together in a chain. Data structures are processed under set algorithms, i. e., an ordered sequence of operations is applied and information contents in multiple data structures in distributed peer-to-peer systems are strictly aligned together¹².

The emergence of blockchain is inseparable from the evolution of cryptocurrencies. M. Swan, the founder of the Institute for Blockchain Studies, specifies three stages in the evolution of blockchain, referring to the three main categories. Blockchain 1.0 relates to remittances and digital payments based on the electronic payment system Bitcoin¹³. This category exclusively refers to currency transactions. Blockchain 2.0 operates with smart contracts and smart assets and facilitates the origination of guarantee obligations and

¹⁰ M. A. Mukovnin, *Ispolzovanie blokchein-sistem organami publichnoi vlasti: zarubezhnyi opyt*. Collection of papers: Aktualnye problemy razvitiya khozyaistvuyushchikh subektov, territorii i sistem regionalnogo i munitsipalnogo upravleniya, in: Proceedings of the Fifteenth international research and practice conference (Kursk, 2020).

¹¹ D. A. Pogonysheva, "Sovershenstvovanie upravleniya regionalnymi sotsialno-ekonomicheskimi sistemami...128-130

¹² D. A. Pogonysheva, "Sovershenstvovanie upravleniya regionalnymi sotsialno-ekonomicheskimi sistemami..."

¹³ M. Swan, *Blockchain: Skhema novoi ekonomiki* (Moscow: Olimp-Biznes, 2017)

private documents¹⁴. The basic facility is the Ethereum electronic platform. Blockchain 2.0 refers to contracts. Blockchain 3.0 refers to technologies with applicability beyond money transactions, finance and markets, spanning across various domains and operating as a platform or an application¹⁵. Applications (Blockchain 3.0) spread across multiple domains such as management, healthcare, science, education and art.

Acquiring citizenship and issuance of international passports is available via the public services portal, though the procedure is not fully automated and requires scheduling an appointment at the General Administration for Migration Issues of the Ministry of Internal Affairs of Russian Federation. A transition to e-Residency would simplify the procedures of naturalisation (accessible from across the globe) and the issuance of documents such as passports (Russian and international) and temporary residence permits. Business registration in Russia is conducted by the Federal Tax Service. Prior to the review stage, the application process is available online via the public services website. However, the applicant should arrange to personally collect the resolution from the registration authority. A transition to blockchain by the service for state registration (Rosreestr) would significantly simplify the system of registration of land rights. For now, the process of registering land possessions is not automated. Applications are filed and results are collected in person, by mail, through a legal representative or via a multiservice center. Note that finalising a sale of real estate after weeks-long procedure often only takes hours. This becomes possible due to the smart contract mechanism powered by blockchain. Thus, anyone acquiring a title can rely on an algorithm determining whether all proper conditions are in place to conclude a transaction¹⁶. Where all criteria are met and the algorithm confirms it, ownership can be automatically transferred to the new owner. This eliminates the need for an intermediary performing checks of complex legal documents. When the government opens a public tender to contract the performance of works, provision of services or supplies of goods for public or municipal needs, information on the auction arranged by public authorities is announced in the unified information system of government procurement. However, the bidding procedure is available via electronic platforms chosen by the Ministry of Economic Development. An electronic auction involves submitting scanned documents. With blockchain, this process would be automated and would cut down time requirements for executing and filing documents. Blockchain helps to optimise and simplify these processes. In regional socioeconomic management, to optimise business processes (renting, leasing, purchasing production equipment, etc.), the input and initial control of information is handled in applications downloaded on the participants' computers. Data verification and storage is facilitated by distributed computing software that supports user interactions without the need for a proxy server and ensures data integrity in the system of ledgers stored on the computers of immediate users in the chain¹⁷. In leasing transactions or purchase and sale of goods or services, the advantages of blockchain include legal risk mitigation, improved speed and precision of information processing, transparency and openness of users' shared access to information, considerably smaller costs compared to a centralised data storage. Given that blockchain facilitates tracking of operations all through the ranks of the production

¹⁴ D. A. Tapscott, *Blockchain revolution: How the technology behind bitcoin is changing money, business, and the world* (Grand Haven: Brilliance Audio, 2016)

¹⁵ A. V. Babkin, "Kriptovalyuta i blokchein-tekhnologiya v tsifrovoi ekonomike: genezis razvitiya", *Nauchno-tekhnicheskie vedomosti Sankt-Peterburgskogo gosudarstvennogo politekhnicheskogo universiteta. Ekonomicheskije nauki* Vol: 10 num 5 (2017): 9–22

¹⁶ E. M. Zemlyanukhina y A. N. Karpenko, "Blokchein, kak mekhanizm upravleniya organizatsiei", *Vestnik FGBOU VO Sankt-Peterburgskii gosudarstvennyi ekonomicheskii universitet* (2016): 35-38

¹⁷ D. A. Pogonysheva, "Sovershenstvovanie upravleniya regionalnymi sotsialno-ekonomicheskimi sistemami..."

system and supply chain, it thus provides the opportunity to identify the sources of inferior quality products preventing them from ending up with consumers. Blockchain provides general transparency for various market participants that would be hard to realise in other circumstances. Transparency in the supply chains of production equipment plays a crucial role in providing customer needs. This opportunity to track transactions in real time means customers can trust the supply chain of materials and equipment. Any participant in the supply chain of materials and equipment gains real-time access to any document as may be required and gets the opportunity to continuously track all changes in its status. Such transparency provides immediate visibility into what links may be inefficient and, further, an opportunity to fix them in the shortest time possible and thus reap cost savings in the long run¹⁸. Blockchain opens up new potential in managing supply chains, specifically relating to decision-making by all participants of the chain on a real-time basis. This continuous real-time access to the supply chain of production equipment including all the respective transactions facilitates interactive operations. E. g., understanding beforehand that there is going to be a short delivery of materials and equipment, the organisation would rearrange its plans, tap into its own inventory, place an order with another supplier to cover the missing items or revisit pricing. Chain participants can exchange various technical or other resources providing certain value in the operations of market participants. Blockchain helps to save negotiation time and financial costs by excluding intermediaries between the producer and consumer of materials and equipment and mitigates the risk for the participants by providing complete open control¹⁹. Blockchain has the potential to improve stability and efficiency in the digital world. The digital market requires real-time reporting, which is what is needed for many participants of the material and equipment market. A transition from hard-copy to electronic accounting records would help to reduce errors and processing times in certain transactions from days to minutes²⁰.

Blockchain advantages as described above are yet inaccessible primarily due to the lack of a legal framework for adopting the technology in the described elements of the socioeconomic system.

Currently, in the Russian Federation, there is an ongoing active debate over blockchain adoption as a means of improvement of public governance. State regulation of digital technologies and in particular blockchain is at an early stage now in the Russian Federation. Fundamental documents were adopted, including the Strategy for the Development of an Information Society in the Russian Federation for 2017–2030 enacted by Presidential Decree No. 203 of 09.05.2017²¹; also in 2017, the Government of the Russian Federation adopted the Programme "Digital Economy of the Russian Federation"²². The functional structure of the national programme administration system and the method of development, monitoring and control of performance of the constituent federal projects

¹⁸ D. A. Pogonysheva, "Sovershenstvovanie upravleniya regionalnymi sotsialno-ekonomicheskimi sistemami..."

¹⁹ D. A. Pogonysheva, "Sovershenstvovanie upravleniya regionalnymi sotsialno-ekonomicheskimi sistemami..."

²⁰ D. A. Pogonysheva, "Sovershenstvovanie upravleniya regionalnymi sotsialno-ekonomicheskimi sistemami..."

²¹ Presidential Decree of the RF No. 203 "On the strategy for the development of an information society in the Russian Federation for 2017–2030". May 9, 2017. Available at: <http://kremlin.ru/acts/bank/41919>

²² National programme "Digital Economy of the Russian Federation" Available at: https://digital.gov.ru/uploaded/files/natsionalnaya-programma-tsifrovaya-ekonomika-rossijskoj-federatsii_NcN2nOO.pdf

are set forth in the Regulation on administration system of the national programme "Digital Economy of the Russian Federation"²³. One of the technologies referred to in this programme is specifically the distributed ledger system (blockchain); currently, efforts are put into the development of a roadmap, a strategic paper on adopting and advancing blockchain in Russia. However, no corresponding statutory regulations are yet in place. Such regulatory outlook probably reflects a wait-and-see approach taken by the government. However, the current global trends of socioeconomic development driven by blockchain leave no room for Russia to stay on the sidelines. Thus, Russian lawmakers have taken the course of settling it in the legal framework. The official stance over the past years has shifted from outright bans against the use of this technology toward an understanding of the need for statutory regulation. However, to ensure positive results, the proper approach is to carefully review the existing global practices of blockchain operations and apply the findings to expand the existing statutory regulations and adopt a special framework law directly governing this domain in legal relations²⁴.

Discussion

Some countries have already been active adopters of the technology in the public domain. Estonia has been actively advancing blockchain in public administration. Where it concerns statutory regulation of blockchain in Estonia, note that Estonian legislation is technologically neutral, i. e., traditional national regulation applies. Each blockchain project in Estonia is reviewed on a case-by-case basis for potential compliance requirements. Specially arranged government committees and commissions review each blockchain project individually, obtain approvals from competent authorities and decide upon its designation within a specific administrative domain. This legal approach in Estonia contributed to the development and adoption of e-Residency, the electronic citizenship project. The programme allows its participants to apply for Estonian citizenship, gain access to online services of the tax and customs authorities and any Estonian databases, it also supports the use of digital signature and company registration services. Estonian citizens also can use it to register marriages and births. Such services are accessible from across the globe, which helps to erase territorial boundaries. In 2017, a blockchain platform became operational in Estonia supporting electronic auctions to lease or sell public assets facilitated by the e-Auction 3.0 application. The technology streamlines the system of registration, control and automation in the above transactions²⁵. In 2016, Ghana adopted a special resolution on a pilot land cadastre project based on blockchain, Bitshares Cadastral. The platform powers land title registration, sales and purchases of land. The CADASTRAL tokens are available on Bitland, which may be used in land registration transactions. Tokens can be invested in the local economy to generate additional profits. Adopted in 28 communities, blockchain ensures transparency in real estate transactions. It opens up the possibility to mitigate risks and errors in originating and executing documents²⁶.

²³ Resolution of the Government of the Russian Federation of 02.03.2019 No. 234 "On administering the national programme "Digital Economy of the Russian Federation"...

²⁴ E. V. Gridnev y V. K. Shaidullina, "Problemy pravovogo regulirovaniya ispolzovaniya blokchein-tehnologii v Rossiiskoi Federatsii", *Nauka i obrazovanie: novoe vremya* Vol: 4 num 27 (2018): 121-126.

²⁵ *Obzor primeneniya tekhnologii blokchein v gosudarstvennom upravlenii*. Available at: <http://fastsalttimes.com/sections/obzor/1503.html>

²⁶ *New Blockchain Initiative Bitland Is Putting Land on the Ledger in Ghana*. Available at: <https://www.prnewswire.com/news-releases/newblockchain-initiative-bitland-isputting-land-on-the-ledger-in-ghana-300269491.html>

The two-tier legal system of the USA involves certain state-level specifics of local statutes. Blockchain regulation is more detailed at the local level²⁷. The state of Arizona has led the way in the development and adoption of blockchain. In April 2018, the Corporations/Blockchain Technology bill No. 2603 was signed to become law²⁸. The law sets forth the notion of the blockchain technology defined as distributed ledger technology that uses a distributed, decentralized, shared and replicated ledger, which may be public or private, permissioned or permissionless, or driven by tokenized crypto economics or tokenless. The law also provides definitions of a smart contract, electronic record and electronic signature. The law directly provides that signatures secured through blockchain are valid electronic signatures and that smart contracts are legal, enforceable contracts under Arizona law. The new law would permit companies to use blockchain to store and transfer data. Such data would have equal legal force, eliminating the need for hard copy documents²⁹. Virginia adopted the project Follow My Vote, an online voting platform. Each voter is assigned an ID. The new platform brings in the ability to change your vote and observe the election in real time. The platform will allow for greater election transparency, which helps to prevent fraud. Another major example of blockchain practice in the public sphere is the Advocate blockchain platform. It facilitates the interactions of local governments with residents³⁰.

As shown above, international practice already provides several models of legal regulation in using blockchain in socioeconomic management. The Estonian case probably suits Russia best of all and it may be absorbed in full or in part.

Conclusion

The enhancement of public administration and programme-based structure of government can involve the use of blockchain as the foundation of the digital platform. This technology offers the optimal way to improve the efficiency of socioeconomic policies and potentially provides a decisive impulse for galvanising the Russian economy by advancing fiscal administration and strengthening cross-agency ties in project management. The priority for now is to overcome the barriers preventing the development and adoption of blockchain, which specifically relate to network capacities, processing powers of computing systems and ensuring appropriate competence levels among public officers in operating a cryptographic framework. The key priority in the organisational legal domain is the development and adoption of a system of standardisation concerning data storage, processing and representation and document unification. Without that, no blockchain-powered socioeconomic management is possible. Standards should take into account the industry of operation of the blockchain information technology, as well as the size of the respective consumer, be it an economic entity, industry, region or socioeconomic system. Subject to proper legal regulations, the blockchain technology has significant potential in the public sector and specifically socioeconomic management, which confirms the hypothesis of this study. The above research falls short of a complete review of the use of blockchain in socioeconomic management; further studies should probably address applications in non-financial sectors.

²⁷ G. O. Shakhnazarov, "Pravovoe regulirovanie primeneniya tekhnologii blokchein v zarubezhnykh stranakh", *Colloquium-journal* Vol: 13-13 num 37 (2019): 143-147.

²⁸ Arizona State Bill № 2602. April 3, 2018. Available at: <https://www.azleg.gov/legtext/53leg/2R/laws/0122.pdf>

²⁹ Arizona Blockchain Regulation. Available at: <http://elliott.law/articles/arizona-blockchain-regulation/>

³⁰ Obzor primeneniya tekhnologii blokchein v gosudarstvennom upravlenii...

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