
Block Chain and Financial Controlling in the System of Technological Provision of Large Corporations' Economic Security

Albekov Adam Umarovich¹, Vovchenko Natalia Gennadyevna²,
Andreeva Olga Vladimirovna³, Sichev Roman Alexandrovich⁴

Abstract:

The article is devoted to the research of current trends and priorities for the blockchain technology use in order to ensure the economic security of large corporate entities. Large corporate entities operating in terms of digital economy were selected as the object of the research. The subject of the research is a set of economic and organizational and financial relations ensuring the financial controlling effectiveness in large corporate entities, implemented with the blockchain technology application.

The work highlights the advantages and risks of the blockchain technology use at different levels of the economic system on the basis of the study of accumulated experience, reveals institutional gaps and organizational dysfunctions appearing in the course of modelling the blockchain technology application experience to solve definite economic problems, defines the need of institutional, legal, information and technology preparation of economic agents to the blockchain technology implication.

Forcing the practice of the blockchain technologies use in corporate entities can provide a minimum level of the corporate sector infrastructural readiness to risk management in the economic system integration into digital economy. At the same time the use of the system and functional approach has allowed coming to a conclusion that the blockchain technology spread in the international and domestic contracting between the corporate sector subjects is creating new threats to economic security, which requires the inclusion of possible risks decomposition in the systems of corporate audit and controlling as a part of the proactive approach.

Keywords: Economic security, block chain technology, financial controlling, large corporations, organizational and finance modeling, sustainable development

JEL Classification: F38, F52, G10, G34, L8

¹Corresponding author, PhD (Economics), Professor, Honored Scientist of the Russian Federation, Member of the Presidential Council on International Relations, Rector of the Federal State Budgetary Educational Institution of Higher Education "Rostov State University of Economics (RSUE)", albekov@rsue.ru

²PhD (Economics), Professor, Vice Rector of Research and Innovation of the Federal State Budgetary Educational Institution of Higher Education "Rostov State University of Economics (RSUE)", nat.vovchenko@gmail.com

³PhD (Economics), Associate Professor, department of Economics and Finance, Federal State Budgetary Educational Institution of Higher Education "Rostov State Transport University", a_o_v@mail.ru

⁴Candidate of Economics, Assistant Professor, Lecturer of the "Audit" Chair of the Federal State Budgetary Educational Institution of Higher Education "Rostov State University of Economics (RSUE)", sichevroman@gmail.com

1. Introduction

In terms of digital economy dynamic development and increasing integration of information and financial technologies, the problem of economic systems infrastructural preparation at different levels (from nano- to mega-) to functioning in changing conditions is becoming actual. Financial markets are more sensitive to financial and technological innovation (fintech), which leads to an increase of the speed of transaction, reduction of the financial contracts service and management of costs. At the same time increase of the financial contracts speed changes the parameters of effectiveness evaluation (organizational and economic) in the real economy sector, which affects investment dynamics due to changes in investors' expectations and requirements. It is bound to influence on the effectiveness of the systems of ensuring economic security of the business entities, as it is they that are responsible for harmonization and balance of the pool of investment and financial purposes considering specific character of the particular corporate entity's business processes.

2. Theoretical, informational and empirical, and methodological grounds

The research is built on theoretical grounds formed on the basis of the postulates of institutional theory, theory of network economics, organizational management theory, and philosophy of economy school, financial economics' concepts, and financial globalization theory (Fetai, 2015; Glavina, 2015; Thalassinos and Dafnos, 2015; Thalassinos and Liapis, 2014; Hapsoro and Suryanto, 2017; Thalassinos *et al.*, 2015). Information and empirical basis of the research were the materials formed as a result of a monographic review and analysis of scientific periodicals presented in international electronic libraries, as well as the authors' own developments devoted to the analysis of large corporations functioning in the Russian economy (Vovchenko *et al.*, 2017; Anikina *et al.*, 2016). The methodology includes a system and functional approach. The following methods were applied as the research methods in addition to general scientific methods: system and diagnostic analysis, mathematical modeling methods, financial diagnosis and multiple economic analyses.

3. Results

Hyper-network super-system structure of modern digital economy differs by a number of properties and characteristics changing the level of management tools functionality due to the emergence of new risks and relevant threats. At the same time the issue of ensuring sustainable development considering ecological and social factors is becoming relevant in the global economic system. This requires modeling and implementation of appropriate strategies by large corporate entities, serving as basic moderators of local economic spaces. Information and technological landscape and organizational and financial infrastructure require new approach from modern corporations with the purpose to provide the opportunity of data verification and

leveling possible damages from the risks implementation. Any managerial decisions in modern conditions have to be taken quickly, but mandatory with support of high-quality analytics, formed on the basis of authentic and up to date information on the status of the corporate entity internal and external environment (Xanthopoulos, 2014; Thalassinos *et al.*, 2015; Theriou and Aggelidis, 2014).

Despite the fact that the neural network technology already exists in the field of providing support to managerial decisions adoption and analytical support, the quality of the information basis itself can often provide only a retrospective analysis, while achieving sustainable economic security in terms of rapidly developing external environment requires a proactive approach. Data on the correctness of the economic contracting (metadata) are usually provided by audit systems, and controlling allows timely detecting and correcting the economic processes dysfunctions. However the metadata collection and processing technologies allow making adjustments and essentially depend on intermediaries (information technologists, personnel of the control and supervision department, etc.), which creates the possibility of inaccurate metadata appearance. Low-quality information base leads to adoption of incorrect managerial decisions and increases the risks of economic management. From this perspective the research of functional opportunities and risks of the blockchain technology becomes especially important as applied to the tasks of technological support of the large corporations' economic security.

Increase in the scope and ways of the blockchain use in the global economy is making actual the problems of analysis of the correlation of risks and benefits of this technology's widespread application in the real economy sector. Imbalance of speed and quality of financial transactions in the virtual and real sectors creates new threats for the large corporate entities' economic security. In its turn this keeps current the problems of balancing technological support to achieve the goals and objectives of corporate entities development considering the global trend of ensuring sustainable development (Andreeva and Shevchik, 2017).

High level of interest in promising innovative technologies in digital economy, e.g. the blockchain technologies often leads to exaggerated expectations in terms of their functionality (Jessel, 2016). Unconditionally the use of these technologies allows reducing financial cycle from several days to few seconds. However this feature does characterize only simple transactions as for example performing purchase and sale transactions using cryptocurrencies (Albekov *et al.*, 2016)

At the stage of the model of global economic development digitalization, the possibility of wide blockchain use in the financial markets requires presence of trusted third parties for some functions, such as the «know your customer» (KYC), counteraction to legalization (laundering) of revenues from crime and terrorism financing, insurance, sales of credit and complex financial products (Mainelli, 2015).

The blockchain technology application, its functionality assessment in the part of not only the audit of transactions, but also with the purpose of controlling, is the least studied aspect of ensuring the business entities economic security in today's digital economy.

Theoretical and methodological and applied aspects of the blockchain technology implication into business practice are presented in the scientific, periodical and applied literature, first of all, by the cryptocurrencies development and further perspectives of the blockchain technologies use. At the same time most researchers scarcely pay attention to emerging unprecedented risks and the need of their regulation.

Currently it is possible to talk about limited effectiveness of classical contracts due to delay of institutional and legal improvement procedures. This testifies about the fact that the main provisions of the classical theory of contracts, based on the R. Coase's postulates, shall be reviewed in terms of digital economy. However it is not clear which vector will allow balancing the pools of the transaction participants' economic, legal and ecological interests. Arrunada (2017) in his study of the perspectives for the blockchain technology application in the real estate market draws attention to the exposure of the third parties' rights. This conclusion allows the author confirming about exaggerating the opportunities of this innovative technology in ensuring the property transactions effecting.

The issue of legal, institutional and infrastructure unreadiness of modern economic systems to extensive application of not only the innovative technologies themselves (in this case – the blockchain technology), but even the mechanism of their translation requires a separate discussion. Finnish researchers Lauslahti, J. Mattila and T. Seppälä (2017) note that the algorithmic advantages of smart contracts compared to conventional contracts (created using spoken or written language or definite actions) provide the opportunity to generate positive network effect at the innovations implication by expansion the ways and purposes of their application. In terms of legal regulation the blockchain technology allows protecting the transaction, the subject of which is an intellectual product and/or technology because the fact that announcement of intention is expressed implicitly in the contractual obligations performance acquires special importance for such transactions. However it is this fact that requires readiness of the legal basis to regulate transactions in the information and financial technology markets, as the effectiveness of the “fintech” products varies in time under the influence of internal and external factors, which leaves unclear the procedure of the buyer's protection.

Active use of the blockchain technologies in the cryptocurrencies market can be considered as necessary but not sufficient argument in favor of the decision on the need for the soonest translation of the technologies to other types of financial markets. At the same time this clearly shows that other types of financial markets

must now bring their technology, institutional and legal infrastructure in compliance with the new trends of information and financial technologies.

Researchers Micheler and Von der Heyde (2016) from the London School of Economics and Political Science pay attention to the blockchain technology opportunities in the securities market in order to ensure effectiveness of investment and financial market for corporate entities due to the transparency of transaction and mechanism of financial tools formation, as it is the blockchain technology use that can ensure attractiveness for the investors.

At the same time the problem of the need to bring the corporate entities employees' competencies and the corporate information systems' architecture itself in accordance with the rules and laws of the digital economy has not been paid due attention. This is determined by the fact that the transparency of the entire business process can not only show the positive aspects of financial contracts, but also highlight the issuers' organizational and financial dysfunctions. In our opinion, such circumstances reduce the blockchain technology's attractiveness for the issuers themselves. Moreover according to practitioners, the modeling of the target information and technological architecture combined with the actualization of the employees' competencies is a rather expensive and long process. The issue of ensuring economic security, protection of the rights and implementation of the opportunities of the business entities not using the blockchain remains open.

Goertzel *et al.* (2017) have noted that the contracting with the blockchain technology application ensures the opportunity to reduce the impact of state and government structures on economic activity simultaneously with the humanization of global economic interaction. The authors note that the informational revolution and appearance and use of more sophisticated data processing algorithms ensure the business processes transparency, and in the case of blockchain application provide an opportunity for the parties of the transaction to decide on the possibility of its effecting considering all components and stages of the product formation. To this end the practice of the blockchain technology's application in global digital economy can be expanded far beyond the purchase and sale transactions, and be applied, for example, for the organization of various projects (crowdfunding, crowdsourcing, outsourcing, etc.).

Obviously along with a lot of positive effects, the use of blockchain in terms of absence of a single international base of the transactions regulation and their consequences generates some pool of threats to economic security, which are not considered in any of the classical or modern concepts due to hybridization of the risks themselves and sources of their formation. The problem of economic systems sensitivity to technological innovation is not less important, as the virtual systems sensitivity to information and technological innovation is much higher than of the real economy systems. This effect is partly conditioned by, firstly, the differences in

the reproductive cycle functioning in virtual and real sectors of economy: the digital revolution occurred in recent history, requires from the systems of real production some level of efficiency defined by the digital environment. However the “path dependence” effect does not allow achieving them quickly. Secondly, this effect is conditioned by modern features of the society behavioral features, manifesting low loyalty to innovative technologies in case of absence of their wide public legitimation, even if such behavior is counterproductive (Catalini and Tucker, 2016).

In addition possibility of the blockchain innovative technology use by corporate entities in modern conditions acquires some special significance, as it gives an opportunity to limit (or to eliminate) the use of financial intermediaries in effecting transactions. And if the business processes in the framework of online payment by cryptocurrencies (peer-to-peer – P2P) are already regulated (Mattila, 2016), there are as many risks as benefits to the use of such transactions among legal entities of different jurisdictions.

At the same time, combination of these risks can be assessed objectively as an economic security threat at both micro and macro and mega levels of the economic system (Peters *et al.*, 2015). The main discussion on this issue starts around the supervision and regulation challenges, as the concept of monetarism is more relevant to the digital economy (with cryptocurrencies circulating in it). The management systems of sustainable development are determined by entirely different theoretical and methodological base that will inevitably lead to serious inconsistencies in the genesis of the economic systems of different sizes. For example, up to now it is not clear how the problem with cryptocurrencies legitimation within national economies will be resolved, as in developed countries a function of emission is assigned to the Central Bank institution.

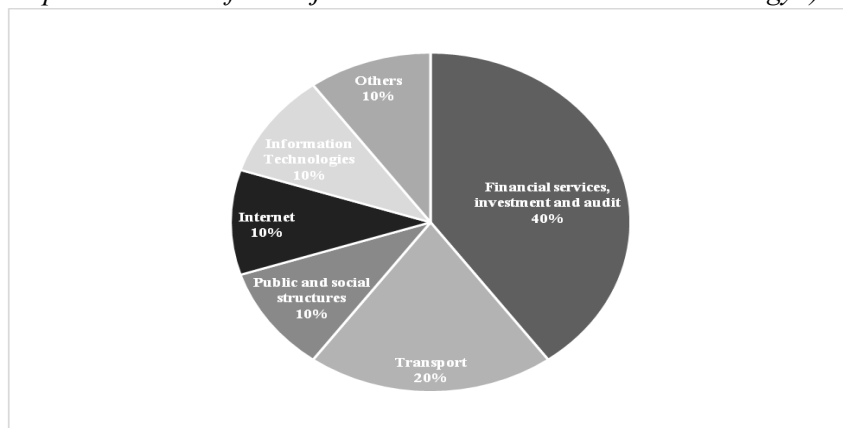
The increase of financial resources turnover in virtual sites is unlikely to contribute to the improvement of investment projects attractiveness within the real economy, although it is possible to ensure the crowdfunding mechanism effectiveness. Currently the investment projects payback period in the real economy and the level of their potential profitability cannot be admitted competitively when compared to investments in cryptocurrencies. Thus it is obvious that the formation of a new economic security threat is a trend to the capital withdrawal to the sector of virtual economy. On the other hand, the blockchain technology can ensure a financial cycle reduction and cash shortages prevention, which have become the basic problem of the Russian economy due to the crisis of debtors' non-payment.

Catalini and Gans (2016) from The National Bureau of Economic Research (USA) emphasize the reduction of cost of the transactions verification and networks building due to the application of the blockchain ensuring the transaction attributes verification by participants at different time points and at the same time providing technological possibility to access new markets. Reduction of the transaction self-

cost is a dominant motive in carrying out the deals in the global market, which is characterized by the growth of reputation capital importance in terms of the crisis of confidence. In addition, there is a problem of assessing the market power of the markets participants using the blockchain technology as the highest level of the transactions security (Witte, 2016) which does not allow third parties obtaining information about the transaction, which announces an increased interest to the blockchain from the markets of illegal products.

The conducted analysis of the blockchain application risks and benefits demonstrates the need in balancing risks and benefits of this technology application. In the Russian practice the named trend is supported: the most frequently the blockchain technology is used in financial markets (Figure 1). According to the research conducted with the assistance of the Deloitte company for the World Economic Forum, the most promising areas for the expansion of the blockchain application practice are global payments, insurance, syndicated loans, trade finance, contingent convertible bonds (“The future of financial infrastructure...”).

Figure 1. Sectoral specialization of companies using «Blockchain» in Russia (Drawn up on the basis of: “Projects based on the blockchain technology”)



In 2015-2017 more than 2.5 thousand applications for the patents related to the blockchain were filed, and the total amount of investment in this area for the same period gained \$1.4 billion. In accordance with the forecasts in 2017, almost 80% of banks will start using the blockchain technology.

4. Conclusions and recommendations

1. New infrastructure of financial services based on the blockchain will build the processes in a new way and raise doubts about traditional approaches, which are the basis of nowadays' business models. In those areas where the blockchain application would give maximum effect, a deep cooperation between market participants, developers and regulators will be required. Despite the fact that the blockchain

technology has a great potential to bring simplicity and efficiency in the financial area due to creating new infrastructure of financial services, it should be considered only as one of many technologies on the basis of which infrastructure of the financial services of new generation will be formed. This is explained by the necessity of ensuring the transactions security. Awareness of the blockchain technologies has increased greatly, however still there are significant barriers for its wide application like uncertainty in legal area, recently emerging collective efforts on the standardization in the blockchain area, and others.

2. The business processes types as well as different configurations of the factors define the way and order how the blockchain application is determined by the purpose and tasks of technologization. The blockchain application will vary in each particular case, and in each of them the blockchain technology will be used in different ways for different benefits. The blockchain can be divided into groups according to the access to the data. In the public block-chain there are no restrictions in reading the blocks of chains and sending transactions to be included in the blockchain (herewith the data may be encoded). Private block-chain provides direct access to the data, but access to send transactions is limited by a certain group of organizations. Public (inclusive) block-chain (no permission block-chain) does not impose any restrictions on the transactions handlers' identity (i.e. the users who can create blocks of transactions). Exclusive block-chain (permission block-chain) involves the transactions processing by only a certain list of subjects with confirmed identities. Various environments for the block-chain implication require at least a correct choice of the type of technology: public or private, no permission or permission. Selection of the type of technology and the way of differentiation of rights has a crucial impact on the final efficiency of the technology. So permissioned blockchain can be described as fast, energy-efficient and easy to scale, but at the same time censorship-resistance and tamper-resistance are excluded.

3. Theoretically the corporate entities governing exclusive blockchain can provide access to reading transactions and the blocks headings (perhaps limited) to investors in order to provide technological, transparent and reliable way of checking areas of the invested capital use. For security reasons it is important to provide full access to reading the blockchain data to the regulators with the purpose of institutional compliance with laws, and to provide all individuals and institutions with a clear and comprehensive description of the blockchain protocol, which includes an explanation of possible interactions with the blockchain data.

4. If the blockchain database is completely transparent to customers (i.e. customers do not have access to the blockchain data), the blockchain security is reduced. While the system remains protected against attacks on the database itself, interaction with clients becomes vulnerable, for example, for MitM-attacks. Since the built-in transaction authorization protocol is one of the key points of the blockchain technology, its ignoring in favor of centralized decisions may influence negatively the system security. Moreover as the transactions in this case are available to a

limited number of computers, the risks of subjective interference with these computers functioning appears, wherein the clients will not be able to detect this interference. Thus non-transparent design of the blockchain disrupts essentially the two key aspects of this technology application: decentralization – a lack of single points of failure; restlessness –reliance on algorithmically laid down rules of the transaction processing without human interference.

5. Currently the blockchain use in the processes of controlling of large corporations operation can be considered only in terms of combination of the blockchain and sidechain, namely: only part of the business process (investment processes or compliance control) in the system of connection to the data blocks. This is explained by the fact that the issues of the corporate financial control can be resolved more efficiently by applying classical corporate information systems, as access control, data encryption, and the identification of the hash keys do not only justify the objectives of the internal financial controlling, but also create new threats for the corporate economic security.

References

- Albekov, A.U., Vovchenko, N.G., Epifanova, T.V., Filchakova, N.Yu. 2016. Electronic Currency: Potential Risks of National Safety / Electronic Currency in Terms of Modern Legal and Economic Challenges. Source book of international research-to-practice conference. Editorial team A.S. Genkin, E.L. Sidorenko, O.I. Semykina. Moscow: Yurlitinform.
- Andreeva, O.V., Shevchik, E.V. 2017. Organizational and Financial Modeling of Transnational Industrial Clusters Sustainable Development: Experience, Risks, Management Innovation. *European Research Studies Journal*, 20(1), 141-147.
- Anikina, I.D., Gukova, V.A., Golodova, A.A. and Chekalkina, A.A. 2016. Methodological Aspects of Prioritization of Financial Tools for Stimulation of Innovative Activities *European Research Studies Journal*, 19(2), 100 – 112.
- Arrunada, B. 2017. Block-chain's Struggle to Deliver Impersonal Exchange. *Research Papers in Economics (RePEc)*. <https://econ-papers.upf.edu/papers/1549.pdf>
- Catalini, C., Gans, J.S. 2016. Some Simple Economics of the Block-chain. The National Bureau of Economic Research. <http://www.nber.org/papers/w22952.pdf>
- Catalini C., Tucker, C. 2016. Seeding the S-Curve? The Role of Early Adopters in Diffusion. The Networks, Electronic Commerce and Telecommunications ("NET") Institute. http://www.netinst.org/Catalini_16-02.pdf
- Fetai, B. 2015. Financial Integration and Financial Development: Does Financial Integration Matter? *European Research Studies Journal*, 18(2), 97-106.
- Glavina, S. 2015. Influence of Globalization on the Regional Capital Markets and Consequences; Evidence from Warsaw Stock Exchange. *European Research Studies Journal*, 18(2), 117-134.
- Goertzel, B., Goertzel, T. and Goertzel, Z. 2017. The global brain and the emerging economy of abundance: Mutualism, open collaboration, exchange networks and the automated commons. *Technological Forecasting and Social Change*, 114(C), 65-73.
- Hapsoro, D., Suryanto, T. 2017. Consequences of Going Concern Opinion for Financial Reports of Business Firms and Capital Markets with Auditor Reputation as a

- Moderation Variable: An Experimental Study. *European Research Studies Journal*, 20(3), 3-20.
- Jessel, B. 2016. Get Bold with Block-chain. *Journal of Financial Transformation*, 43, 15-20.
- Lauslahti, K., Mattila, J., Seppälä, T. 2017. Smart Contracts: How will Block-chain Technology Affect Contractual Practices? The Research Institute of the Finnish Economy (Etla). <https://www.etla.fi/wp-content/uploads/ETLA-Raportit-Reports-68.pdf>
- Mainelli, M. 2015. Sharing ledgers for sharing economies: an exploration of mutual distributed ledgers (aka blockchain technology). *Journal of Financial Perspectives*, (3)3, 38-58.
- Mattila, J. 2016. The Block-chain Phenomenon – The Disruptive Potential of Distributed Consensus Architectures. The Research Institute of the Finnish Economy (Etla). <http://www.etla.fi/wp-content/uploads/ETLA-Working-Papers-38.pdf>
- Micheler, E., Von der Heyde, L. 2016. Holding, clearing and settling securities through blockchain/distributed ledger technology: Creating an efficient system by empowering investors. *Journal of International Banking & Financial Law*, 31(11). London School of Economics and Political Science. http://eprints.lse.ac.uk/68792/1/Micheler_Holding%2C_clearing_and.pdf
- Peters, G., Panayi, E., Chapelley, A. 2015. Trends in cryptocurrencies and blockchain technologies: A monetary theory and regulation perspective. *Journal of Financial Perspectives*, 3(3), 92-113.
- Thalassinos, I.E., Pintea, M., Rațiu, I.P. 2015. The Recent Financial Crisis and Its Impact on the Performance Indicators of Selected Countries during the Crisis Period: A Reply. *International Journal of Economics and Business Administration*, 3(1), 3-20.
- Thalassinos I.E. and Dafnos G. 2015. EMU and the process of European integration: Southern Europe's economic challenges and the need for revisiting EMU's institutional framework. Chapter book in *Societies in Transition: Economic, Political and Security Transformations in Contemporary Europe*, 15-37, Springer International Publishing.
- Thalassinos, I.E. and Liapis K. 2014. Segmental financial reporting and the internationalization of the banking sector. Chapter book in, *Risk Management: Strategies for Economic Development and Challenges in the Financial System*, (eds), D. Milos Sprcic, Nova Publishers, 221-255.
- Thalassinos, I.E., Stamatopoulos, D.T. and Thalassinos, E.P. 2015. The European Sovereign Debt Crisis and the Role of Credit Swaps. Chapter book in *The WSPC Handbook of Futures Markets* (eds) W.T. Ziemba and A.G. Malliaris, in memory of Late Milton Miller (Nobel 1990) *World Scientific Handbook in Financial Economic Series Vol. 5*, Chapter 20, 605-639.
- Theriou, G.N. and Aggelidis V. 2014. Management Accounting Systems, Top Management Team's Risk Characteristics and their Effect on Strategic Change. *International Journal of Economics and Business Administration*, 2(2), 3-38.
- Vovchenko, G.N., Holina, G.M., Orobinskiy, S.A. and Sichev, A.R. 2017. Ensuring Financial Stability of Companies on the Basis of International Experience in Construction of Risks Maps, Internal Control and Audit. *European Research Studies Journal*, 20(1), 350-368.
- Witte, J.H. 2016. The Blockchain: A Gentle Four Page Introduction. The Cornell University Library (USA). <http://arxiv.org/pdf/1612.06244>.
- Xanthopoulos, A. 2014. Financial Crisis, Intervention and Performance Measurement. *International Journal of Economics and Business Administration*, 2(4), 14-35.