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Methodical Approaches to the Formalized Assessment of Developmental Regularities of Blockchain Technologies in Regions of Russia

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ABSTRACT: Methodical approaches to the formalized assessment of demand for blockchain technology in the regions of Russia through the prism of a reputational economy. Development of theoretical and methodological bases for quantitative assessment of the level of blockchain technologies penetration into the socio-economic system of the regions, followed by analysis revealing the features of the distribution of the Volga Federal District regions according to the ratio of demand for blockchain technologies and their economic potential level. A key feature of the study is the proposed preliminary version of the conceptual approach to quantifying the region's reputation capital index in the field of block chain technologies. This will allow the transition from qualitative assessments concerning the development of the process under study and its influence on key parameters of regional development to formalized ones based on the application of economic and statistical modelling methods. The reputation capital dynamics in the regions of the Volga Federal District in the field of blockchain technologies for the period from 2010 to 2018 has been assessed. The data obtained demonstrate an increasing, wavy trend of the aggregated index. The regions - leaders in terms of the blockchain technologies development and also lagging territories are defined, followed by the argumentation of the identified patterns causing the differentiated nature of the regional "blockchainization".

Keywords: Blockchain Technology; Digital Economy; Regional Development; Formalized Assessment of Demand For Blockchain Technology; Government Regulation.

I. INTRODUCTION

Acting as a breakthrough innovative instruments, blockchain technology is one of the significant tools for the digitization of economic processes in the economy. They simplify financial transactions and reduce their cost. In this regard, and also taking into account the high rate of penetration of these instruments into the national economic systems, the financial sector should have clear and unambiguous ideas about what prospects they expect in the development of the distributed data storage market and its integration into the system of reproduction processes, as well as how these technologies can affect the transformation of existing financial institutions and form a new settlement system. Innovations will be based on electronic cryptographic transactions, the principles of transparency in the distribution of financial flows, the improvement of business process mechanisms, the secure administration of networks, the security of bilateral transactions without the involvement of a guaranteeing third party (law firm, notary, bank, etc.).

The dynamism of the blockchain technology market development and its high rate of integration into the system of financial transactions of national economic systems are confirmed by the data obtained by high-ranking international expert agencies. So, already in 2013-2014, 5.4 billion US dollars were invested in innovations related to the development of payment systems on the blockchain platform [1]. According to the report of the World Economic Forum - 2016, investment in the study of blockchain use in financial transactions amounted to 1.5 billion US dollars.

According to research by scientists [2-4], the market for distributed data storage in the financial sectors of national economic systems will not only help improve the efficiency of financial operations, but will also form a single global financial network. A McKinsey study shows that approximately 50 per cents of executives in the financial industry are confident that blockchain technology will have a significant impact on the industry over the next three years [5]. IBM estimates that 66 percent of banks will have a scalable blockchain based by 2020 [6-8]. Such predictions show that change is inevitable and may materialize over the next few years. In addition, the financial sector has already begun to undergo a technological revolution [9, 10].

Considering the above, it is necessary to state that traditional operators of financial transactions, start-ups, operating business agents, the public sector should now focus on overcoming technological, regulatory and integration barriers before blockchain technologies can become a reality and get a new round of development and diffusion into the system of socio-economic relations.

Despite its potential and very significant growth prospects, the research space revealing the features and key parameters of the blockchain technology market development is still fragmented. It practically excludes from its "field of view" empirical methods of knowledge and is being limited, in its overwhelming majority, only by theoretical explanations. As for the regional level of research on the identified problems, there is a vacuum here. No conceptual, diagnostic, or analytical apparatus has been formed.

In this regard, in order to eliminate the identified problems, this article attempts to find and develop methodological tools that allow quantitatively expressing the penetration of blockchain technologies into territorial economic systems (using the example of the Volga Federal District regions).

II. METHODS

In our opinion, one of the options in solving this problem can be an approach based on assessing the relevance of blockchain technologies in the regions through the prism of the theory of the reputational economy. It allows us to determine in a concentrated form the demand for the object or subject of study by assessing the factors of institutional and opportunistic order. These factors determine the tonality and meaningful characteristics of the studied phenomena parameters based on dynamically corrected signals in the global information space. The mentioned signals form the ideas / expectations of economic agents regarding the prospects for development and the demand for the processes under study.

The works by both Russian and foreign scientists [11-16] are devoted to solving such issues in the context of using the reputational economy principles.

In a concentrated form, the main approaches and methods for measuring reputational capital are based on measuring the tonality of information materials devoted to the object of research in the Internet space.

In our opinion, the use of these algorithms and methods based on the theory of the reputational economy is also possible in the context of the present study. Here, the key task is the search and scientific substantiation of the solution which allows us to form the basis for assessing the inclusiveness of regional economic systems in the processes of "blockchainization" of business processes.

Based on the methodological approaches of the above studies, the authors provide below an algorithm for constructing integral indexes of blockchain technology penetration into regional economic systems (Region Reputation Capital Index in the field of blockchain technology I_{bchr}). The results of testing the proposed methodology are also presented on the example of the regions of the Volga Federal District.

The calculation algorithm developed by the authors in a concentrated form is presented below. It includes three main stages.

Stage I. Assessment of the popularity of the request in the external environment (for each request)

$$I_i = P_j \times k; \quad (1)$$

Where

i -request number;

P_j -probability of clicking the j-th row of the request result;

k-information source level (federal/regional).

The following structure of directions is proposed for the functional analysis of information web space in the field of assessment of the blockchain technology reputation in the region. It is based on four basic requests that determine, in turn, the values of subindexes:

1. The sub index reflecting information on the popularity and applicability in practice of blockchain technologies in the region (I_{bch}).
2. The subindex reflecting information on the informational background of the region in the development of instruments of the regional digital economy (I_{de}).
3. The subindex characterizing the background information regarding changes in the field of information processes (I_{ip})
4. The subindex reflecting information on the speed and quality of the processes of digitalization of business processes in the region (I_d).

Each of the presented blocks is constructed on the basis of using thematic search requests (Digital Economy, Blockchain, Informatization, Digitization).

Stage II. The definition of request reputation in RuNet (within the following search engines: Google, Yandex, Mail.ru - Search engines were selected based on ranking data (http://gs.seo-auditor.com.ru/sep/2018/01/).

$$e_i = \sum d \times I_i \quad e_i = \sum d \times I_i; \quad (2)$$

Where

d-share of the search engine in RuNet;

I_i-popularity of the request.

Stage III. The calculation of the index of the reputational capital of the region in the field of blockchain technology I_{bcr}

$$E_r = \sum e_i \times w_i; \quad (3)$$

Where

e_i-reputation of the request;

W_i- *the* frequency of the search request. It is determined based on statistics of requests (https://wordstat.yandex.ru/)

The most important component involved in formula 2 is the index characterizing the search engine share in RuNet. This index is used as a kind of weighting factor and demonstrates the role of a particular search engine in determining the values of the region's reputation capital index in the field of blockchain technologies I_{bchr} within a single search request. Ignoring this step will result in the wrong rating system due to the fact that the status of search engines will be equal for all those that are included in the analysis. However, given that the popularity of search engines in RuNet is of a differentiated nature, there is a need for their "weighting". Limit values of the regional reputational capital index in the field of blockchain technologies I_{bchr} are within the range from 0 to +1,994 (according to the formed features of the technique).

III. RESULTS AND DISCUSSION

In accordance with the methodological approach presented above, integral assessments of the reputational capital for the regions of the Volga Federal District in the field of blockchain technologies were obtained (Table 1; Fig. 1 is a diagram with areas and accumulated results).Calculations were carried out for the period from 2010 to 2018.

Table 1: Integral values of the reputation capital index for the regions of the Volga Federal District in the field of blockchain technologies I_{bchr} for the period from 2010 to 2018. (Regions are arranged in decreasing order of the index based on the results for 2018).

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Perm region	0.011	0.053	0,003	0.073	0.022	0,019	0.001	0.487	0.773
Republic of Tatarstan	0.369	0.282	0.038	0.455	0.595	0,291	0.434	0.563	0.659
Kirov region	0,000	0,000	0.065	0,006	0.065	0.065	0.110	0.251	0.589
Ulyanovsk region	0.012	0.020	0.025	0,010	0.012	0.020	0.137	0.861	0.572
Samara Region	0.026	0.081	0.043	0.081	0.066	0.026	0.042	0.269	0.435
Republic of Bashkortostan	0.118	0,000	0.072	0.163	0.083	0,212	0.235	0.285	0.430
Republic of Mordovia	0.098	0,000	0,000	0.234	0.152	0.234	0.326	0.215	0.389
Orenburg region	0,000	0,000	0,000	0.028	0.028	0,002	0.030	0.086	0.328
Chuvash Republic	0.080	0,000	0.066	0,000	0.097	0.037	0,000	0.170	0.296
Nizhny Novgorod Region	0,000	0.150	0.063	0.093	0.141	0,000	0.082	0.203	0.293
Udmurtia	0,309	0,226	0.143	0.432	0.235	0.103	0.146	0,302	0.279
Penza region	0.293	0.001	0.001	0.459	0.183	0.012	0.141	0.091	0.233
Saratov region	0.056	0,000	0.119	0.156	0.123	0.065	0.123	0.275	0.206
Mari El Republic	0.129	0.129	0.079	0.410	0.126	0.150	0.079	0,221	0,204

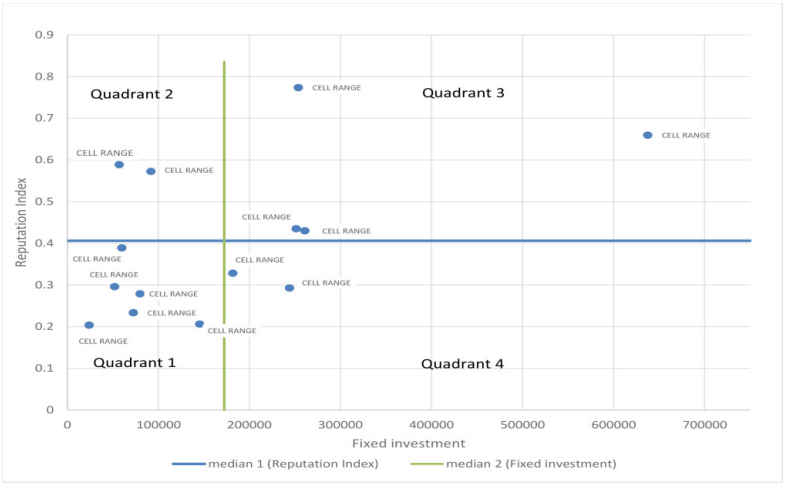

Fig. 1. Distribution of the Volga Federal District regions by the level of demand for blockchain technology and investments in fixed capital for 2018.

On the basis of the calculated data presented, it can be concluded that the regional blockchainization processes are starting to "occupy" spaces of the regions of Russia more and more each year. At the same time, just like for any other phenomenon, there is no doubt that this process is much differentiated from the point of view of penetration into the regional environment, as can be seen from the example of the Volga Federal District. In accordance with the estimates obtained, it is necessary to state that the highest level of demand for blockchain technology (by the end of 2018) is noted in such regions as the Perm Territory, the Republic of Tatarstan and the Kirov Region. The smallest is noted in the Republic of Mari El, Saratov and Penza regions.

The developed toolkit for diagnosing the level of permeability of blockchain technologies in regional economic systems allows us to solve such an important and poorly studied issue in economic theory as the assessment of the relationship between the economic development level of a region and the main parameters of its integration into the digital economy. This type of analysis in this study is implemented through the prism of comparing investments in fixed capital of the territory and the level of penetration of blockchain technologies into its ecological environment (Figure 3).Regions are divided into 4 groups according to the level of investment activity and the level of "blockchainization" using median values. The regions that are the most lagging behind both in terms of investment activity and permeability of blockchain technologies into the system of regional socio-economic processes are located in quadrant 1, and the leaders are regions which hit in quadrant 3.

IV. SUMMARY

The data obtained demonstrate the presence of a pattern expressed in the fact that the regions characterized by the leading positions in the District in terms of rates and level of socio-economic development have very high rates of "blockchainization". And vice versa, regions that are somewhat lagging behind in key parameters of socio-economic growth have a very low level of penetration of blockchain technologies into the system of business and operational processes. Given this, there is a need to develop appropriate government measures aimed at enhancing the digitization of the economy in these regions. Otherwise, based on the above trends in the penetration of blockchain technologies into territorial economic systems, and also based on the assumption that the competitiveness of regions today and in the future will be determined by the

availability of adaptation mechanisms to the processes of globalization and digitalization, regions that show a noticeable lag behind the processes of “Blockchainization” will have very low prospects for intensive and progressive development.

V. CONCLUSIONS

In general, it should be summarized that the study of issues concerning a formalized assessment of the territorial demand for blockchain technology is highly relevant and popular [17]. In spite of that distributed data storage technology penetration raises in economic systems at meso- and macro-levels, in the space of scientific and expert work there is a certain vacuum concerning publications which reflect methodological approaches to the quantitative assessment of "blockchainization" process development at both national and regional environment levels. At the same time, the understanding and scientific substantiation of these processes creates a significant potential for the implementation of a whole series of research projects aimed, for example, at finding the interrelations between the level of digitalization of the economy and the pace of its socio-economic development. The methodical approach developed in this study allows us to get somewhat closer to the solution of the task. At the same time, it, like any other new approach, undoubtedly needs to be improved and refined. In fact, this work is an invitation for further scientific discussions on this scientific applied and fundamental problem.

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