

Digitalization of regional economy in the conditions of industrial revolution 4.0

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Abstract — The article studies the theoretical aspects of the notion “digital economy” from the point of view of system, transformational, technology and innovation approaches. Also the factors and conditions ensuring or preventing the development of the digital economy are shown. The planned development of the industry of informational and communicative technologies according to the government Program “Digital economy of the Russian Federation” (the necessity of which is determined by the industrial revolution 4.0) predetermines the importance of the researches of regional specificity. Thus, the practical constituent of research became the analysis of development of segments of the industry mentioned above using as the example the Volgograd region which include such constituents as: natural and labour resources, capital, entrepreneurial ability, knowledge indispensable for the economic activity and so on. By means of comparative analysis with other regions of the macro region (Southern Federal District) the economic and institutional problems at the development of digital industry in the region mentioned above are studied. The factors internal and external determining them are shown. The corresponding variant of solution or recommendations for their leveling are suggested.

Key words — *digital technologies, regional economy, industrial revolution, factors of development, infrastructure*

I. INTRODUCTION

Nowadays the study of the digitalization processes of the economy are becoming more and more important due to the necessity of the simplification of the system of economic relations by means of use of informational and communicative technologies. This circumstance determines an increased interest to the researches of scientific community carried out in this sphere from government authorities and also from domestic and foreign scientists.

Currently in the Russian Federation the Government adopted the Program “Digital Economy of the Russian Federation” dated July, 28th 2017 within the Strategy for Informational Society Development in the Russian Federation for the period 2017 – 2030 dated May, 9th 2017. The goals of the program mentioned above are as follows: creation of necessary and sufficient conditions of institutional and infrastructural character; growth of national economy competitiveness at the global market” [1].

The implementation of the Program requires a close cooperation of the economic agents of the economic system based on the interaction “state-business-science” and the main result of its implementation is the creation of at least 10 national companies leaders (technology intensive enterprises, developing “penetrating technologies” and managing the digital platforms) ensuring the development of digital economy in the country.

3040,4 million rubles are allocated from the federal budget for priority goals which are presented in the Program (“Informational infrastructure”, “Creation of research competences and technological stocks”, “Informational security”) [2].

This total figure characterizes the funding of the digitalization of the Russian economy in the whole. However the researches characterizing the level of digitalization and potential (economic and institutional) for its growth in specific regions of the county are especially relevant.

Such an obstacle is determined first of all by a high level of economic and social differentiation of the regions of the Russian Federation. The object of the study in the current research is the Volgograd region.

II. MATERIALS AND METHODS

In the current research the following research methods were used: method of logical and comparative analysis for the identification of the specificity of digitalization development in the Volgograd region in comparison with the Southern Federal District of the Russian Federation. In its turn the statistical method ensured the objectivity of the data which became the basis for the identification of available regional resources for the development of informational and communicative technologies characterizing the regional conditions for the evolution of the given industry.

III. RESULTS AND DISCUSSION

It is reasonable to begin the analysis from the identification of various approaches to the definition “digital economy”. Thus, at the federal level this term is determined as “economic activity the main production factor of which are the digital data creating the informational space taking into account the needs of the society” [3].

The given definition has rather a general character but however the domestic and foreign science suggests a number of definitions reflecting various approaches (system, transformational, technical and innovative and so on) to this term.

Thus, within the system approach suggested by the Russian scientists B.P. Polshchikov, A.V. Babkin, D.D. Burkaltseva, D.G. Kostan, Yu.N. Vorobiev the “digital economy” is defined as “a system of social, economic, organizational and technical relations founded on the use of informational and communicative technologies” [4,5].

According to the transformational approach the digital economy is a modern process of transformation under the influence of informational and communicative technologies. Within this approach the definitions of the following foreign and domestic researchers as Erik Brynjolfsson, B. Cahin, B. Johansson, Ch. Karlsson, P. Stowe, A.P. Dobrynin, K.Yu. Tchernykh, P.V. Kuprianovasky, S.A. Sinyagov and others are presented [6,7].

The technical and innovative approach explained the appearance of digital economy (N.K. Vasilenko, K.V. Kudryavtseva) from the point of view of digital technologies use at collection, record, processing, transformation and transfer of the information [8].

The multiplicity of the definitions of the studied phenomenon is explained by its multifold character which in the opinion of the President of the World Economic Forum in Davos K. Schwab is determined by the “digital revolution creating radically new approaches to the changes of the processes of interaction and cooperation in the economy in the whole” [9]. K. Schwab adds that “ the fourth industrial revolution is the mixture of technologies of physical, digital and biological world which creates new opportunities and it influences political, social and economic systems” [10].

This obstacle displays the impact of informational and communicative technologies both on the national economy in the whole and on its separate units in particular.

A significant differentiation in the regional development is explained by a number of factors one of which is the development of the main channels of the impact of informative and communicative technologies on economic processes in the regions of the Russian Federation. Consequently the necessity of the analysis of the opportunities of the development of digital technologies at the meso level appears. The object of such an analysis can be one of the regions of the country, i.e. the Volgograd region.

For the assessment of the condition of the potential of the Volgograd region the analysis of the economic space should be carried out from the point of view of:

- A. conditions (ranked according to the spheres of the activity of society: economic and institutional);
- B. resources of the region (nature, labour, capital, entrepreneurial ability, knowledge necessary for business activity) [11].

First, let’s analyze the economic and institutional indices characterizing the development of digitalization in the economy of the region under analysis in comparison with some regions of the Southern Federal District selected according to the highest economic performance in the given macro region (TABLE 1).

Judging from the data below it is obvious that the Volgograd region according to the major part of the ratios characterizing the level of regional digitalization lags behind the leading regions of the federal district.

TABLE I. INDICES OF ECONOMY DIGITALIZATION OF THE REGIONS OF THE SOUTHERN FEDERAL DISTRICT, 2017

Index	Region of the Southern Federal District		
	Krasnodar kraï	Rostov region	Volgograd region
Number of organizations which used informational and communicative technologies, % from the total number of organizations	51,8	46,5	39,7
Expenditures on informational and communicative technologies, mln. rubles	23227,3	10920,7	8963,3
Number of personal computers per 100 employees, items	17	21	19
Number of organizations which used the Internet, % from the total number of organizations	90,7	83,0	79,3

^a Federal Service for State Statistics [12]

The indices mentioned above give a general idea about the economic and institutional constituents of development of informational technologies in the mentioned region.

Let us analyze more thoroughly the conditions influencing a low level of informational technologies' development in the Volgograd region.

The following institutional conditions should be mentioned:

A. In 2017 the Administration of the region approved the Program "Development of informational community of the Volgograd region" (with amendments of 2019) the main goal of which is the "increase of the interaction of citizens, organizations and the state on the basis of informational and telecommunication technologies" [13].

B. In 2018 a three day workshop "Digital transformation of the Volgograd region" took place and there a number of agreements were reached between the scientific community, regional Administration, social activists and entrepreneurs for a further development of new software which is focused on the development of the region and improvement of the life standard of population [14]. In the region there exist 50 informational systems such as: portal "Government services", electronic diary, informational system in healthcare and so on.

C. In 2014 the Interdepartmental Commission for digital development of the Volgograd region was established. Its main goal is the provision of the interaction between:

- Territorial and federal authorities;
- Administration of the Volgograd region;
- Local authorities responsible for municipalities of the Volgograd region;
- Other interested organizations involved in the digitalization of priority sectors of the economy and social sphere connected with the creation of necessary conditions for the development of social economy [15].

D. The following organizations are created and function in the region:

- Interdepartmental commission for the issues connected with the introduction and development of systems of software and hardware facilities "Secure city" in the Volgograd region;
- Public council at the Committee of Informational Technologies of the Volgograd region;
- Coordination council for the creation of infrastructure of spatial data of the Russian Federation in the Volgograd region;
- Expert council for the personnel policy in the Committee for Informational Technologies of the Volgograd region [15].

The following measures were taken during the work of the organizations mentioned above:

A. Till the end of 2019 750 million rubles will be spent on the moderinzation of the informational and telecommunication infrastructure. The Administration of the region signed the contract with the cell connection provider [16].

B. The project "Digital development of the industry" is being implemented in the region (with the participation of 40 enterprises) in which more than 600 million rubles will be spent before 2024 [17].

C. The implementation of the national project "Digital economy" is implemented according to the following directions (normative regulation of the digital environment; informational infrastructure; personnel for digital economy; informational security; digital government regulation) with the total amount of financing of 4815,6 million rubles [18].

Having analyzed the existing economic and institutional conditions created today in the Volgograd region it is reasonable to show the total digitalization level of the regional economy.

Thus, in 2017 according to the ranking of the regions of the Russian Federation on the level of digitalization the Volgograd region had the 39th position (for instance, the Rostov region had the 15th rank) [19]. However a positive sign is the improvement of the rank of the region during the year for 17 positions (2016). In 2017 the Volgograd region had the 56th rank [19].

Also it is worth mentioning that according to the rating "Digital Russia" during the first half of the year 2018 the region had 38th rank making way for the Rostov region (14th rank) and the Krasnodar kray (32th rank) [20]. Herewith it should be said that the Volgograd region is in the second "catching-up" triplet of the regions according to the speed of digitalization [20].

The mentioned ranks are explained by the following problems in the regional development in the sphere under analysis:

A. The lack of qualified personnel and the necessity of changes in the educational programs. According to the assessments of specialists by 2024 about 120 thousand IT specialists should be trained [21].

B. The lack of funds (due to the deficit of the regional budget) [20]. In 2017 the expenditures of the budget of the Volgograd region exceeded the profits of the budget at 1483 million rubles [22].

C. The digital inequality (without the access to the Internet there is no opportunity of use of the portal "Governmental Services" and "Clever City"). Not all the regions of the country have the opportunity of the complete coverage of the whole territory of the region [20].

D. The absence of necessary conditions for the development of the enterprises within a 6 stage model (computer availability, net communication, visibility,

transparency, forecasting, adaptability) on the way to the industrial revolution 4.0 [23].

E. Gradual creation of mechanisms of digital environment regulation providing a favourable normative and legal regime for the appearance and development of digital technologies which is not finished in a number of regions and among them there is the Volgograd region [20].

The problems mentioned above constrain the development of digital technologies in the given region what under the modern conditions is reflected on its competitive positions what is especially important during the industrial revolution 4.0 what is based on informational and communicative systems.

IV. CONCLUSION

The improvement of economic and institutional conditions of the region within the modern reality of regional development will create the potential for the development of digital technologies what in its turn will determine the sustainability growth of the economic system of the Volgograd region and will increase its opportunities of meeting the external and internal threats.

The problems of development of the region under analysis require a contemporary solution in the nearest future and are expected to be implemented in the following directions:

A. Human resourcing. In this part the number of state funded places in higher educational institutions should be increased for the training of specialists in the corresponding areas. The following specialists are needed: HR specialists developing technical tasks for programmers, analytics, project managers, managers of informational security and so on. Also the higher educational institutions at the support of federal and regional authorities should develop special educational programs for the training of the staff of the mentioned professions.

B. Funding. Overcoming of the deficit of the regional budget as a way to find the additional sources of funding of the digitalization development in the region later.

C. Creation of an accessible informational environment. The unevenness of coverage by digital technologies of the regional territory creates problems with the use of modern services ("Clever city" and so on).

The solution of the mentioned problem lies in the sphere of regional authorities by means of the creation of necessary conditions not only for subregional districts but also for settlements which are not included into agglomerations.

D. At the stage of development of digital technologies in the economy of the Volgograd region the stage that can be achieved in the 6 stage model in the sphere of IT technologies is the computer availability and net communication. The last four stages are visibility (availability of a virtual clone of an enterprise), transparency (net of digital images with analytical systems), forecasting (connection with manufacturing process for the analysis), adaptability (automation of functions connected with the adaptation of business to changing external

conditions) and they should be developed in a number of large enterprises of the region [23].

E. The creation of the developed legal base in the informational and technological sphere and its productivity growth both from the point of view of stimuli creation and institutional barriers suppression.

Thus having analyzed the degree of involvedness of the Volgograd region into the processes of digitalization within the industrial revolution 4.0 a number of problems and contradictions were identified which exist in the regional economy, hindering or preventing the development of informational and communicative technologies in the given region of the Russian Federation. The overcoming of the enumerated contradictions is possible only by means of the coordinated efforts of federal and regional authorities and also of the enterprises doing business in the region.

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