



Challenges of Russian Economy Digitalization in the Context of Socio-economic Development

VLADIMIR BARINOV¹, MIKHAIL KULAPOV², ONA GRAZHINA RAKAUSKIENE³,
PETR KARASEV⁴ and NIKOLAI URAEV⁵

¹ Professor, Department of the institutional and management innovations, Plekhanov Russian University of Economics, Moscow, Russia, e-mail: Barinov.VA@rea.ru .

² Professor, Laureate of the Russian Government Award, head of science school «Management Theory and Technology», Plekhanov Russian University of Economics, Moscow, Russia, e-mail: Kulapov.MN@rea.ru.

³ Professor, Institute Economics and Business, head of Life Quality laboratory, Mykolas Romeris University, Vilnius, Lithuania, e-mail: ona.rakaus@mruni.eu.

⁴ Associate professor of the Department of higher mathematics, deputy principal for learning and teaching, Plekhanov Russian University of Economics, Moscow, Russia, e-mail: Karasev.pa@rea.ru.

⁵ Professor, Department of the Theory and Technology of Management Plekhanov Russian University of Economics, Moscow, Russia, e-mail: uraev2004@mail.ru

ARTICLE INFO

Received March 23, 2020
Revised from April 25, 2020
Accepted June 27, 2020
Available online September 15, 2020

JEL classification: L10, L81, F12, F21, F30

DOI: 10.14254/1800-5845/2020.16-3.2

Keywords:

Digital economy,
high-tech companies,
risks of unregulated digitalization
processes,
national economy development strategy,
management decisions efficiency,
internet of things

ABSTRACT

Aim: The purpose of this paper is to analyze the issues of changes in business and society while implementing digital economy technologies. Limitations are determined being the result of political levers in the competitive environment amongst high tech companies on the global market of modern technologies. *Methodology:* A number of methods are introduced to evaluate digital economy development level as an instrument to manage the digitalization processes. It highlights the issues of boosting the efficiency of management decisions in digital economy. *Results:* This study provides the results of the research of foreign companies on forecasting the development of digital technologies based on economic efficiency criteria. It also looks into the strategy development limitations for the potential of accelerated implementation of digital technologies in Russia. Authors discuss the risks of unregulated processes of digital transformation and ways to minimize them. *Conclusion:* Firstly, Russian education system has a high potential for training of digital economy specialists. Secondly, original organizational and technological solutions for creating an effective infrastructure of the digital economy have already been adopted. Thirdly, integration and development of specific cases on the basis of modern principles of the digital economy will create a synergetic effect and shall boost the Russian economy.

INTRODUCTION

The ongoing complication of the social structures and relationships which modern digital technologies are based on, generates an exponential growth in data flows which puts on a first place the issue of digital economy development. The importance of ongoing processes has provided a rationale for creating a new type of economy in which relations in terms of production, processing, storage, transmission and use of an expanding volume of data are taking on enormous significance. Data becomes the basis for economic analysis which examines the patterns of modern socio-economic systems. Some experts argue that at the present it is more important for an economic agent not to have the resource itself but rather to have information about the resource and the ability to use it in his favor when planning one's activities (Julius and Emchuk, 2015).

As we can see from the analysis of the world's practice of high-tech production (HTP) technologies expansion in the competitive world, such conditions represent an ideal picture which has been called the "blue ocean". In fact, the fulfillment of these conditions is related to the previous generation technologies. Although products manufactured using similar technologies are quite competitive, the period of their competitiveness is relatively short, and the risks of not working out moral and physical depreciation of equipment are very high. Such technologies have a very limited potential for creating new high-tech jobs, and, consequently, spreading world-class innovations into the national economy. In a given scenario, due to the fact that there is no possibility for using the latest world-class technology achievements the state of domestic economy development is compromised (Barinov and Machnovskaya, 2019).

Moreover, there is an active utilization of technological innovations when it comes to non-market methods of competition. At present technological superiority (architecture technologies 10/7 nm) is only held by three companies in the world (INTEL, Samsung and TSMC (Taiwan Semiconductor Manufacturing Company)). TSMC is a Taiwanese company engaged in the research and production of semiconductor products, founded in 1987 by the government of the People's Republic of China and private investors. TSMC has developed a significant number of promising technologies, manufacturing processes, design tools and standard architectures. According to Trend Force information as of December 2018, TSMC is the largest contract manufacturer of semiconductor chips with a market share of 55.9 %. The second and third places are held by Global Foundries and United Microelectronics Corporation with 9,4% and 8.5% respectively.

The above listed companies are unwilling to cooperate with each other which makes it impossible to use the digital economy potential to the full. Another example of a technological monopoly tool in competition is seabed mining sites, production technologies of which are owned by the US and Norwegian companies. Such technologies are in demand for the explorations on the Russian Arctic shelf (underwater mining and transportation of minerals to the coast), as well as in the Caspian Sea, where sea swells and unstable communication with the coast are constant. The implications of competition through a political influence technique could be seen in the history of relationships between Huawei and the United States Government. According to experts and analysts of the electronics market, the confrontation has ended by the triumph of the Chinese company (as of November 2019). "... *The US attempt to isolate Huawei may well turn into self-isolation and a loss for the American companies on the Chinese, and possibly wider markets, which are able to provide corporations from the Middle Kingdom with financial and technological stability in future ...*" (Arkhipov, 2019). The above examples demonstrate that new technological developments are becoming a relevant tool for competition on both technological and political levels.

Lack of technology transfer, however, has a number of negative aspects for the manufacturer itself. Thus, restraining of technology expansion does not create new high-tech places for the manufacturer itself being a necessary condition for production improvement. Termination of the high-tech end products supply causes the reduction of production volumes in the country of origin (TNCs). Under the Laws of steady growth of profit the reduction has to be offset by similar volumes by another customer. Otherwise, the company that owns the technology suffers losses. This

pattern is acknowledged by the experience of the previously mentioned Huawei under the conditions of sanctions regime. The company has quickly entered new markets and the latest technical innovations (for instance, the Mate X smartphone) will not be released on the US market. This device with a revolutionary flexible folding screen does not use a Google software or chips manufactured in the USA.

Russian economy and large manufacturers of HTP make their technological transfer in other direction. Russia is a world monopolist in production of high-strength titanium and products made of it. This refers to the production of the chassis for heavy long-distance passenger aircrafts of Boeing and Airbus, as well as the supply of rocket engines to the United States, produced by NPO Energomash. In other words, in this case manufacturer utilizes his profit generated by virtue of the law of operations expansion. On the other hand, this results in rent raise according to Shumpert (innovation rent from the technology owner).

This form of additional income is determined not by the market price but by a monopolistic nature. In this case, the price, as it is known, is determined mainly by effective demand. The key factor here is of course the information about technology, as well as the know-how for efficient production. It should be noted that having such information alongside with information about industries applying the necessary technology at one's disposal is obviously not enough to organize a production. These patterns are reshaped under the conditions of digital transformation while implementing National Project "Digital Economy of the Russian Federation" (2017, 2019).

1. THEORETICAL AND METHODOLOGICAL ASSUMPTIONS

Simultaneously, building up the transformation process implies a clear definition of the management subject - the economy and, in particular, digital economy. Taking into account the opinion of a number of leading foreign and domestic experts on this matter, in our view, under "digital economy" one should consider modern type of business, characterized by a predominant role of data and its management methods as vital assets in production, distribution, exchange and consumption. Digital economy is a basis for development and has an impact on such various industries as banking, retail, transportation, energy, education, healthcare and many others. Digital technologies such as the Internet of Things (IoT), big data (Big data), use of mobile devices and gadgets transform ways of social interaction, economic relations, institutions. New ways of cooperation and coordination of economic agents, new business models based on the joint solution of certain tasks, for example, sharing economy, are emerging. Sharing economy or the economy of collaborative consumption represents a new culture as an economic business model. Creation of technology and online platforms are the core of this model. Using them people can exchange assets they do not need at the time. Assets are considered to be violin playing, beds in the apartment, private planes, car sharing. According to another classification, this is a type of short-term lease. This also is applicable to the research and specialized equipment, etc.

Along with the indicated qualitative changes in the economic environment, relations in society are also changing (Raszkowski and Bartniczka, 2018; Atkociuniene and, Mikalauskiene, 2019). Such changes have a scope of positive aspects that are widely discussed by specialists in the field of physical production and information and communication technologies (ICT). Although the impact of digital technology on the transformation of socio-economic systems is fairly obvious, many issues remain understudied. One of the compulsory fields of research that is defined by a systematic approach to the development of effective systems is a comprehensive analysis of positive and negative results of application of new digital economy technologies. Unregulated digital transformation processes carry great risks. It should be mentioned that in the context of a large-scale transition to the digital economy principles, social consequences should be kept under special control. Main processes which generate the risks are following. First is job cuts, when high skilled workers

and specialists are made redundant, which will obviously have serious social implications. Second its recent rise in the proportion of high-tech jobs that brings forward brand new requirements to workers' competencies.

Attempts to implement national projects undertaken by the ASI in line with the RF Government Decree No. 551 as of April 26, 1919 are skeptically taken by independent experts due to incoherence between volume and complexity of tasks assigned and deadlines for their implementation¹. Current methods of personnel retraining for new modern relations format emerging in the digital transformation of business and society are ineffective (Ershova and Ziva, 2018). It should be noted when forecasting such changes that governments of many countries are increasingly striving to develop digital economy, using its advantages to respond to key challenges of our time, such as reducing unemployment rate, tackling poverty, and environmental degradation. Many unsuccessful attempts were made to reduce the gap between wages of top management and the one of an average employee which is massively growing even in the United States. Modern national digital strategies are related to economic development, the creation of innovative enterprises, increasing employment and the development of an effective public sector. The issue of the importance of digital economy-controlled development is also raised more often in Russia as well.

A similar analysis of the positive and negative aspects of digital transformation is necessary not only at each level of economy management but also for the social development. Here we first of all talk about the forecasting of negative impact of its minimization. More than that a strategic choice of areas of digitalization development as the way of solving particular social problems is becoming more important. In this respect main task for the state economy management is not only to set up basic guidelines for building economic relations but also to establish digital economy institutions that will speed up the transformation to an innovative type of development. Parallel to this on one hand the duty of the state is to manage the development of the society aimed at minimizing the negative impact of the massive job cuts, expansion and the development of institutions. On the other hand, the allocation of resources for their creation and mechanisms of public-private partnerships development have to reduce the burden on the budget in this transition period.

Additionally, the key objective is to create attractive conditions for business, competitive environment and higher income generation. It should be noted that in the period of digital transformation these focus areas do not eliminate the obligations of a state to ensure the country's security in terms of safety of its critical infrastructure of the social life and economy. We share the opinion of a number of experts who research this issue and evaluate its current state. There is not enough attention paid to the development of digital potential in order to achieve innovation growth of individual companies and industries. The institutional aspects of digital economy are not properly studied. Challenges and prospects of business development in the context of digital economy are fairly considered. Digital economy share has not been properly reflected in the system of modern economic relations. In this regard, the objective of this paper is to look at the main aspects of the digital economy development and offer insights into its role in the overall system of economic relations. The practical aspects of the digital economy development are indicated below.

2. RESEARCH FINDINGS

2.1 Development of digital economic sectors

A key sector of the digital economy is the production of digital goods, equipment and software products. These products belong to high-tech production and are assigned to a special category of markets in the world economy. These companies share (more than 3200 companies) are listed on

¹ All-Russian Economic Meeting 11.11.2019 // Free Economic Society of Russia website

the NASDAQ. At the same time digital services market is developing. Analysis of the dynamics of this sector in the OECD countries economy illustrates a steady growth in world trade in digital economy products (on average, the growth accounts for 4%). Digital services market growth is also impressive (up to 30% per year). Companies increase their spending on research related to digital technology, suggesting that the digital sector plays a key role in innovations. Digital infrastructure is developing and becoming more accessible, and the quality of communication networks is improving as 4G / 5G technologies and fibre-optic data transmission systems are introduced. Simultaneously, prices are reducing, in particular, for mobile communication services, and the opportunities for using mobile devices to access Internet are increasing, which, ultimately, allows us to forecast the ever-growing coverage and development of digital technologies in the world. Such dynamics, as well as surveys, carried out by the worlds' leading consulting and research companies, give a reason to forecast the growing rate of digital coverage of a wide range of industries and activities generally in the world and the national economy².

There is a considerable potential to use modern digital technologies in the company's activities. Experts identify the following aspects that constructively affect the digitalization of enterprises. The level of use of high-tech equipment, software (operating systems, IT³), the availability of professionals who equally understand technological problems of production and the use of IT. A special feature of modern approaches to such kind of transformation is that digital technologies have a significant potential to accelerate innovation processes. From this perspective, levels of investment into the development of digital potential of the company are vital for being competitive in modern dynamic market. Levels of development of the digital economic sectors and the impact on GDP growth in Russia are visually represented in the research held by RAEC (Russian Association of Electronic Communications). Basically following measures implemented by the governments which are focused on the development of the digital economy can be listed: the development of infrastructure, which is the basis for creating new business models and building scientific and social networks; reducing barriers in the digital economy; increasing the level of knowledge of digital technologies, training and retraining of specialists; providing credibility into digital infrastructure reliability and security, assessing risks; developing the digital economy sector.

Based on innovative technologies produced by the electronic industry digital sector of the economy is represented by two elements. The first one comprises electronics manufacturing industry, including the production of microchips, computers, telecommunication devices, and consumer electronics. The second one is the companies which provide services in the area of digital technologies and use digital tools, ways of storage, and data management techniques. The fact that a number of countries is currently implementing a complex of large-scale programs aimed at the development of digital sectors of their domestic economies confirms the importance of the digital sector growth for national economies. All this creates new jobs in the above-mentioned areas increasing competitiveness in the electronics manufacturing industry and IT technologies and therefore proves the necessity of investments into the digital sector of economy (Gates, 1995).

Nowadays, the problems of the digital sector inevitably affect the competitive ability of economy since falling behind in acquiring and processing relevant data and being unable to use a digital resource eventually leads to losing existing positions on market. Theory of the international trade asymmetry provides that digital dependence of one country on the other leads to negative shift between their economies. It is impossible to overcome such structural dependence because the progress of digital technologies is rather fast, and new technologies can be developed based on previous results. If a country does not have them or otherwise if any technical or technological achievements are lost it becomes impossible to create anything competitive and brand-new to make the next step. For this reason, the condition of digital sector and its element base (special-

² Report by Huawei and Oxford Economics. 09/05/2017, Research: Dell EMC and Intel; Hypergiant Industries, BCG, Accenture

³ www.raec.ru; www.rif.ru

ized hardware, providing necessary characteristics of microcircuits) in particular, is the main driver for social development as a whole. Import of digital products may temporarily eliminate the problem. However, taking into account the innovation frequency in this area is highly dynamic and complete equipment renewal period takes two-three years, dependence on the import of such systems will never provide strong competitiveness in this area.

Modern global economy is becoming highly competitive in the area of digital technologies, which enables to get indisputable analytical advantages. Modern digital economy has created a brand-new resource – data, which albeit the controversial nature of this statement, is a factor of a successful economic activity (Cruz-Jesus et al., 2017). The approved national project “Digital Economy for the Russian Federation” (NPDE) and its supporting federal projects anticipate rapid development of the digital technology sector, as well as the equipment and IT for such technologies. Although national potential for the production of such equipment as well as ongoing sanction regime on Russian economy do not allow to achieve these objectives completely. All this creates a threat of purchasing of IT from other countries. Such risks are unacceptable when it comes to IT equipment components which have special requirements to reliability and quality (aviation and space technology, inhabited submarine laboratories, rescue and fire-fighting equipment, etc.).

Therefore, the options for planned federal projects within the national project of digital economy are, either to buy components from foreign producers with simultaneous risks in case of an emergency, or – the production of components on domestic equipment using domestic IT with data protection guarantee. However, this alternative brings in the risks of violating the timeline of NPDE objectives achievement. The established requirements of NPDE federal projects are in some instances unrealistic if they rely exclusively on domestic equipment and IT. Among the reasons, one may outline insufficient initial level and level of production facilities, and competences of domestic producers.

Modern economics has to answer a lot of questions that worry today many specialists and the public. Continuous data flow produces new effects that have not yet been scientifically explained. Besides, the main problem is that these effects experience prompt changes themselves and therefore the provided explanation (or a theory) risk to become outdated within a short period of time and will have to be modified as well. It is important to note that digital economy produces new effects related to the transformation of economic relationships which have informative nature. In other words, a growing number of behavioral models is based on data that often does not meet the qualitative requirements of completeness, reliability, and relevance. A number of behavioral models that use distorted information or intentionally distort information is increasing. Economic opportunism assumes misuse of data on competitors, markets, and technology. The number of economic crimes in cyberspace is growing and business suffer losses not typical for a traditional economy.

Speed of acquiring and processing of certain important data is becoming a production factor itself and planned disinformation becomes an element of deceptive competition. Economic science cannot ignore such problems. Traditional economic categories, competencies, terminology, the interpretation of certain concepts are continuously changing. The development of research in this field of institutional theory, operating with such categories as information, transactions, in our opinion, can help to overcome scientific difficulties (Varnavsky, 2015). Thus, the processes of digital transformation of production management, economic relations between business entities, institutions of digital economy, and public relations will continue its development in the absence of clearly and quantitatively defined goals and indicators. This is caused not only by high level of uncertainty of scientific and technological progress, economic relations developing on the world market, but also by the inconsistency and differences in the rates of development of economic and social processes in Russia. In these conditions very little application will have traditional methods of strategic company management where goals and strategy are clearly set.

When objectives and strategies are constantly refined and revised in line with the analysis of obtained results and new side effects the methodology of indicative planning becomes popular.

There is a methodology of indicative planning for the state level of management as well. At the company level there are such methods of business planning as balance of goals, financing and human resource with the account of risk management. The conditions of constant growth of uncertainty level determine the extensive use of forecasting and planning tools, including foresight techniques. Such conditions presume on one hand the implementation of given methods of national economy control by the state and municipal bodies. On the other constant involvement and responsibility of these bodies in the implementation of NPDE.

2.2 Key points of modern economic growth

The analysis of the results of managing similar processes in socio-economic systems shows that quarter is the rational periodicity measure of reporting to ensure transformation process management. Achieving the required level of process control involves changes in the format of reporting sessions. The format of participation should include not only reporting on progress, but also identifying «bottlenecks». The necessary element of a successful management on all levels is the list of actions to break down the bottlenecks for the upcoming period (till the next reporting period), provide rationale for the resource allocation and organizational leverage requirements. Basic element of modern economic organization encloses working with data and using information and communication systems in management process. The ongoing transactions represent the exchange of data and its interpretation affecting the character of future interactions. This, in its turn, leads to the development of relationships between market players and rules of conduct, changes in behavioral motives and transformation of the value system. Using the framework of information theory, the institutional theory is synthesizing it with the methods of analysis of transaction costs achieves significant opportunities to held further research of economic relations.

A firm is defined by a set of multiple interactions. Hence, there is a problem of aggregating of data on these interactions into a single organization management system as well as integrating heterogeneous information environments into a unified digital space of a company. Here, under a unified digital space we understand a complex of hardware and software tools, designed for data processing, technological process control, designed to elaborate and implement specific decisions in every scope of a firm's business activity. Level of profitability, transaction costs, organizational effectiveness, and, consequently, market prospects depend on the digital potential of the company. The authors agree with the assumptions of a number of scientists that digital opportunities are becoming much more valuable than the availability of raw materials, financial resources and favorable relationships with business partners. Without reliable data the above conditions will not be fulfilled. Ranked data is a resource that enables to plan the future actions for the extended periods. Technical progress, which is narrowed to a steady improvement of technical systems and increase of their efficiency, converts into production of data of the new capabilities of those systems. Society is evolving only when the new data processing capabilities outperform and replace the old ones. This condition has to represent the capability to not only process a growing volume of data but also to use it for implementing the growth of efficiency of production alongside with the economy of resources (Gritsenko, Semina, 2019).

In the context of the analyzed digitalization of economy a particular interest is focused on the growth points of modern economy. In the beginning of the XX century large oil, metallurgical, machine-building and mining enterprises used to be the main driving forces of the world economy, now the largest companies represent digital economy sector (table 1).

Table 1. Ranking of companies according to the analytics company Brand Finance 2019

<i>Brand</i>	<i>Value (bn)</i>	<i>Dynamics</i>	<i>Revenue(bn)</i>
Apple	\$205,5	12%	\$265,8
Google	\$167,7	27%	\$136,2
Microsoft	\$125,3	20%	\$110,2
Amazon	\$97,0	37%	\$211,4
Facebook	\$88,9	-6%	\$48,8
Coca-Cola	\$59,2	3%	\$23,8
Samsung	\$53,1	11%	\$221,6
Disney	\$52,2	10%	\$33,8
Toyota	\$44,6	0%	\$190,8
McDonald's	\$43,8	6%	\$96,1

Source: Ranking of companies according to the analytics company Brand Finance 2019, <http://brandfinance.com>. Date accessed: 13.11.2019 [forbes.ru/biznes/379363-brand-finance-nazvala...]

Obviously, companies involved in IT sector (Google and Microsoft) and online trading (Amazon) demonstrate the highest growth rates, whereas industrial companies fail to keep pace with those of IT sector and online trading. Theoretical understanding of growing data flows impact on modern socio-economic system is reflected in the concepts of the post-industrial and information society. Changes in production processes, reorientation of production from creating material goods to providing services, and the globalization of the economy are recognized by theorists of the digital society as the most fundamental signs of a new type of society triggered by informatization (Sadkov, Shibaeva, Artemov, 2018).

3. DISCUSSION

3.1 Criteria of digital economy evaluation

What are the criteria-based approaches to digital economy analysis? To measure the development of the digital economy, OECD countries have developed a system of indicators characterizing the following areas: high-tech sector of the economy development, its share in manufacturing products and services; investment into the research, software development, education costs and additional retraining; development and production of information and communication equipment; job creation in science and high technology; indicators of cooperation between corporations, venture firms, universities and research organizations; international circulation of knowledge, international cooperation in science and innovation; mobility of scientists, engineers, students; dynamic Internet expansion; share of high-tech products in international trade.

The impact of increasing data flow on the development of the society and the economy made it possible to describe it as the leading resource for the economic growth of modern society. Experts characterize this condition by the changes in economic relations and the development of a digital economy, indicating the necessity to find new approaches to solve the problems of its development.

The analysis of various scientific surveys held by the authors identified four criteria for the analysis of the digital economy, which one way or another were addressed by the researchers: a criterion related to the employment; geographical criterion; technological; and, in fact, economic. However, the idea behind most definitions is that quantitative changes in the field of data processing have led to the development of totally new socio-economic relations.

We have to take a closer look at the *criteria related to an employment sector*. This approach is associated with works of P. Drucker (1993), D. Bell (1999), C. Leadbeater (1999), and F. Cruz-Jesus et al. (2017), who studied a structure of an employment sector and patterns of supervised changes. The transformation of the socio – economic relationships happens because the majority of the workforce are employed in a digital economy sector. The declining share of those who work in manufacturing and a growing number of those in service sector is considered to be the substitution of a manual labor by a digital one. In this case, data is believed to be a primary resource, so a significant rise of workforce involved in data processing may be considered as a digital transformation.

Statistical surveys show that number of people employed in the service sector has increased. In Western Europe, USA, Japan a percent of people who work in the service industry has passed 70%. Most of these people in one way or another are involved in data processing, therefore we have a clear proof of digital economy existence. Main problem of this approach lays in identifying of categories of employees involved in data processing. For instance, it is considered that the fundamental base for digital economy was an increase in number of IT specialists, telecommunication companies' employees and analysts, whose main responsibility was data processing. However, there is no method for calculating a number of people employed in digital economy. Nevertheless, there is a rapid growth of people employed in commerce, legal services, etc., they are hardly related to the digital economy, but all of them fall under the same category.

Geographical dimensional criteria. A number of digital economy concepts is based on the geographical approach (Mulgan,1991; Urry, 2000). Main focus is on data transition network which link different locations and therefore is able to influence the development of global economic area. Data transition network is a distinctive feature of a modern society. In addition, it is important to understand which aspect of the data transition network should be selected to study digital economy. It could be a completely technological aspect, meaning presence of specific data transition systems on a particular territory or we should analyze other aspects: amount of data transitioned through the network, quality of this data, etc. Nowadays a number of other general issues fall under discussion i.e. how can one differentiate between various levels of networks, which amounts of data and speed of its transfer defines a transition to digital economy.

Economic criteria suggest taking into account growth rate of the economic value in the field of data creation, transmission, processing and storage (Leadbeater,1999; Machhlup,1962). If this type of activity is more dominant in economic area than in agricultural or industrial sectors of the economy, one can assume that the transition to digital economy takes place. Additionally, data itself becomes an object of economic relations. Research institutions and specialized companies provide customized services in data collection and analysis that adds more value. Main problem of this approach is a big volume of statistical material, which proves an increased role of data in economic activities, but its real value and impact on companies is understudied. Furthermore, procedures for evaluating the efficiency of employees' performance and their ability to process and interpret data are not yet well developed. For example, information and analytical department in a manufacturing company deals with information and data processing, but in practice it is impossible to segregate its share in the overall company's production for statistical purposes.

Technological criteria. A number of technological innovations in the field of information and communication technologies has become a basis for a technological concept that is now available for general public (Lane, 1999,; Martin, 1978; OECD, 2015). New technologies are the most rec-

ognizable criteria of changes in economic systems and they are often identified as drivers for economic growth. Main idea of these assumptions is that an increased volume of technological innovations in data transmitting and processing leads to socio-economic relationships reorganization. Many scientists in their researches recognize the importance of technological innovations' impact. Such assumptions are based on the ability of computer technology to transform the telecommunications industry and combine these technologies that has led to the development of such services as email, data transfer in the form of text, audio and video files, social networks, instant messengers, etc. The expansion of digital technology gives a reason for discussions of creating new socio-economic relationships, digital economy (Libin and Libina, 2019). Integrated approach is required for the evaluation of level of digital economy development level.

Fundamental problems occur when the development of the approaches and metrics for the assessment of digital economy progress level are based only on technological criteria. It is complicated to follow a level of development of various digital technologies during empirical studies and to what extent their existence allows us to recognize the economy as digital (first - because there are too many of them, second - each of them has its own impact, third - they are constant in their development). In their attempt to identify a suitable metrics unit the majority of the researchers who focus mostly on technologies are unable to provide simple and verifiable data. One of the problems of giving an appropriate definition to the digital economy lays in measuring and identifying a certain point on the technological scale from which one can determine the economy as digital. Many of the modern researches of the information technology tend to avoid this topic limiting themselves to general description of the technological innovations assuming this is enough to reflect a new type of economy.

There is another question related to a dominant role of the technological criteria used for defining digital economy. Critics disagree with those who claim that at each historical period technologies appear first and only then they start to affect socio-economic relationships. This assumption gives a key role to technologies oversimplifying processes of social changes, splitting socio-economic processes from technologic innovations. However, it is clear that technologies are not detached from a social sector, they are an integral part of a society. Decisions on any type of research or development illustrate social priorities. Development of particular technologies is based on these judgements. A number of researchers have demonstrated how technologies reflect social values (Semenov, 2017).

3.2 Complex evaluation of development level in digital economy

If taking into account all the above, it is hard enough to think of a technological factor as crucial in case of any changes in socio-economic relationships as well as in the development of a digital economy. The analysis of the approaches to the determination of socio-economic relationships, which are formed on the basis of digital technologies, shows that currently there are no accurate and detailed concepts in this area. The majority of researchers focus on quantitative characteristics and assume that after reaching a point of a particular number of quantitative characteristics digital economy starts to dominate.

However quantitative characteristics indicating the growth of data flows do not represent a split from the previous systems. Questions arise when digital economy is defined by the assumption that qualitative change can be identified by a simple calculation of data flows or the people involved in data processing, a number of machinery and telecommunication equipment, etc. In other words, an assumption is being promoted that a quantitative growth in data is somehow transformed into a qualitative change in the economic system.

This idea raises the necessity to research qualitative characteristics of the growing data flow in parallel with the analysis of technological development. It should be realized that growing data flows are not entirely a quantitative factor and are a subject to statistical measurements. How-

ever, when calculating the economic value of the data, its share in processing activities in determining of GDP, the qualitative characteristics of the subject are not taken into account. When all the data circulating in the system is considered as homogeneous mass and becomes available for quantitative measurement, the qualitative side of the issue often remains out of sight. Together with the quantitative measurements of data there comes an understanding that its growing number indicates a deep transformation of economic relationships.

3.2 Efficiency of management in digital economy

And at last, the efficiency of management decisions in digital economy. The quality of the data itself, methods of its processing and effective management decisions being adopted on its basis, according to the authors, is the most significant in the context of the digital economy. Theorists of the digital economy have come to the following conclusion by excluding the measure of value of certain data in favor of quantitative measurements of their growth. Due to the growth of economic weight and quantity of data generated the economy should go through fundamental changes. The ability to measure the distribution of data in numbers is not useless but it is not enough. To understand the development of the digital economy where the key resource is the data it is absolutely necessary to comprehend its quality.

Interpretations of scientists who study data value and quality differ from those who work only with nonsemantic and quantitative measurements (Oborin and Gubanov, 2018). One of the specific features of growing data flows is the complexity of data structuring, preparation for use and data management. Excessive commercialization under market relations leads to an information asymmetry of economic agents, depletion of data flows for public access, raise of transactional expenses in data processing and other negative factors, which are considered as implications of digital economy development (Castells, 2000). An ability to accumulate and create huge data reserves, development of high-speed and capacious equipment, telecom network, cloud storages have put restrictions on processing and analyzing huge amounts of data.

Digital technologies, Internet in particular, raise the degree of cooperation and creative exchange between software engineers and end users, researchers and scientists. New technologies also give an opportunity for a continuous team work on creation of goods and services which also includes a wide range of end users. Users' participation allows to reveal drawbacks, flaws and offer ideas for further development. Wide-scale technological changes, when people, using data and communication technologies, interact to produce innovations, are accompanied by changes in the institutional structure of society. Thus, a comprehensive analysis of the nature of relations in the digital economy is possible only from the perspective of social and innovative development.

According to recent studies, there are two framework conditions essential for socio-economic development of the society. First – to consolidate a great number of society members for production and distribution of a new knowledge. Implicit, inaccessible to certain individuals isolated from social interaction, knowledge has to be circulated and enhanced. Second - it is essential to create an «open access» space to exchange knowledge and circulate it. Also, there is a need to lower barriers for cooperation, geographic and linguistic and other obstacles, developing social networks which are general or specialized by nature (Libin and Libina, 2019).

With a growing number of data flows there comes an opportunity to move to another level of management of economic processes. Modern data retrieval systems allow to automatize management decisions process and make it possible to produce a more detailed analysis of economic activity. Modern databases enable to analyze and to forecast economic processes at the macro level as well as regional, industry or company levels. Digital devices, smartphones, IoT allow to get data directly from economic operators. Data received from these devices gives an opportunity to

create digital patterns of consumers, technologic processes, which lead to the economy of resources, optimization of procurement systems and cost cutting, etc. (Popov et al., 2019).

The increased use of digital devices has led to the introduction of a concept of "big data". Data flows are continuously growing (their volumes are already reaching terabytes and petabytes), data is exchanged in real-time mode, processed and used for making decisions. Opportunities produced by Big Data are characterized as unprecedented for the development of management and science. Working with big data is a basis for digital economy growth, as they provide a new level of socio-economic data analysis.

CONCLUSION

Digital economy development provides an opportunity to expand communication and creates a free exchange of ideas and experience. Internet channels allow to combine efforts for starting a business, to look for investment opportunities, employees, partners, resources and marketplaces. Also, digital technologies may be an essential element for staff training, knowledge sharing and implementing of innovative ideas in the social area. Digital technologies development has a significant role in the public economy sector. Digital government and public services are more often seen as means of reducing costs, providing more efficient services to public and businesses, as well as being a part of the government's program to saving the environment.

Digital government and innovative technologies are regarded as means of ensuring the effective government participation in the sustainable development. Digital government will allow government agencies to provide better services and be more open to the public. It can help governments to minimize environmental damage, promote the efficient management of natural resources, as well as stimulate economic growth and promote the development of the public sector.

A separate issue of digital transformation is the analysis of risks that get in a way of creation of a fully functional digital economy. The nature of this problem is determined by the digital inequality discussed above. Along with countries actively introducing and using new technologies, there are entire regions that are cut off from global information communications that do not take an advantage from the transition to a new type of functioning of the socio-economic system. The differences are not only in the level of technology, investment resources deficit or low level of human capital development, but also in the extremely insufficient level of institutions functioning.

Among the conditions for the development of the digital economy in Russia, several aspects can be outlined. Firstly, Russian education system has a high potential for training of digital economy specialists. This indicator established in the NP CE is expected to be fulfilled not only in terms of quantitative characteristics, but also in the competencies of young specialists who meet the highest requirements of our time. This is especially important, since in a digital economy a person will focus mainly on the implementation of new opportunities and systematic organization of interaction in the ecosystem of people and machines, and routine operations will be transferred to machines. Secondly, at present, original organizational and technological solutions for creating an effective infrastructure of the digital economy have already been adopted. Thirdly, integration and development of specific cases on the basis of modern principles of the digital economy will create a synergetic effect and shall boost the Russian economy.

REFERENCES

- Arkhipov, A. (2019), "Huawei wins the sanctions battle with the United States", *News*, 11/18, <https://www.vesti.ru/doc.html?id=3211260>
- Atkociuniene, Z.O., Mikalauskiene, A. (2019), "Knowledge Management Influence on Implementing Sustainable Development Means in the Organization", *Transformations in Business & Economics*, Vol. 18, No. 3C (48C), pp. 546-564.
- Barinov, V., Makhnovskaya, E. (2019), "Structural Analysis of the Processes of the Diversification in the High-Tech Industries", *International Conference on Politics, Economics and Management*, pp. 175-179.
- Barron, I., Curnow, R. (1979), *The Future with Microelectronics: Forecasting the Effects of Information Technology*, Pinter.
- Bell, D. (1999), *The Coming of Post-Industrial Society: A Venture in Social Forecasting*, Basic Books, New York.
- Castells, M. (2000), *Information era: economics, society and culture*, translation from English under the editorship of O.I. Shkaratan, HSE, Moscow.
- Cruz-Jesus, F., Oliveira, T., Bacao, F., Irani, Z. (2017), "Assessing the pattern between economic and digital development of countries", *A Journal of Research and Innovation*, Vol. 19, No. 4, DOI 10.1007 / s10796-016-9634-1.
- Digital government 2020. Prospects for Russia*, [http://www.iis.ru/docs/ DigitalGovernmentRussia2020RUS.pdf](http://www.iis.ru/docs/DigitalGovernmentRussia2020RUS.pdf) (reference date: 10/19/2019).
- Digital economy in Russia*, <http://fb.ru/article/334484/tsifrovaya-ekonomika-v-rossii> (reference date: 03/28/2019).15.
- Digital economy in the Russian Federation: Program of the Russian Federation Government as of July 28, 2017 No. 1632* <http://static.government.ru/media/files/9gFM4FHj4PsB79I5v7yLVuPgu4bvR7M0.pdf>. (reference date: 03/25/2019).
- Drucker, P. (1993), *Post-Capitalist Society*, HarperCollins, New York.
- Ershova, T., Ziva, S. (2018), "Key competencies for the digital economy", *Information Society*, No. 3, pp. 17-26.
- Gates, B. (1995), *The Road Ahead*, Pengiun, Harmondsworth.
- Gritsienko, A.A. Semina, L.A. (2019), "Digital economy in Russia: challenges and development prospects // Collection of scientific articles Digital economy: development issues and solution mechanisms", *International scientific and practical conference 06/08*, Sterlitamak, Ed. Aeterna, pp. 14-17.
- Julius L.V., Emchuk L.V. (2015), "Information systems and their role in the modern enterprises activities in *Perspective economic and management issues Collection of scientific articles*, Scientific journal «Economics and finance» & «East West» Association for Advanced Studies and Higher Education. pp. 130-134.
- Lane, N. (1999), "Advancing the Digital Economy into the 21st Century", *Information Systems Frontiers*, Vol. 1, No. 3, pp. 317-320.
- Leadbeater, C. (1999), *Living on Thin Air: The New economy*, Viking.
- Libin, A. et al. (2019), "Socio-humanitarian risks of the global digitalization of society", *Information Society*, No. 3, pp. 27-32.
- Machlup, F. (1962), *The Production and Distribution of Knowledge in The United States*, Princeton, Princeton University Press, New York.
- Martin, J. (1978), *The Wired Society*, Englewood Cliffs, Prentice-Hall, New York.
- Mulgan, G. (1991), *Communication and Control: Networks and the New Economies of Communication*, Polity, Cambridge.
- Oborin, M.S., Gubanov, D.A. (2018), "Information challenges of the modern management system", *Drucker Bulletin*, No. 3, pp. 4-12.
- OECD (2015), "OECD Digital Economy Outlook 2015", OECD Publishing, Paris, DOI: <http://dx.doi.org/10.1787/9789264232440-en>.

- Popov, E.V., Semyachkov K.A., Moskalenko Y.A. (2019), "Comparative evaluation of the digital potential of enterprises", *Management in Russia and Abroad*, No. 3, pp. 43-39.
- Raszkowski, A., Bartniczak, B . (2018), "Towards Sustainable Regional Development: Economy, Society, Environment, Good Governance Based on the Example of Polish Regions", *Transformations in Business & Economics*, Vol. 17, No 2 (44), pp. 225-245.
- Sadkov, V.G., Shibaeva N.A., Artemov A.V. (2018), "Digital technologies and boosting the efficiency of the modern industrial economy", *Drucker Bulletin*, No. 1, pp. 5-12.
- Semenov, Y.A. (2017), "IT-economy in 2016 and in 10 years' time ", *Economic strategies*, No. 1 (143), pp. 126-135.
- Urry, J. (2000), *Sociology beyond Societies: Mobilities for the Twenty-first Century*. Routledge.
- Varnavsky, V.G. (2015), "Digital technologies and global economic growth", *Drucker Bulletin*, No. 3 (7), pp. 73-80.