

Transformation of the World When Exposed to the Digital Economy

Andrey Petrovich Garnov

Department of Financial Markets
Plekhanov Russian University of Economics
Stremyanny lane, 36, Moscow, 117997, Russian Federation

Olga Nikolayevna Bykova

Department of Entrepreneurship and Logistics
Plekhanov Russian University of Economics
Stremyanny lane, 36, Moscow, 117997, Russian Federation
lgaa3@rambler.ru

Victoria Yurievna Garnova

Department of Management Theory and Business
Technologies
Plekhanov Russian University of Economics
Stremyanny lane, 36, Moscow, 117997, Russian Federation

Ekaterina Yurievna Kamchatova

Department of Innovation Management
State University of Management
Ryazan Avenue, 99, Moscow, 109542, Russian Federation

Olga Aleksandrovna Elina

Department of Industrial Economics
Plekhanov Russian University of Economics
Stremyanny lane, 36, Moscow, 117997, Russian Federation

Lyudmila Gennadiyevna Rudenko

Department of Urban Economy and Service Sector
Moscow Witte University
2nd Kozhukhovskiy proezd, 12, bldg. 1, Moscow, 115432,
Russian Federation

Abstract—The paper covers the main features of national programs for the development of the digital economy in developed countries and the recommendations of international development institutions to developing countries in this regard. Here the authors also demonstrate fundamental differences between the challenges that are set as part of the digital economy growth options. Cultural and psychological barriers matter in a complex environment that requires major transformations due to digital changes. Formation of additional innovations associated with a specific positioning, weak position in Industry 4.0. The Internet of Things can be called a new direction of integration into the world space; it is a kind of paradigm for using cyberspace in the concept of calculating physical objects with built-in interaction technology or with the external environment. The company's use of the concept of the Internet of Things as a phenomenon can limit the economic and social process that separates the needs of human contribution from the part of actions and operations. It is obvious that Industry 4.0 is not limited to technologies only, because it needs cultural changes due to digitalization. Of course, Michael Eugene Porter's value chain should be regarded as an integral and complete digital process in business. We are witnessing a complete reorganization of industries with the application and introduction of a new business model, the withdrawal of existing players from the market and the restructuring of production, consumption, transportation and delivery. The paper presents the positive and negative externalities of building the digital economy in Russia.

The reasons for these issues, possible positive and negative consequences of digitalization in Russia have been analyzed.

Keywords—digitalization, state control, national program, digital economy, information and communication technologies

I. INTRODUCTION

Today's society cannot be imagined without information technologies, which have been involved in and facilitated almost all sectors of business, have opened up new market opportunities. The emergence of new digital mechanisms, the development of computer technologies and digital communications creates current advantages in information technologies, their adoption and introduction into the social and economic life of society, forms a new system of the global, international economy – the digital system. The digital economy is built on the production of electronic goods and services and the introduction of these products through digital marketing.

Economic relations and laws are the matter of the digital economy. These relations are made in the process of creation, expansion and consumption of scientific and engineering information using modern information technologies; and the progress of these operations is controlled by socio-economic laws.

Relevance is conditioned by technological changes that give updated characteristics both to the global economic system and to the economies of individual countries, markets and business entities. Digital technologies have led to global business innovations. The digital economy is based on completely different laws than the conventional economy. All economic agents are currently working in a constantly changing environment of survival, and expansion and development in this context means the constant adaptation of business to a rapidly changing environment, both strategically and tactically.

In recent years, strategic projects for the development of the digital economy (hereinafter referred to as "DE") began to advance at the level of international organizations, which have become a new paradigm for accelerating the growth of the world economy. This is considered an integral part of a more general future vision.

Today, the digitalization of Russia faces many challenges. Consequently, the actual conversion result may differ significantly from the desired result [1, 3, 6, 7, 8]. It is first required to dive into this situation in order to change the current unfavorable outlook.

One of the key issues of digitalization in Russia is the inaccuracy of the programs in place and their insignificant implementation. This is mirrored in the final change in cost and low attainability of the goal, which can be clearly traced from the dynamics of the performance indicators of the national program of the Russian Federation.

II. MATERIALS AND METHODS

The basic research tool used in this paper is system analysis. Empirical research methods, principles of formal logic, as well as the integration and analysis of the works of Russian and foreign scientists are used to study theoretical and practical matters.

III. RESULTS OBTAINED

Thus, the programs of almost all developed countries proceed from the fact that the stage of creating information and communication technologies (ICT) infrastructure has already been completed or is nearing completion in these countries, and therefore, state support should be provided not for direct investments in its expansion, but for the development and introduction of a wide range of organizational, financial activities and use of innovations both in foreign and domestic policy.

Leaders are such developed countries (Lead Market Initiative (LMI)) as the United States, Germany, Japan and many other OECD countries in the early 2010s. Not only the development of digital infrastructure, but also the transition to new industrial platforms based on these technologies, and most importantly – the development of typical systems for ICT systems and all advanced technologies.

The DE Global Project proposes a fundamentally different approach for developing countries, including the Russian Federation. The performance of the International Development

Association on the definition of DE is based on equating this concept with the concept of information society. Initially, it was "pulled away" from the economy and it reflected only the level of development of ICT infrastructure. Such an approach can reform the legal background that imposes the need to actually create digital infrastructure in developing countries and remove barriers to international integration in advancing new forms of ICT-based organization and production.

Based on data from the World Economic Forum and the World Bank, the OECD has produced several indicators that represent the development of national DE. In all events, all DE development programs in developing countries are aimed at improving the country's position in these ratings. For example, the World Economic Forum's proposal for assessing national readiness for the digital economy uses the latest version of the Networked Readiness Index published in the 2016 Global Information Technology Report. It measures the extent to which a country's economy uses digital technology to enhance its competitiveness and prosperity. We will also evaluate the various factors that influence the development of DE.

The final text of the 2015 G20 Summit is based on DE recommendations and development indicators proposed by international organizations, and provides developing countries with very clear guidance on DE development. First, they should consist in the following [5, 10, 11]:

1. Accelerate the creation of network infrastructure and provide a network connection to the world space.
2. Provide a regulation and policy environment for the growth of international private business, improve market access and contribute to ICT technological innovation.
3. Avoid duplication of the related innovation when introduced and adhere to common standards for the creation and use of global ICTs.
4. Encourage cross-border investment, as Germany does.

IV. DISCUSSIONS

Since the early 2010s, more and more countries have begun to adopt national programs for the development of the digital economy. In addition, such programs available in developed countries are usually incorporated into broader national industrial programs that are technology-oriented.

Some of the existing challenges in the Russian economy can be overcome by using the digital technologies. In December 2016, the President of Russia defined in his message addressed to the Federal Assembly of the Russian Federation (hereinafter referred to as "the Russian Federation") the transition to a digital economy as the predominant vector of development of the economic system [8, 12]. In addition, the Decree of the President of the Russian Federation signed on December 1, 2016 and called On the Strategy of Scientific and Technological Development of the Russian Federation, says that digital technologies are key to the innovative and technological development of the country [10, 14].

The program for the transition to the digital economy is long-term and involves a step-by-step implementation. In particular, until 2019, the challenge was to create organizational, legislative and financial mechanisms to prepare the country for the transition to the digital economy [13, 16, 17]. Further stages involve a complete, significant introduction of the digital economy, which consists in the use of new technologies, among others by small and medium-sized businesses of the Russian Federation, digital technologies of intelligent production, robotic systems, as well as trade and export of the latest scientific developments [15, 24, 32].

The plan for the introduction of the digital economy in the Russian Federation until 2035 defines the term “digital economy” as follows:

The digital (electronic) economy is a collection of social relations formed by digital technologies, electronic infrastructure and services, technologies for processing significant amounts of information and prediction in order to optimize production, consumption, distribution, exchange and socio-economic growth of countries.

The project includes such significant targets as striving to ensure the country’s technological leadership amid the formation of a global digital space; setting up a qualitatively updated structure of economic funds that meet the economic advantages of the electronic economy; creating routes to the establishment of processing areas, commerce, services, taking into account the advantages of the digital economy, and productive in the state of organization and growth of the global digital space; giving rise to the principles of effective administration and modernization of the management of existing economic resources; and some others.

The program specifically focuses on the matter of inventing certain conditions for interesting cooperation between individual business units and the business community as a whole, including in the sector of micro-, small and medium-sized businesses, which, as a rule, operate in a single region. The opinions of the expert community on the stage of development of the digital economy differed. Thus, a number of specialists in electronic economy are aware of the product of the transformational influence of general technologies in information and communication, which intersects with all sectors of the economy and social initiative.

On the contrary, the analysis of key political documents of the USA shows that by the time the documents were put in place, a full-fledged digital infrastructure had already been created in the country, while the adopted strategy was based on industrial automation and Industry 4.0 technology. Another characteristic feature of US political documents is that their targets and priorities initially go beyond the national economy and aim at global international dominance in the digital sphere. Therefore, the priorities of the US National Agenda for the Digital Economy adopted in 2015 states: “Since the Internet is most suitable for our companies and employees, where data and services can freely cross borders, promote a free and open Internet around the world.” In addition, “Promoting innovation through legal support of rights to the results of intellectual activity” is being introduced [8, 25, 31].

The same program provides extensive support to US companies operating in overseas digital markets. For example, sales offices were opened outside the US to provide operational support to US companies.

The DSM program (Digital Single Market [5, 30]) in place in the EU countries since 2015 provides for performance towards facilitating access for consumers and enterprises to “digital” goods and the formation of a digital “single” DE market, due to removing barriers that hold back cross-border ecommerce transactions. The document largely addresses the creation of a single “equal playing field” and a favorable environment for digital networks and content services, as well as private investment in the development of ICT infrastructure, and ensuring a level playing field for market players.

In Germany, the High-Tech Strategy 2020 was put in place in 2006 and has been revised several times since then. The latest release is based on Industry 4.0, Germany’s leading strategic initiative for industrial information technology. This strategy should enable Germany to remain competitive in the global market and maintain high wages. The cyber physical system (CPS) designed for this purpose should help increase resource productivity, production efficiency and the emergence of more flexible models of labor organizations. Much attention was paid to the German program aimed at strengthening international cooperation (mainly in the field of product protection and promotion of industrial information technology suppliers) and the creation of new Internet-based markets [7, 22, 26, 30].

Unlike the other programs under discussion, China’s national digital development program is primarily aimed at developing digital infrastructure, but this is entirely related to its uneven economic growth. This is due to the priority of the domestic market. In March 2015, Prime Minister Li Keqiang announced the Internet Plus strategy to build an information society by 2049 at the annual meeting of the Chinese People’s Congress [4]. By 2025, we will focus on the digital renewal of the country’s industry, financial sector and trade (from the roadmap to design work and commissioning). An important project is the introduction of smart manufacturing [9, 28]. The Internet of Things, smart technologies and high-tech devices are the priority areas.

In 2016, China announced another major national plan “Made in China 2025.” [2, 29] Intended for phased putting in place from 2016 to 2020. In addition, 2021-2025 - developing “green industry”, building “smart factory”, supporting “smart manufacturing.” From 2016 to 2020, the China Development Bank will allocate at least USD 44 billion for the implementation of only the first stages of this program. The key focus of this program is to promote innovation in the quality standardization and equipment manufacturing, integration of standardization and innovation, compatibility of military and civil standards, designing of group standards, improvement of corporate standardization, and expansion of innovation. That is, everything is aimed at improving the quality and growth of industry and innovative technologies [18, 21, 26].

The decisive trend of the Fourth Industrial Revolution based on Industry 4.0 is the digitization of technological processes to create new value in the production of materials. Introduction of the global trend of the Industry 4.0 concept into the practice of domestic companies, the importance of the global trend of the national industry, study and systematization of digitalization features, consideration of risks and dangers and designing of appropriate industrial policy measures, in search of new scientific approaches for this. Modern trends and promising areas of innovative transformation of the industrial sector of the Russian economy are determined in terms of the identified features of Industry 4.0.

In Russia, the concept of Industry 4.0 is covered and regulated by several policy documents and regulatory legislation. First, the National Technology Initiative (NTI) is a comprehensive strategy for the development of various Russian industries and leadership in high-tech markets. The concept was developed until 2035 and is divided into packages containing specific technologies.

The main document related to distribution and use of the Industry 4.0 concept is the Digital Economy of the Russian Federation program. The program mainly targets building an ecosystem of the digital economy in Russia. The main technologies included in the program are [1, 15, 18, 19, 23], a large amount of data. Key technologies also include the items required for the Industry 4.0 concept. For example, it provides a definition of the Industrial Internet, a smart factory technology that does not exist today. These days, a legal framework for the development of Industry 4.0 is in the process of being formed in Russia. It can be said that this concept emphasizes the necessity for further development of the digital economy in Russia. Plans to introduce similar technologies in specific industries as part of a regional development strategy are also available. However, the problem lies in the lack of regulation of certain technologies, such as distributed ledger systems (blockchains) and the Internet of Things. Currently, there are no legal restrictions on these technologies, which cannot be officially evaluated and placed on the company's balance sheet. They are also restricted for the use by government companies and companies that do business with government.

Therefore, Russia is faced with the challenge of developing and implementing its components, and hence programs and legal enactments that define the concept of Industry 4.0 itself. However, the regulation of certain technologies is problematic a bit. For example, the issue of legislation on cryptocurrencies and blockchains has been considered by the legislative bodies of the Russian Federation for several years, but so far the documents to regulate this technology have not been adopted.

In the constantly growing level of global competition, the industrial policy is a necessary condition for meeting the requirements of technological change. Now there is a plan for the necessary industrial policy: developing digital technologies and establishing relationships between participants, assisting and supporting companies in upgrading their equipment and training new working professions. Competition will also be fierce and unforgiving between the

participating countries: Germany retains the lead, outsiders with a serious competitor status (e.g., South Korea and China). Countries that are able to leverage digitalization in industries like (France, US, UK) and countries that rely on regional cluster support (Italy). The primary aspects of this model are as follows: demand / product (market, segment, product design), productive organization (methods and means), organization associated with wages. In addition, consistency between the components is required to achieve a stable production model.

It is clear that Industry 4.0 is not limited to technology, as it requires cultural change due to digitization. Certainly, the value chain must be mapped to a "virtual product / process," a partially or fully digitalized business model that brings together all professions, employees, partners and suppliers. We are witnessing the emergence of new business models, the withdrawal of "old" players from the market, and the reorganization of all industries through the restoration of production, consumption, transportation and distribution.

The final budget for the digital economy program is constantly changing. The amount of such change reached 1.6 trillion rubles when it was last presented by the Government in the 2019 digital economy program [4]. The period of relevance of these figures is unknown, but given the usual budgetary process in Russia, the figures will change several times by 2024. Looking at how the cost of the program might change, a number of questions arise. Does such a huge investment in itself justify? "How are responsibilities assigned and what do responsible people expect if the plans are not implemented?"

In particular, changes in project costs and objectives cannot be achieved due to the lack of mechanisms for clear planning and accountability. Billions or trillions can be allocated for this purpose, but the matter is not only in the amount of investments, but also in their effect. State reform is not productive in this situation. The duration and scope of the planned changes to achieve at each stage need to be determined followed by the control of the plan implementation at each stage. A period of about 3 months is desirable. Then, responsible persons shall be assigned for each area and sanctions can be imposed depending on the magnitude of the deviation if it does not correspond to the planned indicators.

The second point is the wrong choice of vectors for development and financing.

Taking into account the latest estimates, the Government of the Russian Federation proposes the following options of cost allocation: 772.4 billion rubles for the development of information infrastructure. Further assessment: development of digital technologies – 451.8 billion rubles, digital management – 222.5 billion rubles, training in the digital economy – 143.1 billion rubles. The Government is going to spend 30.2 billion rubles on information security. Moreover, the cost of regulatory control of the digital environment will reach 1.7 billion rubles [4, 27].

Consideration is given to the first largest expense item proposed by the Russian Federation. What is the reason for this decision? "Do we need this?" - A question with a vague

answer. Theoretically, the creation of 5G networks should improve and simplify the penetration of the Internet into our lives and condition the development of the Internet of Things. However, this goal does not require primary funding within the digital economy of Russia and modernization in terms of 5G. The authors believe the threats associated with this need to be understood in order to pave the way for the spread of the Internet.

The transition to a digital platform implies the development of hacking and attack functions both at the user level and at the state level. At the user level, this is determined by designing software and security technologies [20]. In fact, cybersecurity cannot be achieved simply by creating your own self-contained Internet. If we do not solve the problem of import substitution, we will rely only on foreign information technologies and factor bases.

V. CONCLUSIONS

Thus, the project for the development of the “digital economy” on a global scale essentially means an a priori imbalance between technological development and its goals. In developed countries, on the other hand, with the support of the state, based on a consortium of large transnational companies, and based on the widespread use of ICT, a very solid foundation is being created for a number of promising production technologies. The focus is on financial and organizational innovation using ICT infrastructure and the creation of a digital platform that can be used by both production and services. At the same time, the intellectual property of these innovations is protected by the international standardization system, which does not allow the effective use of uncertified software and hardware solutions with similar capabilities.

In developing countries, the International Development Agency sets completely different agenda: create national resources to facilitate the growth of a national ICT environment and extend it to all spheres of society, government and industry. The second digital innovation is to remove barriers to the development of this infrastructure, but from the standpoint of the security and protection of intellectual property. In other words, the matter means a deeper integration of developing countries into the world economy and their dependence on the flow of international capital.

As part of our study, we can make some suggestions:

- Using digital technologies to enhance the efficiency of government programs by increasing “transparency”. Today this is possible in terms of available resources and cost savings.
- Using a systematic approach: import substitution, technology introduction.

This approach stimulates demand for national high-tech products and programs, provides standards and protocols, and allows applying a combination of administrative, economic and socio-political methods.

The arrangement of large-scale change initiatives must be carried out gradually and responsibly. Especially with regard to the implementation of such plans at the state level. Consequently, if the digital economy is incompletely and inconsistently introduced, then this may affect Russia’s innovation policy more negatively than positively.

References

- [1] Batagov G E 2019 The role of human capital in the digital economy From ‘Capital’ to the digital economy: collection of scientific papers (Vladikavkaz: IPC NOSU) p 320
- [2] More than 40% of those wishing to leave the country are young people 2019. Available at: <https://www.interfax.ru/russia/649004>
- [3] Dzhioev A V 2018 The role of intellectual capital in achieving national competitiveness Humanities and socio-economic sciences 6 (103) pp 113-115
- [4] The Digital Economy national program will receive 1.6 trillion rubles by 2024 2019. Available at: <https://www.cableman.ru/content/natsprogramma-tsifrovaya-ekonomika-poluchit-16-trln-rublei-do-2024-goda>.
- [5] Annual summary report on the implementation and assessment of the effectiveness of state programs of the Russian Federation at the end of 2018. - Moscow: Ministry of Economic Development, 2019. p 343
- [6] Dzhioev A V 2018 Theoretical background of knowledge economy. Issues of regulation of cross-border movement of social processes / Collection of proceedings of the I [4] International scientific and practical conference. Vladikavkaz Institute of Management. pp 107–111
- [7] Gurieva L K 2015 New Economic Geography as the Theoretical Platform of Region Innovative Development Mediterranean Journal of Social Sciences 6 pp 19–26
- [8] Gurieva L K, Dzhioev AV 2016 Sustainable Development of the Russian Economy Scientific miscellany of the Black Sea countries 2 pp 5–8
- [9] “Not only facts”: Let’s talk about age 2018 Available at: <http://www.ug.ru/article/1061>.
- [10] A Digital Single Market Strategy for Europe – Analysis and Evidence. 2015 Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52015SC0100>.
- [11] A National Strategic Plan for Advanced Manufacturing 2012. Available at: https://www.energy.gov/sites/prod/files/2013/11/f4/nstc_feb2012.pdf.
- [12] Chancen und Herausforderungen der vierten industriellen Revolution 2014. Available at: <https://www.strategyand.pwc.com/de/studien/industrie-4-0.pdf>.
- [13] Davidson A B The Commerce Department’s Digital Economy Agenda 2016. Available at: https://www.nist.gov/system/files/documents/director/vcat/Davidson_VCAT-2-2016_post.pdf.
- [14] Eight Great Technologies 2012. Available at: <https://www.gov.uk/government/publications/eight-great-technologies-infographics>.
- [15] G20 Leaders’ Communiqué 2015. Available at: <http://www.g20.utoronto.ca/2015/151116-communique.pdf>.
- [16] Growth Review Framework for Advanced Manufacturing 2010. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/31755/10-1297-growth-review-framework-for-advanced-manufacturing.pdf.
- [17] Industrial Internet Consortium 2020. Available at: <http://www.iiconsortium.org/>
- [18] La Nouvelle France Industrielle 2015. Available at: <https://www.economie.gouv.fr/lancement-seconde-phase-nouvelle-france-industrielle>.
- [19] Made in China 2025 2015. Available at: <http://english.www.gov.cn/2016special/madeinchina2025>.

- [20] Strategy for American Innovation 2015. Available at: https://obamawhitehouse.archives.gov/sites/default/files/strategy_for_american_innovation_october_2015.pdf.
- [21] The New High-Tech Strategy. Innovations for Germany 2014. Available at: <https://rio.jrc.ec.europa.eu/index.php/library/new-high-tech-strategy-innovations-germany>.
- [22] World Economic Forum 2009. Available at: http://www.mclellancreative.com/files/WEF_Thought_Leadership_White_Paper ICTecGrw.pdf.
- [23] Ganichev N A 2019 On the dual nature of state programs for the development of the digital economy in developed and developing countries // "Russia" foresight: the future of technology, economy and human being. Volume 2 / Collection of reports of the V St. Petersburg International Economic Congress (SPEC-2019) / under general editorship of S.D. Bodrunov. (Saint Petersburg: INIR).
- [24] Ganichev N A, Nikulin I A 2018 Features of state programs for the development of the "digital economy" for developed and developing countries / Collection of proceedings the Nineteenth All-Russian Symposium. Moscow: Publishing House. CEMI pp 736-736
- [25] State Council of the People's Republic of China 2020. Available at: <http://english.gov.cn>.
- [26] Kazantsev S Yu, Frolov I E 2006 Conditions and potential for development of the Russian information and communications system Problems of forecasting 4 pp. 80–98.
- [27] Shultseva V 2015 China's digital economy: assimilation! Resistance is useless! The first mile 4 pp 90–94
- [28] Bryukhovetskaya S V, Artamonova K A, Gibadullin A A, Ilminskaya S A, Kurbonova Z M 2019 Management of digital technology development in the national economy IOP Conference series: earth and environmental science pp 42018.
- [29] Gureev P M, Degtyareva V V, Prokhorova I S 2020 National features of forming a digital economy in Russia Advances in Intelligent Systems and Computing 1100 pp 13-20
- [30] Morkovkin D E, Gibadullin A A, Kolosova E V, Semkina N S, Fasehzoda I S 2020 Modern transformation of the production base in the conditions of Industry 4.0: problems and prospects Journal of Physics: Conference Series. 1515 pp 032014. DOI: 10.1088/1742-6596/1515/3/032014
- [31] Morkovkin D E, Lopatkin D S, Shushunova T N, Sharipov B K, Gibadullin A A 2020 Formation of the conditions for the development of innovation Journal of Physics: Conference Series 1515 pp 032002. DOI: 10.1088/1742-6596/1515/3/032002
- [32] Morkovkin D, Lopatkin D, Sadriddinov M, Shushunova T, Gibadullin A and Golikova O. 2020 Assessment of innovation activity in the countries of the world E3S Web of Conferences 157. pp. 04015. DOI: <https://doi.org/10.1051/e3sconf/202015704015>.