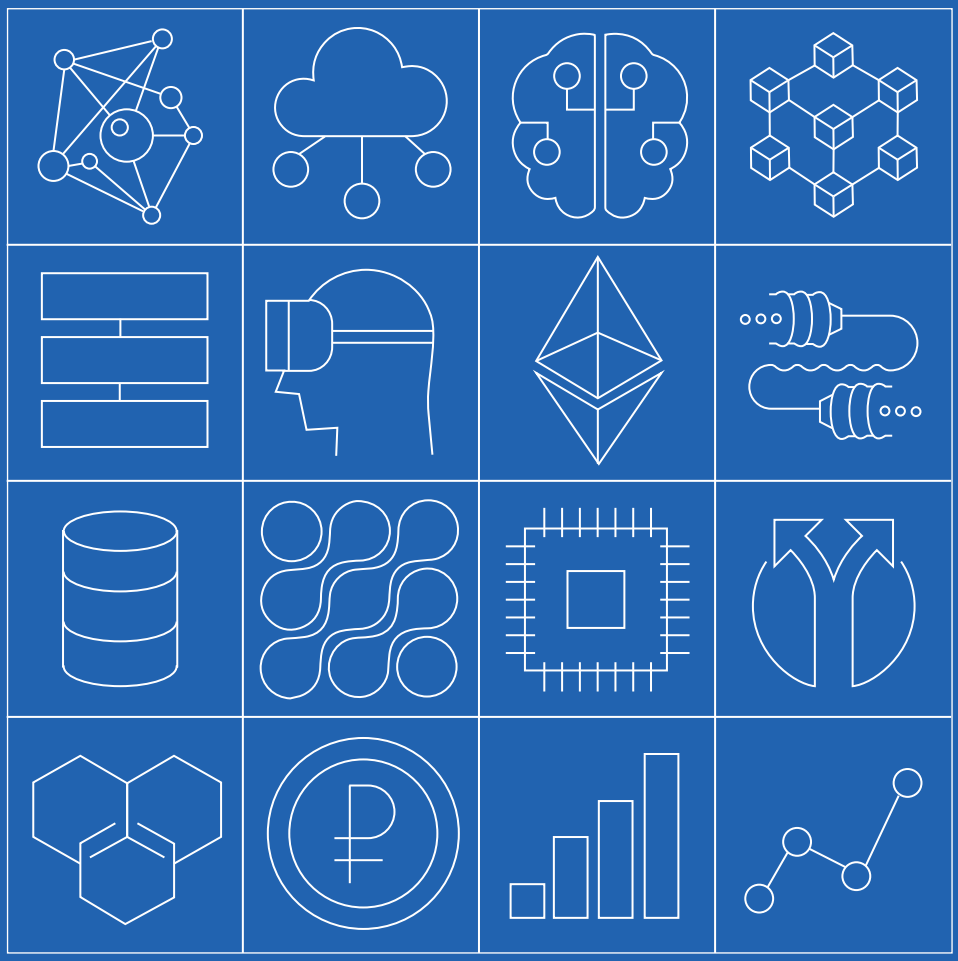
Digital economy country assessment for Russia



DIGITAL ECONOMY COUNTRY ASSESSMENT FOR RUSSIA

INSTITUTE OF THE INFORMATION SOCIETY
MOSCOW, MAY 2018

UDC 004 (470+571)

D74 Digital Economy Country Assessment for Russia. Moscow: Institute of the Information Society, 2018. — 158 p.

ISBN 978-5-901907-47-4

This publication presents for the first time an analysis of the current state of digital economy development in Russia. Much attention is paid to indicators characterizing non-digital factors (government policy, leadership and institutions, human capital, business environment, R & D and innovation, information security and trust) and digital foundations (telecommunications infrastructure, data centers, digital platforms, etc.) of the digital economy development. The maturity level of the digital sector of the economy (icluding ICT sector and the content and media sector) was separately assessed. Use of digital technologies in the public sector, as well as by business and citizens arehas been investigated, and the economic and social effects of digital transformation in Russia are assessed. Both international and national comparisons have been made.

This work maybe of interest to experts and managers involved in the elaboration and implementation of information society and digital economy development policies.

This report was prepared by the Institute of the Information Society and experts from other Russian organizations with support from the World Bank.

Phone.: +7 (495) 912-22-29 E-mail: info@iis.ru
Design and master-copy: D. Kapustin
Published 21.05.2018. Format 70x100 1 / 16.
Fonts «PT Sans», «PT Serif» by the Paratype Co.

ISBN 978-5-901907-47-4

Table of contents

Acknowledgments

This report has become one of the interim reports prepared as part of the initiative "Development of the Digital Economy in Russia" in the process of writing the report "Competing in the Digital Age: Policy Implications for the Russian Federation". This report is the first global pilot project to create a methodology for assessing a country's readiness for the digital economy (Digital Economy Country Assessment, or DECA), developed by the World Bank in collaboration with the Institute of the Information Society (IIS) and other partners in Russia in 2017.

The following experts participated in the preparation of the report: Nikolai A. Dmitrik, head of department of the National Center for Digital Economy, Lomonosov Moscow State University, Natalia V. Dneprovskaya, associate professor of the Plekhanov Russian University of Economics, Andrey P. Dobrynin, Director of the Center for Geospatial Economic Analysis of the Faculty of Economics, Lomonosov Moscow State University & deputy director of the National Center for Digital Economy, Lomonosov Moscow State University, Alexander M. Elizarov, professor of the Kazan Federal University, Tatiana V. Ershova, director of the National Center for Digital Economy, Lomonosov Moscow State University, Yuri E. Hohlov, chairman of the Board of Directors of the Institute of the Information Society, Dmitry E. Namiot, senior researcher, Laboratory of Open Information Technologies, Lomonosov Moscow State University, Ivan V. Nevolin, senior researcher at the Central Economics and Mathematics Institute of the Russian Academy of Sciences, Valentin V. Padzhev, head of the Directorate of the Institute of the Information Society, Oleg V. Simakov, deputy head on Information Technology of the Federal Bureau of Medical and Social Expertise, Boris B. Slavin, scientific director of the Faculty of Applied Mathematics and Information Technologies of the Financial University under the Government of the Russian Federation, Sergey B. Shaposhnik, head of Directorate of Monitoring of the Information Society Development of the Institute of the Information Society & senior researcher at the Institute of History of Science and Technology of the Russian Economy of Sciences, Maxim A. Yurevich, junior researcher at the Financial University under the Government of the Russian Federation.

Help and support in preparing the report were provided by the employees of the Institute of the Information Society: Vadim I. Galperin, Peter S. Ershov, Alexander V. Katin, Olga V. Kopyeva, Olga V. Reznikova, Louiza M. Rizmanova and Victor V. Stroganov.

We are grateful to the experts who express their views on the current level of digital economy development in the Russian Federation in the course of the interview: Ivan S. Berov, Director of Strategic Innovation program of the PJSC "Rostelecom"; Timur R. Gareyev, senior expert of the Skolkovo Institute of Science and Technology, D. G. Gokov , chairman Smart City Chair of the Siberian State University of Telecommunications and Informatics; Irina Dezhina, Head of the Scientific and Industrial Policy Group of the Skolkovo Institute of Science and Technology; Igor L. Dmitriev, chairman of the board of directors of the group of companies "Intescom", Sergei L. Dobridnyuk, Director of Innovations, Diasoft LLC; Tatyana V. Eferina, head of the monitoring department of the Analytical Center under the Government of the Russian Federation; Vidia A. Zheleznov, Director of Strategy and Marketing Communications "RTC-Data Center" LLC, Boris V. Zingerman, head of the department of computerization of Hematology Research Center; Oleg I. Karasev, chairman of the Chair of Statistics of the Faculty of Economics of the Lomonosov Moscow State University, Alexei O. Kozyrev, Deputy Minister of telecommunications and Mass Communications of the Russian Federation; Anatoly N. Kozyrev, the deputy director of the Central Economics and Mathematics Institute of the Russian Academy of Sciences, Nikolay V. Komlev, Director of the Association of Computer and Information Technology, Vyacheslav V. Kondratyev, professor at the Moscow Physical-Technical Institute, Anna N. Korobova, deputy head of the Prefecture of Zelenograd administrative district of the Government of Moscow, Sergey A. Lebedev, Director of the Center for Cybernetics of the Plekhanov Russian University of Economics; Alexander S. Levashov, editor-in-chief TAdvisor, Sergey N. Macedonsky, general director of the analytical agency "in4media / Forrester"; Alexander S. Molchanov, vice-president of the "ProObraz" LLC; Dmitry E. Namiot, senior researcher of the Laboratory of Open Information Technologies of the Lomonosov Moscow State University, Andrey A. Prozorov, the head of the expert direction of the company Solar Security, Alexander N. Raikov, the general director of the Agency of New Strategies, Alexander N. Ryabushko, Deputy Director of the OGKU "Department of Affairs of the Ulyanovsk Region", Alexei L. Semenov, Director of the Informatics for Education Institute of the Federal information Center "Informatics and Management" of the Russian Academy of Sciences, Vladimir P. Tikhomirov, Chairman of the Expert Council on Information Technologies in Education at the State Duma Committee on Education; Mikhail M. Elyanov, president of the Association for the Development of Medical Information Technologies.

Several experts, for various reasons, wished to remain anonymous, and we also express our sincere gratitude for this position.

The following World Bank staff participated in the preparation of the report: Oleg Petrov (team leader), Carlo Maria Rossotto (co-team leader), Kim Andreasson, Artem Anikyev, John de Boer, Mikhail Bunchuk, Yulia Danilina, Declan Deasy, Aynura Dzhoroeva, Zamira Dzhusupova, Yaroslav Eferin, Nagy Hanna, Jeff Kaplan, Alexander Korolyov, Gwanhoo Lee, Elena Lipilina, Alla Morrison, Juan Navas Sabater, Rafal Rohozinski, Asya Rudkovskaya, Sean Silbert, Andrew Stott.

Introduction

The widespread use of information and communication technologies, and Internet technologies in particular, have resulted in the emergence of the global information society and digital economy. This fundamental process is based on a deep digital transformation of both the economy and society. The digital transformation of the economy plays an important role in accelerating the pace of global economic development, increasing productivity in existing sectors, creating new markets and industries, as well as in achieving sustainable inclusive economic growth through participation of all stakeholders.[1] In addition, the digital transformation of society serves as a powerful catalyst and a factor for strengthening inclusiveness: the transformation establishes faster and more efficient communication among different communities, and creates exchange of information, ideas and products.

At the international level, no unified approach to the definition of "digital economy" has yet emerged because of the complex and dynamic nature of this phenomenon. Recent studies indicate the penetration of elements of the digital economy within the general economy, and assert that it can no longer be described as a separate part or a subset of the traditional economy.[2] The studies also indicate that the digital economy is broader than e-commerce and e-business: it includes entrepreneurship, communication and provision of services in all sectors, including transport, financial sector, manufacturing sector, education, health, agriculture and other sectors, retail, media, entertainment and digital enterprise management.

The distinctive features of the present stage of economic development include not only large-scale use of the new digital technologies (such as artificial intelligence, predictive analytics, additive technology, and the Internet of Things), but also the deployment in creation of the economic value of the accumulated arrays of digital data about the subjects and processes of economic activity. In this case, the pace of development of certain traditional sectors is uneven: erasing the boundaries between adjacent areas, and creating new previously non-existent fields of activity and fundamentally different business models.

---

1 G20 Digital Economy Development and Cooperation Initiative. URL: http://www.g20chn.com/xwzxEnglish/sum_ann/201609/P020160912341422794014.pdf

2 Digital Transformation // European Commission. Growth, Internal Market, Industry, Entrepreneurship and SMEs. URL: https://ec.europa.eu/growth/sectors/digital-economy/policy_en

It is important that the countries take deliberate steps aimed at the formation of the Digital Economy and gaining the associated benefits to increase the number of jobs, improve national competitiveness, ensure greater diversification of output, create favorable conditions for business and to encourage innovation in the development and improvement of necessary services.

Digital transformation processes are characterized by great complexity and multi-dimensionality. They are affected by many different factors, the most significant of which require timely detection and measurement in order to make the right strategic decisions, plan development in key areas and to implement corrective action based on feedback.

Globally, considerable experience has been accumulated as regarding measuring of the development and implementation of digital technologies. Alongside this, the entire range of new technologies and phenomena of digital economy is not, so far, getting into the field of statistical observation. Thus, effort is required to revamp the international standards of surveillance and engineering of the metering procedures for different aspects of digital economy, such as defining the scales of the latter.

International organizations are responsible for significant contributions to monitoring the development of the information society in general and the use of ICT in various spheres of activity.

Thus, since the late 1990s a UN specialized agency, the International Telecommunications Union (ITU), regularly conducts research and publishes reports on the global state of affairs in terms of access and use of ICTs, regularly updating the conceptual basis of such observations. Among the monitoring tools created by ITU are the ICT Development Index and the ICT Price Basket Index, which is published since 2009 and included in the annual analytical report on Measuring the Information Society[3] and the Global Cybersecurity Index, published since 2014.[4]

Some of the most important results of monitoring research are contained in OECD materials, in particular in guidelines and reviews on measurement of the digital economy.[5] [6]

Since 2001, the World Economic Forum, in cooperation with the international business school INSEAD, prepares and publishes the annual Global Information Technology Report,[7] which includes the Global Networked Readiness Index. Since 2009, jointly with the Cornell University and the World Intellectual Property Organization INSEAD develops the annual Global Innovation Index and the related analytical report.[8]

In 2004, the Partnership on Measuring ICT for Development, which unites a number of UN agencies, Eurostat and the OECD, began in cooperation with the public authorities of different countries the formation of an agreed core list of ICT development and use indicators. In the period of 2005-2011 the Partnership, based on OECD experience,

---

3 *Measuring the Information Society Report 2017. Volume 1 – Geneva: International Telecommunication Union, 2017. – xi + 155 p.*
Measuring the Information Society Report 2017. Volume 2 – Geneva: International Telecommunication Union, 2017. – viii + 251 p.

4 *Global Cybersecurity Index 2017. – Geneva: International Telecommunication Union, 2017. – 78 p.*

5 *OECD (2014) Measuring the Digital Economy: A New Perspective. – Paris: OECD Publishing, 2014. – 156 p.*

6 *OECD (2017) OECD Digital Economy Outlook 2017. – Paris: OECD Publishing, 2017. – 324 p.*

7 *The Global Information Technology Report 2016. – Geneva: World Economic Forum and INSEAD, 2016. – 307 p.*

8 *Cornell University, INSEAD, and WIPO (2017) The Global Innovation Index 2017: Innovation Feeding the World. – Ithaca, Fontainebleau, and Geneva: Cornell University, INSEAD, and WIPO, 2017. – 432 p.*

provided several basic research outputs devoted to standards and methodology for monitoring the development of the information society and the economy including a universal set of key indicators on access to and use of ICTs.[9]

These ratings provide an opportunity to gain an initial understanding of the state of affairs in Russia regarding the development of the digital economy and the individual factors influencing its development, compared with other countries. Below are the current positions of the Russian Federation in the above-mentioned and some other global rankings.

Rating / Year	Organization	Rank
Global Competitiveness Index[10] / 2017-2018	WEF	38 of 137
World Digital Competitiveness Ranking[11] / 2017	IMD	40 of 63
Networked Readiness Index / 2016	WEF, INSEAD	41 of 139
Doing Business Index[12] /2018	The World Bank	35 of 190
Human Development Index[13] / 2016	United Nations Development Program	49 of 188
Human Capital Index[14] 2017	WEF	16 of 130
Global Innovation Index / 2017	INSEAD, Cornell University, the World Intellectual Property Organization	45 of 127
ICT Development Index /2017	ITU	45 of 176
Global Cybersecurity Index / 2017	ITU	10 of 134
UN E-Government Development Index[15] / 2016	UN Department of Economic and Social Affairs	35 of 193

Таблица 1. Russia's place in the international ratings

The general conclusion that can be made on the basis of Table 1 is that in most cases, Russia lags behind the top ten leading countries, which is not in sync with the stated political objective of becoming one of the champions of the information society development and the digital economy. Understanding the causes of the gap and developing measures to close it requires a more detailed, comprehensive analysis of the country

9 *Partnership on Measuring ICT for Development. URL: https://www.itu.int/en/ITU-D/Statistics/Pages/intlcoop/partnership/default.aspx*

10 *The Global Competitiveness Report 2017–2018. – Geneva: World Economic Forum, 2017. – 380 p.*

11 *IMD Digital World Competitiveness Ranking 2017. – Lausanne: IMD, 2017. – 180 p.*

12 *World Bank (2018) Doing Business 2018: Reforming to Create Jobs. Washington, DC: World Bank, 2018. 304 p.*

13 *Human Development Report 2016: Human Development for Everyone. New York: United Nations Development Program, 2016. – 271 p.*

14 *The Global Human Capital Report 2017: Preparing people for the future of work. – Geneva: World Economic Forum, 2017. – 191 p.*

15 *United Nations E-Government Survey 2016. – UN, New York, 2016. – 217 p.*

readiness for digital economy development, use of digital technologies in various sectors of the economy, and assessment of their impact on economic and social processes.

This analysis of the current state of development of the digital economy in Russia was carried out taking into account the accumulated experience, which has been mentioned above. The data sources include the main relevant parameters, mainly related to ICT infrastructure and access to ICT, the ICT market, the information industry, innovation potential, trust and security in the use of ICTs, and use of ICTs for development in key sectors. However, given the emergence of new specific developments and technologies, this list of indicators was significantly expanded and clarified.

Methodology

In order to assess the current situation regarding the development of the digital economy in Russia we used the digital economy assessment methodology developed by the World Bank in collaboration with the Institute for the Development of the Information Society for various countries of the world. The methodology is based on research by international organizations (OECD, ITU, World Economic Forum, and others), leading global consulting firms, industry representatives, as well as the World Bank. The overall conceptual approach for assessment is based on the vision of the processes of development of the digital economy, presented within the World Development Report 2016: Digital Dividends, which examines the socio-economic effects of the development of the digital economy ("digital dividend"), and the conditions for achieving those dividends.

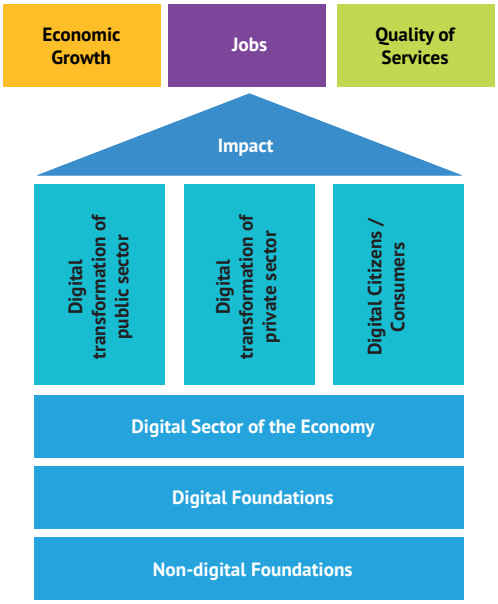
The digital economy – here defined as the economy based on the development and use of digital technologies — is built on three foundations that enable transformation of the economy and society (see Figure 1):

- ***non-digital foundations*** including policy and strategic planning, leadership and institutions, regulatory framework, human capital, innovations, business environment, trust and security, which provide the enabling environment within which digital transformation can occur;
- ***digital foundations*** including digital infrastructure, shared digital platforms, and emerging digital technologies are the tools from which transformation can emerge;
- ***the digital sector of the economy***, comprising the ICT sector and the content and media sector, is the engine for digital transformation.

The pillars of the digital economy are the economic and social subject areas in which transformation occurs:

- ***digital transformation of the public sector***, which includes digital and non-digital foundations for transformation of the public sector as well as use of traditional and emerging digital technologies in the public sector;

- ***digital transformation of the private sector***, consisting of digital and non-digital foundations for transformation of the private sector as well as use of traditional and emerging digital technologies in the private sector;
- ***digital citizens and consumers*** addresses citizen access to and use of digital technologies for social and economic activities including work, the purchase of goods and services, education, social networking, political participation, etc.;
- digital transformation has a significant ***impact*** on economic and social processes, primarily on economic growth, the labor market and the quality of services.



The methodology is focused on diagnostics of the current situation. The results of the diagnostics can create a basis for strategic planning of digital transformation. In its structure, the methodology is limited in scope, and provides: (i) the basic assessment of the current state of maturity of the digital economy; (ii) identify key gaps, challenges and opportunities in the development of the digital economy; (iii) identification of areas that require more careful analysis before policy measures or investments.

Each of the subject areas of the assessment is characterized by a set of indicators of two types – quantitative indicators (including those used by international organizations) and qualitative indicators/questions that characterize important aspects of development, which do not have metrics. In order to determine the relative strengths and weaknesses and subject areas of the digital economy development, all the indicators were assessed on a 5-point scale based on benchmarking of the international experience and best practices of leading countries.

Conversion into a 5-point scale of quantitative values was carried out in accordance with different algorithms depending on the availability of comparable data for other countries:

1. In cases where international datasets are available (for individual indicators or composite indexes) originating from a recognized source and covering a wide range of countries with different levels of development (e.g. the UN data – ITU, UNESCO, UNDESA, and the WEF data) the scoring on 5-point scale was based on dividing the minimal and maximal value range into five intervals, and assigning a score reflecting the interval for Russia.

2. In cases when comparable statistics are available only for Russia and the developed countries (OECD and/or the EU), the range from maximum and minimum values of the indicator applicable to the OECD or the European Union countries was divided into 4 intervals (for a score from 2 to 5) with scoring reflecting the value assigned to Russia. If the value of the index assigned to Russia was less than the minimum value for the developed countries (which practically was never the case), a score of 1 was assigned.

In cases when for Russia there were no comparable data sources or there were no international statistics on the assessed parameter or the assessed parameter had no metrics ("qualitative" indicators – evaluation of programs and policies, regulatory norms for various sectors, etc.), the score for Russia was based on expert assessment methods, involving the experts familiar with the relevant subject areas in Russia and globally.

The general assessment based on sections and subject domains was defined as the arithmetic means of evaluation of indicators, that described the subject domain.

The methodology of assessment was first applied and further improved upon for the case of Russia during the development of the Russian Digital Economy Program, endorsed by the Russian Government on July 28, 2017. The results of the assessment were also used during the preparation of action plans for the implementation of the abovementioned Russian Digital Economy Program.

1. Non-digital foundations for digital economy development

1.1 Public policy and strategic planning

The development of the digital economy requires the development and implementation of public policy, including the definition of strategic goals and objectives for the use of digital technologies for socio-economic development, preparation and implementation of action plans and programs, assessment and monitoring of the development of the digital economy to provide feedback in the digital transformation of the control system.

1.1.1 Strategy for development of the digital economy

Current strategy for socio-economic development

In 2008, Russia approved the "Concept of Long-Term Socio-Economic Development of the Russian Federation until 2020" [1], which functions as a strategy. This strategy also produced more than 60 sectoral and intersectoral strategic documents. Today it is obvious that some of the existing targets – both general and ICT – will not be met by 2020. For example, the proportion of enterprises engaged in technological innovation is projected to increase to 40-50%, but the actual value of this indicator does not exceed 10% (7.3% in 2016 – see section 1.5.2.); spending on research and development is projected to increase to 2.5-3% of GDP, but the actual share according to the latest data is only 1.1%, etc. [1]. In 2011, in response to changing circumstances, including those associated with the global economic crisis, an updated strategy for socioeconomic development until 2020 [2] was developed at the request of the Russian Government, but never approved. According to the law "On strategic planning in the Russian Federation", this strategy should be developed by January 1, 2018, and documents adopted earlier must be brought into line with the law before January 1, 2019 [3, p. 47]. As a result, there is no current strategy, and sectoral strategic documents are not all in accordance with the law on strategic planning, are often incompatible with each other, and are descriptive in nature.

Current digital economy strategy

In May 2017, the President of the Russian Federation approved the "Strategy for the development of the Information Society in the Russian Federation for 2017-2030" [4], which replaced a previous strategy from 2008. The development of the new strategy took into account the message of the President's address to the Federal Assembly on 5 December 2016 concerning the need to develop a program for the development of the digital economy [5]. Based on this demand, the new policy can be considered a strategy for digital transformation. There are also a number of private strategic and conceptual documents in the production and use of digital technologies, in particular the "Strategy for development of the information technology industry in the Russian Federation for 2014-2020" [6], "The concept of regional information" [7] and others.

Although the strategy's priorities include "the development of economy and social sphere", the digital transformation of the social sphere as presented in the document is insufficient. For example, of possible specific tasks in the sphere of culture, only the creation of a national electronic library "and other state information systems" including "objects of historical, scientific and cultural heritage of the peoples of the Russian Federation" is mentioned. Also not reflected in the objectives of inclusive development strategy for the digital economy is any mention of involvement of persons with disabilities and other vulnerable groups. In addition, there is no proposed solution for the very topical problem of overcoming the digital divide between regions, nor measurable targets for the strategy (these should be developed by government).

1.1.2 Implementation of the digital economy strategy

Implementation of strategy for socio-economic development

The Russian government's annual action plan for 2017 approved and implemented 42 state programs of the Russian Federation [8] and 33 federal special-purpose programs [9], developed and implemented projects in 12 priority areas [10], and accepted road maps (action plans) for the implementation of concepts and initiatives [11], while hundreds of regional programs are also in place. The problem is the weak consistency of these documents with one another and with other strategic planning documents.

Implementation of the digital economy strategy

In the field of digital technologies, there are the state program "Information Society (2011-2020)" [12] and other policy documents:

- federal target programs ("The development of the electronic and radio-electronic industry in 2013 – 2025. "[13], etc.).;
- road maps (action plans) for the implementation of concepts and strategies (Roadmap "Development of information technology industry" [14], and others.);
- sections on the use of ICT in programs dedicated to the development of individual sectors;
- regulations creating public information systems (Unified State Information System in the Healthcare Sector, Russian Unified e-Service Bus System, and others).

These documents have not yet been updated to reflect the tasks of digital transformation, are not consistent with the adopted Strategy for the Development of the Information Society, and are not arranged in a single, coherent system of documents.

In 2017, the Russian Digital Economy Program was approved by the Presidential Council on strategic development and priority projects [15] and by the Government of the Russian Federation on 28 July 2017 [16]. In December 2017 and February 2018, the Government Commission on the Use of Information Technologies to Improve the Quality of Life and Business Environment approved the action plans for directions "Regulatory Environment", "Development of Research Competences and Technological Reserves", "Information Infrastructure", "Information Security" "Manpower and Education" of the Russian Digital Economy Program [17, 18].

The program documents broadly depict the various areas of ICT production and use (e-government, e-health, e-education, ICT sector and others) but they are in need of an update to take into account new trends in the development and use of digital technologies.

The first version of the Russian Digital Economy Program does not include areas such as the digital transformation of public administration, education, health, industry, and agriculture, among others. It also does not touch on the development of the digital sector of the economy (ICT-sector, content and media sector). In January and March 2018, at the meetings of the Subcommittee on Digital Economy of the Government Commission on the Use of Information Technologies to Improve the Quality of Life and Business Environment, a list of directions for digital transformations of several areas was preliminarily approved to be included in the Russian Digital Economy Program. The President's Decree of the 7 May 2018 provides for transforming the priority sectors of the economy and social sphere, including healthcare, education, industry, agriculture, construction, urban economy, transport and energy infrastructure, financial services, by means of digital technologies and platform solutions [19]. These areas will be included in the program. Now work is underway to develop action plans for these areas, but so far there have been no officially approved action plans for the sectoral areas.

In international rankings of ICT use, Russian policy documents are not ranked very highly. In the WEF Executive Opinion Survey of business managers, Russia ranked in 76th place on "Having a clear plan for the use of ICT to improve the competitiveness of the country", with a score of 3.6 on a 7-point scale. [20]

1.1.3 Digital transformation measuring, monitoring and evaluation

Monitoring and evaluation of digital transformation

Russia has developed a branch of government statistics known as the Information Society statistics. Rosstat and line ministries monitor the production and use of ICTs, and the official Rosstat website has an "Information Society" section [21]. At the same time, there is no single methodological approach to the monitoring carried out by various agencies, and the monitoring system has not been modernized to include new objectives for the digital economy, so a number of important indicators are not currently measured.

The set of targets to be monitored in the strategic planning document is not balanced, and there are almost no measurable performance objectives related to the effectiveness and efficiency of digital transformation. Indicators for the digital

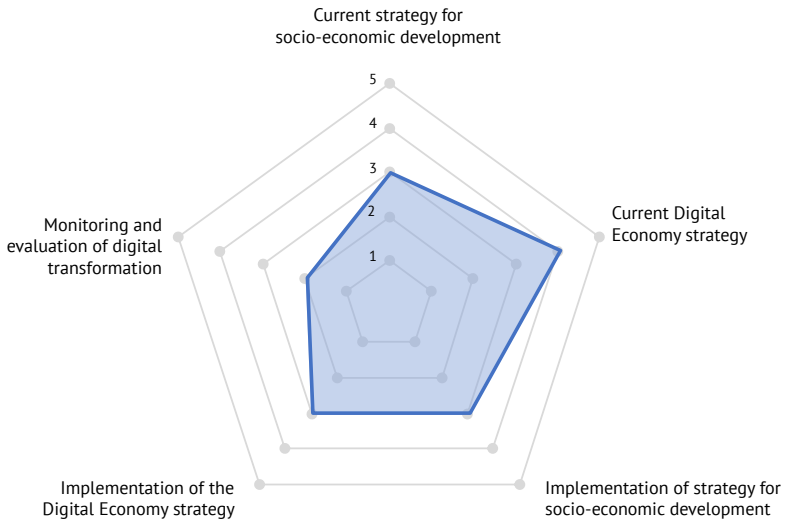
transformation of the public sector do not form an interconnected system based on the same conceptual model to allow an estimation the contribution of individual initiatives to the achievement of objectives.

In the Russian Federation in the 2000s and 2010s, work was undertaken to harmonize federal statistical observation with international standards. Based on OECD models, forms to survey the use of ICT by organizations (№ 3-inform 2003 G. [22]) and the population and households (№ IT-1 to 2013 [23]) have been developed and introduced. In 2015, in accordance with OECD recommendations, a collective grouping of economic activities that make up the ICT sector and the content and media sector were approved [24]. The Russian Ministry of Telecom and Mass Communications carries out monitoring of telecommunications at the recommendation of ITU.

At the same time, this harmonization was insufficiently consistent, and methodical peculiarities of Russian statistical observations do not allow for fully valid international comparisons (samples of enterprises and the public do not fully comply with the OECD recommendations: small businesses are not polled, the sampled age group from the population was 15 to 72 years, rather than recommended 16-74, etc.) of all the indicators available. Most importantly, forms focused on digital economy, including a number of questions about the use of new digital technologies (data analytics, cloud computing, among others), have not been modernized in accordance with the latest versions of the OECD model questionnaire [25], [26].

1.1.4 Assessment of the current status and findings

Indicators for the whole section are presented in the diagram below. The specific values are contained in the table in Annex 1.



The Russian Federation has successfully adopted a broad framework of strategies and government programs for the development of the digital economy, including Strategy for the Development of the Information Society in the Russian Federation for

2017-2030 (May 2017), and the Russian Digital Economy Strategy (July 2017). Action plans set out detailed road maps for the implementation of socioeconomic and digital development initiatives. Monitoring and evaluation are carried out by Rosstat and line ministries, which have both made efforts to bring statistical monitoring of ICT use in line with international standards.

Russia needs a new socioeconomic development strategy. Policy documents and action plans should be made consistent with one another and compliant with laws on strategic planning. Policy documents need to be prescriptive and contain balanced set of targets organized into a single interconnected hierarchical system of key performance indicators (KPIs) that would enable effective, results-oriented management of the portfolio of digital transformation projects. Strategic planning documents, road maps, and monitoring instruments need to incorporate the digital transformation of the social sector and access for socially and geographically disadvantaged groups. Monitoring and evaluation need to be updated to the latest OECD standards. Agencies collecting data should develop and adopt a shared methodology.

Overall level of readiness: ***moderate***.

References

1. Концепция долгосрочного социально-экономического развития Российской Федерации до 2020 года. Утверждена распоряжением Правительства Российской Федерации от 17 ноября 2008 г. №1662-р. URL: http://www.government.ru/info/6217/
2. Стратегия социально-экономического развития страны до 2020 года. URL: http://2020strategy.ru/
3. Федеральный закон от 28.06.2014 № 172-ФЗ «О стратегическом планировании в Российской Федерации» URL: http://www.kremlin.ru/acts/bank/38630
4. Указ Президента Российской Федерации от 09.05.2017 г. № 203 «О Стратегии развития информационного общества в Российской Федерации на 2017 – 2030 годы» URL: http://www.kremlin.ru/acts/bank/41919
5. Послание Президента Федеральному Собранию. 1 декабря 2016 г. URL: http://www.kremlin.ru/events/president/news/53379
6. Распоряжение от 1 ноября 2013 года №2036-р «Об утверждении Стратегии развития отрасли информационных технологий в Российской Федерации на 2014–2020 годы и на перспективу до 2025 года» URL: http://www.government.ru/docs/8024/
7. Распоряжение Правительства Российской Федерации от 29 декабря 2014 года №2769-р. «Об утверждении Концепции региональной информатизации» URL: http://www.government.ru/docs/16473/
8. Государственные программы Российской Федерации. URL: http://www.government.ru/programs/
9. Перечень федеральных целевых программ и федеральных программ развития регионов, предусмотренных к финансированию из федерального бюджета на 2017 год. URL: http://fcp.economy.gov.ru/cgi-bin/cis/fcp.cgi/Fcp/FcpList/Full/2017
10. Приоритетные проекты Правительство Российской Федерации. URL: http://www.government.ru/department/361/about/

11. «Дорожные карты». Планы мероприятий в рамках Национальной предпринимательской инициативы по улучшению инвестиционного климата и их исполнение. URL: http://government.ru/roadmaps/

12. Государственная программа «Информационное общество (2011–2020 годы)». Утверждена Постановлением Правительства Российской Федерации от 15.04.2014 № 313 «Об утверждении государственной программы Российской Федерации «Информационное общество (2011 – 2020 годы)» (в редакции от 21.02.2015 № 157, от 17.06.2015 № 602, от 21.10.2016 № 1083, от 17.02.2017 № 203, от 03.03.2017 № 256, от 31.03.2017 № 380) URL: http://government.ru/programs/218/events/

13. Государственная программа «Развитие электронной и радиоэлектронной промышленности на 2013–2025 годы» URL: http://innovation.gov.ru/ru/node/11067

14. Распоряжение от 30 декабря 2013 года №2602-р. «Об утверждении новой редакции плана мероприятий («дорожной карты») «Развитие отрасли информационных технологий» URL: http://www.government.ru/docs/9576/

15. Протокол заседания Совета при Президенте Российской Федерации по стратегическому развитию и приоритетным проектам от 19 июля 2017 г. URL: http://kremlin.ru/events/councils/55100

16. Программа «Цифровая экономика Российской Федерации». Утверждена распоряжением Правительства Российской Федерации от 28 июля 2017 г. № 1632. URL: http://government.ru/docs/28653/

17. О «дорожных картах» по направлениям программы «Цифровая экономика Российской Федерации». URL: http://government.ru/orders/selection/401/30895/

18. План мероприятий по направлению «Кадры и образование» программы «Цифровая экономика Российской Федерации». URL: http://government.ru/news/31428/

19. Указ Президента Российской Федерации от 7 мая 2018 г. N 204 «О национальных целях и стратегических задачах развития Российской Федерации на период до 2024 года» URL: https://rg.ru/2018/05/08/president-ukaz204-site-dok.html

20. The Global Information Technology Report 2016. Innovating in the Digital Economy. – Geneva, 2016. World Economic Forum and INSEAD. – 290 p. URL: https://www.weforum.org/reports/the-global-information-technology-report-2016

21. Информационное общество. Официальная статистика. URL: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/science_and_innovations/it_technology/

22. Об утверждении статистического инструментария для организации федерального статистического наблюдения за деятельностью в сфере образования, науки, инноваций и информационных технологий. Приказ Росстата № 391 от 05.08.2016. URL: http://www.gks.ru/bgd/free/b16_27/Main.htm

23. Об утверждении формы федерального статистического наблюдения «Анкета выборочного обследования населения по вопросам использования информационных технологий и информационно-телекоммуникационных сетей». Приказ Росстата № 521 от 16.09.2016. URL: http://www.gks.ru/bgd/free/b16_27/Main.htm

24. Приказ Минкомсвязи России от 07.12.2015 № 515 «Об утверждении собирательных классификационных группировок «Сектор

информационно-коммуникационных технологий» и «Сектор контента и средств массовой информации». URL: https://minjust.consultant.ru/documents/17644

25. The OECD Model Survey on ICT Usage by Businesses. 2nd Revision. URL: https://www.oecd.org/sti/ieconomy/ICT-Model-Survey-Usage-Businesses.pdf

26. The OECD Model Survey on ICT Access and Usage by Households and Individuals. 2nd Revision. URL: https://www.oecd.org/sti/ieconomy/ICT-Model-Survey-Access-Usage-Households-Individuals.pdf

1.2 Leadership and institutions

Leadership and governance are processes that influence people and organizations to produce a certain result. The direction and results of the digital economy development depends on the competence, behavior and responsibility of decision-makers, as well as the maturity of national institutions. Another significant factor in the digital economy development is participation of main stakeholders, such as representatives of government, businesses, civil society, and academia.

1.2.1 Managing the development of the digital economy

Availability and effectiveness of digital economy management system

Existing Russian Federation strategic planning documents and normative documents cover only some elements of the digital economy governance system. Issues such as the labor market and employment, social protection, productivity, demand generation and other issues that are gaining prominence in the digital economy are either not addressed, or are only dealt with in a very limited way.

A similar situation existed until 2017 in management of digital economy development in that strategies was not included in the tasks to be performed by the current institutions. In order to overcome this situation, the Presidential Council for Strategic Development and Priority Projects in July 2017 decided to form a principally new governance system for the Digital Economy Program [1] and the Russian Government began to set up such a system [4].

At the strategic level, the coordinating body is the Digital Economy Working Group of the Economic Council under the President of Russian Federation [2]; at the tactical level, it is the Government Commission on the Use of Information Technology to Improve the Quality of Life and the Business Environment, and its Digital Economy Subcommittee [3]. At the operational level, these bodies are the NGO "Digital Economy", digital economy centers of excellence based in leading organizations or development institutions like Agency for Strategic Initiatives or Skolkovo Foundation, and federal authorities with responsibility for particular subject areas [4]. At the strategic and operational levels, key stakeholders from government, business and academia are well represented in management bodies for the digital economy development.

The weakness of the current governance system is the lack of civil society and regional representatives at all levels of the management bodies.

1.2.2 Stakeholder participation

Stakeholder participation in management of the digital economy development

In the Russian Federation, there is a practice of involving representatives of main stakeholders in the development of initiatives and strategic planning documents (see, for example, [5]).

At the same time, there is limited stakeholder involvement in the implementation of government programs, projects and initiatives in the Russian Federation, including at the legislative level. As a result, the participation of other stakeholders, particularly from civil society, in the supervision and monitoring of results is minimal.

1.2.3 Digital leadership

Senior leaders have publicly taken personal ownership and accountability for any digital transformation initiatives

In accordance with established procedure [6], a high-level executive (not lower than a minister) is given responsibility and accountability for implementing each government strategy, program or action plan and initiative in the Russian Federation.

Within business, those responsible for digital transformation are typically managers in the position of Chief Information Officer, or (more recently) Chief Digital Officer, equivalent to the position of company vice-president or deputy general director.

1.2.4 Regulatory and financial institutions

Presence of an independent regulatory body in the telecommunications sector

The Russian Ministry of Telecom and Mass Communications is the regulatory authority in the telecommunications sector and is not an independent body.

Presence of an institution responsible for regulating the use and protection of data

In the Russian Federation there is no special regulatory authority responsible for the use and protection of data. At the same time, the regulation of the use and protection of data in the Russian Federation is carried out by several government authorities.

Provision of financing for the digital economy development

The main sources of funding for digital economy development are private sources, national development institutions, and state and municipal budgets.

It should be noted that the greatest contribution to funding for the digital economy development comes from the private sector, but existing incentives are too weak to create sufficient motivation for companies' reorientation of funds towards digital transformation of their businesses.

Financing for digital economy development from state and municipal budgets is fragmented. Separate programs and projects are not united by a common strategy for digital economy development and are poorly coordinated with each other.

Reorientation of funding from state and municipal budgets is limited only by the time frame defined by the legislation on the budget process. If the reorientation will require amendments to the budget law, it can be done twice a year, but in cases stipulated by law [12] reorientation can be done at any time.

Reorientation of funding from private sources is not restricted by legislation and is carried out independently, usually on the basis of the analysis of market conditions.

Public-private partnerships for the digital economy development

Mechanisms for public-private partnerships are usually based on concession agreements on the creation of information systems for detecting violations of traffic regulations particularly regarding speed limits and systems for weight and dimensional control of long vehicles, in accordance with current legislation on public-private and municipal-private partnerships [13]. This section of the legislation requires modernization to extend it to other ways of using digital technologies.

1.2.5 International cooperation

Cooperation with other countries for the digital economy development

The Russian Federation is actively involved in work being undertaken at the global level on the development of the digital economy.

For example, Russia is a member of the G20 Digital Economy Development and Cooperation [7] and operates within the international association of the five BRICS countries on ICT cooperation [8].

As part of the Eurasian Economic Union (EAEU), the Russian Federation in December 2016 signed the EAEU Digital Agenda Declaration [9], according to which governments of member states, together with the Eurasian Economic Union, developed and submitted for approval to the Supreme Eurasian Economic Council the main directions for the implementation of the EAEU Digital Agenda until 2025 [9].

There are ministerial programs for multilateral or bilateral cooperation in some areas of the development of the digital economy, such as in human development or research. For example, in the federal target program "Research and Development" [10], research is supported by international multilateral and bilateral cooperation. This mechanism, in particular, has helped to support the activities of the Russian national contact point for the priority areas of the EU Framework Programme for Research and Innovation "Horizon 2020." [11]

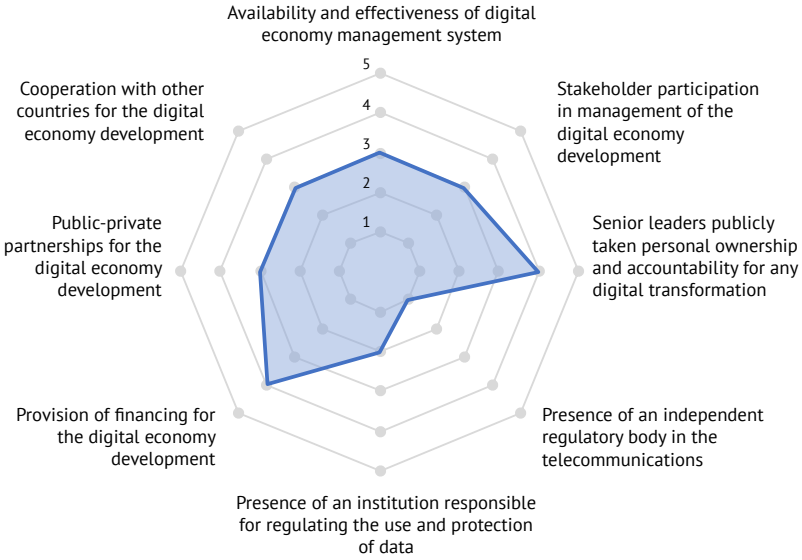
At the same time, there is no inclusive state program for cooperation and knowledge exchange in the field of the digital economy development between the Russian Federation and other countries.

1.2.6 Assessment of the current status and findings

The indicators for the section are presented below in the below diagram. Specific values are contained in the table in Annex 1.

In the Russian Federation, there is strong encouragement of leadership and institutions that ensure the development of the economy in general, and the digital economy in particular. Almost all government programs implement activities aimed at developing ICT and creating conditions for the use of ICT in business, which is impossible in the absence of leaders and clear rules aimed at stimulating business.

The main challenges in leadership and institutions relate to the lack of incentives to stimulate business and citizens that are appropriate to the current state of the economy.



As the Russian Federation lags behind the leading countries in this field, the absence of an independent regulatory body for the telecommunications sector and the institution responsible for regulating the use and protection of data should be noted.

In general, the level of development of leadership and institutions in the Russian Federation can be assessed as ***moderate***.

References

1. Программа «Цифровая экономика Российской Федерации». Утверждена распоряжением Правительства Российской Федерации от 28 июля 2017 г. № 1632. URL: http://government.ru/docs/28653/
2. Распоряжение Президента Российской Федерации от 03.04.2017 № 97-рп «Об утверждении состава рабочей группы Экономического совета при Президенте Российской Федерации по направлению “Цифровая экономика”» URL: http://government.ru/docs/all/110981/
3. Распоряжение Правительства Российской Федерации от 15.08.2017 № 1739-р «Состав подкомиссии по цифровой экономике Правительственной комиссии по использованию информационных технологий для улучшения качества жизни и условий ведения предпринимательской деятельности» URL: http://government.ru/docs/28824/
4. Постановление Правительства РФ от 28.08.2017 № 1030 «О системе управления реализацией программы «Цифровая экономика Российской Федерации»» URL: http://static.government.ru/media/files/zutOPH6TyKz2ciJAFcn74orvpb89UCMa.pdf
5. Приказ Минкомсвязи России от 16.03.2017 № 120 «О создании межведомственной рабочей группы при Министерстве связи и массовых коммуникаций Российской Федерации по подготовке проекта программы «Цифровая экономика»; Приказ Минкомсвязи России от 30.03.2017 №

159 «О внесении изменений в приказ Министерства связи и массовых коммуникаций Российской Федерации от 16.03.2017 № 120»

6. Постановление Правительства РФ от 02.08.2010 № 588 «Об утверждении Порядка разработки, реализации и оценки эффективности государственных программ Российской Федерации»
7. Инициатива «Группы двадцати» по развитию и сотрудничеству в области цифровой экономики URL: http://kremlin.ru/supplement/5111
8. Документы, принятые по итогам VII саммита БРИКС URL: http://kremlin.ru/supplement/5002
9. Решение Высшего совета «О формировании цифровой повестки ЕАЭС» URL: http://www.eurasiancommission.org/ru/act/dmi/workgroup/Pages/Решение-Высшего-совета-от-26-декабря-2016-г.aspx
10. Федеральная целевая программа «Исследования и разработки по приоритетным направлениям развития научно-технологического комплекса России на 2014—2020 годы» URL: http://www.fcpir.ru/
11. Национальная контактная точка по международному сотрудничеству в сфере ИКТ URL: http://ncp-it.ru/
12. Бюджетный кодекс Российской Федерации от 31.07.1998 № 145-ФЗ, Части 3, 7 и 7.2 Статьи 217
13. Федеральный закон от 13.08.2015 № 224-ФЗ «О государственно-частном партнерстве, муниципально-частном партнерстве в Российской Федерации и внесении изменений в отдельные законодательные акты Российской Федерации» (в ред. от 29.12.2015 N 391-ФЗ, от 03.07.2016 N 360-ФЗ, от 03.07.2016 N 361-ФЗ)

1.3 Laws, regulations & standards

The success of the development of the digital economy in the country is largely determined by the legal basis of the digital economy and society as a whole. The distribution and use of digital technologies requires solving fundamentally new legal problems arising in the digital economy, such as processing and availability of data from the Internet of Things or the ethics of artificial intelligence devices.

It is important at an early stage to determine the principles of legal regulation of the digital economy, as well as the types of entities, activities, relationships, facilities, and legal facts arising from the transformation through the use of digital technologies.

1.3.1 Regulating digital infrastructure

Regulations and policy to support the deployment of broadband and overcoming the digital divide

Article 57 of the law "On Telecommunications" [1] guarantees the provision of universal communication service in the Russian Federation, such as telephone services (using payphones or similar devices), data transmission services, and the provision of Internet access by means of multiple access points.

In this case, the collective means of access must be within walking distance, and all settlements with a population of 250 people or more must be equipped with at least one access point, providing the ability to transfer data to the user's equipment at a rate of not less than 10 Mbit/s.

Obligation to provide mobile broadband services in sparsely populated and remote areas, assigned to operator in the provision of radio frequency

Requirements for mobile broadband coverage to sparsely populated settlements are part of the conditions of competition for the provision of radio frequencies. Operators are free to decide about their interest competing for radio frequencies subject to the announced conditions.

Regulations ensuring non-discriminatory access and shared usage of passive and active telecommunications infrastructure

In the Russian Federation, issues of non-discriminatory access and sharing of communication infrastructure have, for the most part, been resolved. What remain partly unresolved are issues of joint use of radio frequencies; use of other operators' communications infrastructure for the construction of the "last mile" in multi-family housing; transmission of "last mile" from one operator to another when the subscriber changes operators; sharing network operators and their mutual settlements (traffic transmission, virtual operators).

Regulations regarding use of cloud computing and data centers resources

In the Russian Federation there are no regulatory legal acts directly regulating these activities.

1.3.2 Regulating the use of data

Regulations regarding data protection

There are normative legal acts regulating the use of, access to, or distribution of certain types of data, such as personal data [2], open data [3], state and municipal procurement data [4], and data constituting tax secrets [14] or medical secrets [5].

A significant part of the legal regulation of the use of data based on the fact that these are an integral part of information systems and do not exist as an independent entity [9].

Regulations allowing government data reuse

The use by public authorities of their existing data about citizens and organizations is regulated through laws on access to or distribution of certain types of data, for example, federal laws on personal data [2], basic protection of public health [5], state pension provision [7], acts of civil status, [8] access to information on national activities of state bodies and local authorities [3], the organization of public and municipal services [6], the Tax Code of the Russian Federation [14] and other laws and regulations.

Sharing by authorities of personal information, tax or confidential information on citizens and organizations is carried out on the basis of statements made by those individuals and organizations, including those submitted in electronic form in order to obtain public services.

Non-personal and non-confidential information about citizens and organizations is shared between authorities in the manner prescribed by the administrative regulations of the performance of public functions.

1.3.3 Regulation of digital interactions

Regulations on equal or predominant digital transactions, notifications and documents to physical ones

These types of transactions are largely governed by the laws "On information, information technologies and information protection" [9] and "On electronic signatures." [10] Individual issues concerning interaction between entities via digital technologies are governed by other laws and regulations [4, 6, 11, 12,13, 14].

Unresolved issues include the priority of electronic documents (notification) over paper and the mass-free use of e-signatures by citizens.

1.3.4 Regulation of digital payments

Regulations on digital payment systems and e-payments

The use of digital payment systems and electronic payments are regulated by the federal laws "On the National Payment System" [11], "On the application of cash registers in the implementation of cash payments and (or) calculations with use of electronic means of payment" [5], as well as numerous regulations of the Russian Federation and the Government of the Bank of Russia.

1.3.5 Incentive mechanisms for digital goods and services

Incentive mechanisms for the use of digital goods, services, rights to use them

Incentive mechanisms are used to stimulate the production and use of digital goods and services and rights of use.

In addition, there are forms of stimulus specific to the digital economy, such as a special order of depreciation in respect of computer technology to organizations operating in the field of information technologies (p. 6 Art. 259 of the Tax Code of the Russian Federation [14]) or an exemption from sales tax (as well as transfer, implementation, rendering for their own needs) of exclusive rights to the programs for electronic computers, databases, and the rights to results of intellectual activity on the basis of a license agreement (paragraph 26 h. 2 of Article 149 of the Tax Code of the Russian Federation[14]).

1.3.6 Cybersecurity regulations

Cybersecurity legislation and policies

Cybersecurity regulation is carried out by federal laws on information, information technologies and data protection [9], personal data [2], and orders of the Federal Service for Technical and Export Control [15, 16, 17].

These standards are mandatory for use in many cases, in particular for certain types of data (e.g., all personal data, and personal data contained in state and municipal information systems).

Legal protection for confidential data

Legal protection of confidential information is regulated by the Federal law "On information, information technologies and information protection" [9]. A feature of the legal protection of confidential information in the Russian Federation is the fact that application of protection is the sole responsibility of the owner of the confidential information in question.

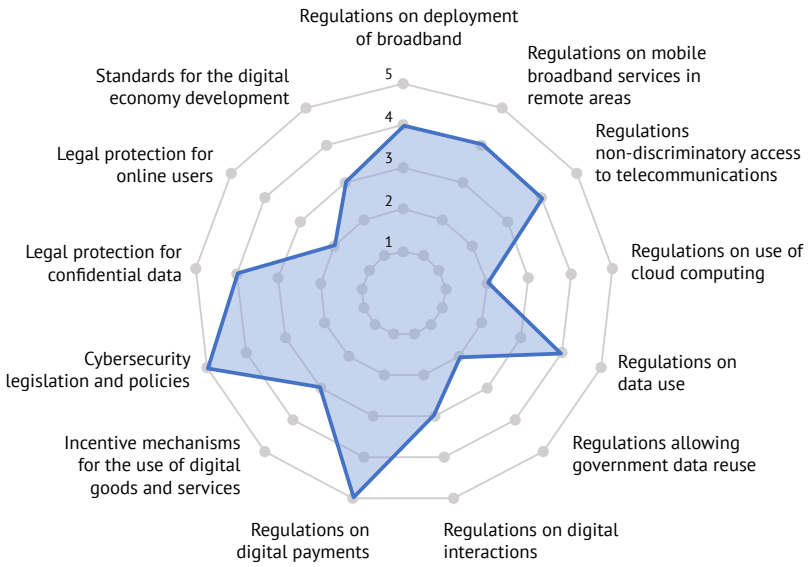
Legal protection for online users

Legal protection of online users is governed by the federal law "On information, information technologies and information protection" [9]. It should be noted that it is largely focused on the protection of rights holders, and not consumers of information.

1.3.7 Standards

Relevance and effectiveness of the national system of standards for the digital economy development

Standardization in the Russian Federation covers almost all areas of activity, but it has features that reduce the value of its application of standards. This is a lag is the national adoption of international standards. For example, the Russian standard GOST R ISO 15704-2008 was approved 8 years after the prototype ISO 15704: 2000 "Industrial automation systems. Requirements for standard enterprise architecture and methodologies " Another feature of the processes of technical regulation in the Russian Federation is the non-applicability of the application of standards.



1.3.8 Assessment of the current status and findings

Indicators for the whole section are presented in the diagram below. The specific values are contained in the table in Annex 1.

Regulation in the Russian Federation is a new process constructed subject to "baggage" inherited from the Soviet Union. During that era, many regulatory questions did not even arise due to the virtual absence of competition. However, over the past 25 years, legislators and regulators have worked hard to update legislation and Russia now lags behind the leading countries only in the field of standardization.

In general, the level of development of legislation, regulation and standards for digital economy development in the Russian Federation can be assessed as ***developed***.

References

1. Федеральный закон от 07.07.2003 № 126-ФЗ «О связи»
2. Федеральный закон от 27.07.2006 № 152-ФЗ «О персональных данных»
3. Федеральный закон от 09.02.2009 № 8-ФЗ «Об обеспечении доступа к информации о деятельности государственных органов и органов местного самоуправления»
4. Федеральный закон от 05.04.2013 № 44-ФЗ «О контрактной системе в сфере закупок товаров, работ, услуг для обеспечения государственных и муниципальных нужд»
5. Федеральный закон от 21.11.2011 № 323-ФЗ «Об основах охраны здоровья граждан в Российской Федерации»
6. Федеральный закон от 27.07.2010 № 210-ФЗ «Об организации предоставления государственных и муниципальных услуг»
7. Федеральный закон от 15.12.2001 № 166-ФЗ «О государственном пенсионном обеспечении в Российской Федерации»
8. Федеральный закон от 15.11.1997 № 143-ФЗ «Об актах гражданского состояния»
9. Федеральный закон от 27.07.2006 № 149-ФЗ «Об информации, информационных технологиях и о защите информации»
10. Федеральный закон от 06.04.2011 № 63-ФЗ «Об электронной подписи»
11. Федеральный закон от 27.06.2011 № 161-ФЗ «О национальной платежной системе»
12. Федеральный закон от 22.05.2003 № 54-ФЗ «О применении контрольно-кассовой техники при осуществлении наличных денежных расчетов и (или) расчетов с использованием электронных средств платежа»
13. Налоговый кодекс Российской Федерации (часть первая) от 31.07.1998 № 146-ФЗ
14. Налоговый кодекс Российской Федерации (часть вторая) от 05.08.2000 № 117-ФЗ
15. Приказ ФСТЭК России от 11.02.2013 № 17 «Об утверждении Требований о защите информации, не составляющей государственную тайну, содержащейся в государственных информационных системах»
16. Приказ ФСТЭК России от 18.02.2013 № 21 «Об утверждении Состава и содержания организационных и технических мер по обеспечению безопасности персональных данных при их обработке в информационных системах персональных данных»
17. Приказ ФСТЭК России от 14.03.2014 № 31 «Об утверждении Требований к обеспечению защиты информации в автоматизированных системах

управления производственными и технологическими процессами на критически важных объектах, потенциально опасных объектах, а также объектах, представляющих повышенную опасность для жизни и здоровья людей и для окружающей природной среды»

1.4 Human capital for digital economy

With the development of the digital economy, the role of human capital is increasing: it is becoming the primary productive force and a key driver of economic growth. Demands on its components and mechanisms of reproduction are changing. The widespread penetration of digital technology, automation and robotics are leading to the decline of jobs requiring medium qualifications and an increase in demand for highly skilled creative professionals, and are making the possession of digital skills and related competencies a necessary condition for employment in any professional activity.

1.4.1 Digital competencies

ICT specialists in employment

The development of the digital economy and the ICT sector in Russia is not provided with the necessary number of people with professional competences in the field of digital technologies. The share of ICT specialists (higher and secondary qualifications) among the employed population of the country is small, amounting to 1.5% in 2017 according to Rosstat [1], 2.5 times less than the EU average (3.7%) and 4,5 times inferior to the European countries-leaders in the development of the information society and the digital economy (Finland – 6.8%, Sweden – 6.6%) [2]. Representatives of ICT companies, educational institutions and authorities interviewed during the survey spoke about the shortage of staff. A particularly problematic situation with qualified specialists is in the public sector, which is connected with the personnel migration to the commercial sector, where the level of salaries is higher, and "enticement" of university graduates who prefer to work in the business sector instead of teaching, for example, in secondary professional educational institutions, universities or at school.

Secondary and tertiary education enrolment rate

Russia ranks high in terms of involvement of young people in education – in the rating of 130 countries assessed under the WEF Global Human Capital Index, Russia ranks 12th in the secondary education enrolment rate (98.7%, leaders are Japan, Norway and Lithuania) and 16th place in tertiary education enrolment rate (78.7%, leaders – Greece, South Korea and Australia, the USA with 85.8% ranked 8th) [3].

Digital competencies requirements in professional standards

In Russia, ICT competence is included in the professional and educational standards for both ICT professionals and professionals in other fields. Professional standards have been developed under the general program of development of professional standards, initiated by presidential decree of May 7, 2012 No 597 [4]. But for now, of the more than 7,000 jobs, as reflected in the Single Tariff-Qualifying Directory of Works and Professions of Workers and the Unified Qualification Schedule of Managers, Professionals and Employees, only 1,000 categories of jobs have developed professional standards, meaning a coverage of

about 14% [5]. This is clearly not enough, moreover, the absence of professional standards is an obstacle in development of vocational training programs, since the latter, in accordance with the legislation on education [6] should be developed on the basis of established qualifications (professional standards).

1.4.2 Efficient use of talent

Country capacity to retain talent

Experts interviewed during the creation of the World Economic Forum Executive Opinion Survey: The Voice of the Business Community assessed the ability of Russia to retain talented people as rather lowly. Russia with its value of 3.5 on a 7-point scale occupies 59th place in the ranking of WEF Global Competitiveness Index [7]. The problem of the "brain drain" common for the entire post-Soviet period has been exacerbated recently. According to data provided by the Russian Presidential Academy of National Economy and Public Administration (RANEPA) based on foreign statistics and interviews, in the current decade there was a real increase in skilled (intellectual) emigration from Russia. About 100 thousand people annually emigrate to developed countries, of which about 40% have a higher education. In general, RANEPA estimates the number of Russians with higher education abroad at around 800 thousand people at present. One of the main motives for emigration is "a noticeable change in the economic situation after 2014, leading to difficulties in the labor market, a reduction in salaries, and a reduction in opportunities for career development"; many leave for educational purposes; about a quarter of those polled by RANEPA indicate political reasons [8].

Country capacity to attract talent

Experts estimated the ability of the country to attract talented people from other countries even lower: 77th place in the ranking of the WEF Global Competitiveness Index with a score of 3.5 (on a 7-point scale) [7]. Russia remains an attractive place for labor migration from the CIS countries, but this is mostly a low-skilled labor force. Labor migration from developed countries is much less.

1.4.3 Training of personnel for the digital economy

Compliance of educational programs of all levels with the requirements of the digital economy

In Russia, educational programs for the development of knowledge and skills in ICT have been implemented at all levels of education. At the same time, work on forecasting and modeling competencies of the digital economy and upgrading educational standards and programs for all levels of education to take into account the requirements of competence for the digital economy is just beginning in Russia. Appropriate measures are provided in the Russian Digital Economy Program [9]. Updates to the federal state educational standards to meet the requirements for the formation of competencies of the digital economy for all levels of education are planned before the end of 2019 and updates to the educational programs of all levels of education by the end of 2020.

Training of specialists in digital technology

The output of specialists trained in computer technology is growing: in 2016, numbers reached 7 people per 10 000 population (in 2013 – 2 persons). Growth will continue since the numbers admitted as students to this specialty is consistently higher than the number graduating each year (in 2016, 11 people per 10 000 population). [10] Those skilled in the ICT are prepared not only for their field, but for other adjacent specialties (applied mathematics and computer science, and others.). Although the numbers are growing, the demand for them remains high: in 2014 about a third of companies experienced a need for such specialists [11]. According to the estimates of the Russian Ministry of Telecom and Mass Communications, the increment of the number of specialists in 2015-2016 was only 3.6% while the annual demand, according to HeadHunter, is growing by 25% [12].

Quality of math and science education

An important prerequisite for the formation of digital competence is the level of mathematics and science education in the country.

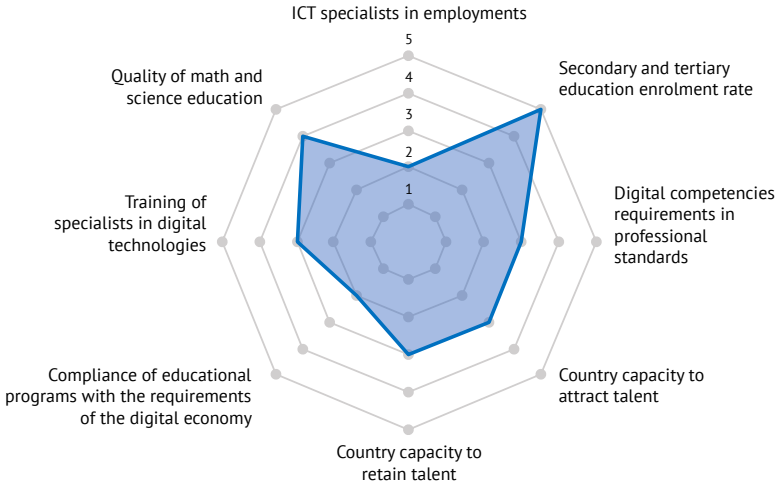
In the Program for International Student Assessment (PISA) in reading, mathematics and science, Russia occupies 26th place out of 71 with an index value of 491.8, well behind the leaders, Singapore and Hong Kong [13].

According to the WEF Executive Opinion Survey, in an assessment of the quality of mathematics and natural science education, Russia occupies 51st place out of 137 with a value of 4.4 on a 7-point scale. The global leaders are Singapore (6.5), Finland, and Switzerland [7].

1.4.4 Assessment of the current status and findings

Indicators for the whole section are presented in the diagram below. The specific values are contained in the table in Annex 1.

Russia has traditionally high scores in international rankings of human capital development, which is considered to be its competitive advantage. The strengths of



the country are the level of education of population, education enrolment rate, and a relatively high level of training in mathematics and natural science majors. However, the adaptation of the education system to the skills and needs of the digital economy has not yet occurred. Most of the educational program is not updated and does not allow the formation of core competencies for digital transformation.

In general, we can assess the level of human capital development in the Russian Federation as ***moderate***.

References

18. Итоги выборочного обследования рабочей силы. 2017 год. Росстат. URL: http://www.gks.ru/free_doc/doc_2017/bul_dr/trud/ors-2017.rar
19. Eurostat. Digital economy and society. Database. Digital Skills. ICT specialists in employment. URL: http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database?p_p_id=NavTreeportletprod_WAR_NavTreeportletprod_INSTANCE_pgrsK5zx6I84&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-2&p_p_col_count=1
20. Global Human Capital Index. URL: http://reports.weforum.org/global-human-capital-report-2017/dataexplorer/
21. Указ Президента Российской Федерации от 07.05.2012 г. № 597 «О мероприятиях по реализации государственной социальной политики» URL: http://www.kremlin.ru/acts/bank/35261
22. Замминистра Любовь Ельцова: Количество принятых профессиональных стандартов к 2018 году превысит одну тысячу. Минтруд России. 28.02.2017. URL: http://www.rosmintrud.ru/labour/20/57
23. Федеральный закон «Об образовании в Российской Федерации» от 29 декабря 2012 г. № 273-ФЗ (часть 8 статьи 73).
24. WEF Global Competitiveness Index. URL: http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/?doing_wp_cron=1526217510.0914869308471679687500#series=GCI
25. Эксперты РАНХиГС рассказали об усилившейся утечке мозгов из России // РБК. 23 января 2018 г. URL: https://www.rbc.ru/society/23/01/2018/5a673f129a794712579d7dbe
26. Протокол заседания Совета при Президенте Российской Федерации по стратегическому развитию и приоритетным проектам от 19 июля 2017 г. URL: http://kremlin.ru/events/councils/55100
27. Росстат. Мониторинг развития информационного общества в Российской Федерации. URL: http://www.gks.ru/free_doc/new_site/business/it/monitor_rf.xls
28. Rosstat. Data Main interregional center for 2014.
29. Кира Камнева Кто остается за кадром. Бизнес готов сам выращивать специалистов // Российская газета – Спецвыпуск №7378 (212).
30. Global Innovation Index. 2017. (indicator 2.1.4.) URL: https://www.globalinnovationindex.org/gii-2017-report#

1.5 R&D and innovation in the digital economy

The digital economy is inherently innovative, since it is based on the most advanced technologies. The success of some of the successful global digital services, such as Facebook, Google, Amazon and others, creates the illusion of lightness promoting digital innovation without serious research. However, the experience of existing digital industry giants and new start-ups in the digital industry says that the scientific foundation (R&D) for modern innovations in the field of ICT is mandatory and determines the success of the digital economy.

1.5.1 Research and development

Researchers per million people

In 2015 Russia was ranked 29th in the Global Innovation Index 2017 in terms of the number of researchers performing R&D per 1 million (3.131 thousand people) [1]. Estonia and Greece have close values; Israel, Denmark and the Republic of Korea are leaders in this indicator, Russia's indicator is 38% of the maximum.

Gross expenditure on R&D

In Russia the share of R&D expenditure is 1.1% of GDP (in 2015 and 2016), which corresponds to 34th place in the Global Innovation Index 2017 [1]. By comparison, Canada spends 1.61%, China 2.09%, Germany 2.88%, and the leader Israel 4.3%.

Gross expenditure on R&D financed by business enterprise

The percentage contributed by Russian businesses to total expenditure on R&D is very low and amounted to 28.1% in 2016 and to 26.5% in 2015, which corresponds to 34th place in the Global Innovation Index 2017 [1] and confirms the low level of interest in commercial sector innovations. By comparison, in Canada, the value of this index is over 45%, Germany 65% and in China almost 75% [1].

R&D expenditure in ICT as a share of all domestic expenditures on research and development

The proportion of R&D expenditure in ICT as a percentage of all domestic expenditures on research and development in the country's GDP is an important indicator. These figures characterize the country's capacity for self-development in the production of digital technology. Domestic expenditure on priority "Information and telecommunication systems" was worth 77.9 billion rubles in 2015, 8.3% of the total R&D expenditure [2]. In 2012, R&D of 60 billion rubles was allocated in the sphere of ICT from a total GDP 66.9269 trillion rubles. It amounted to 0.09%. A similar calculation for 2015 showed the same 0.09%.

Cooperation between universities and businesses in R&D

The level of cooperation in R&D between universities and local businesses is rather low, and in the Global Competitiveness Index 2017-2018 Russia is in 42th place [3]. Universities have an average of 4.3 agreements with tech companies based on 100 academic staff [4]. Off-budget R&D is on average 10% of the budget of the University, indicating weak integration of universities in research activities related to innovation.

1.5.2 Innovation Infrastructure

The share of innovative enterprises

In Russia, the aggregate level of innovation activity of enterprises (the share of enterprises engaged in innovation activity in the reporting period) was 8.4% in 2016, with technological innovation carried out by 7.3% of the organizations. This is much less than in developed countries and most developing countries: in Switzerland, 75.3% of companies were innovative (52.7% implementing technological innovation), Brazil 73.1%, and Germany 67% (implementing technological innovation 52.6%). According to this indicator Russia lags behind all EU countries, and is ahead in technological innovation only of Romania, where the figure is 6.3% [5].

Maturity of the national innovation infrastructure

Russian national innovation infrastructure supports innovation at all stages. [6] There are venture capital funds, and private equity financing is available both as early seed funding and in later stages. Crowdfunding and angel investing are developing. There are numerous parks (created in different regions), coworking centers, and accelerators.

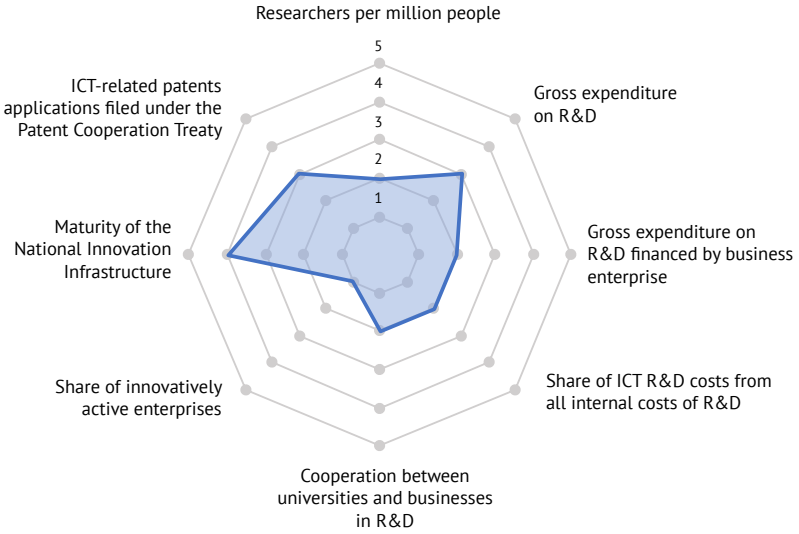
At the same time, according to the WEF Global Competitiveness Index [7] the availability of venture capital in Russia has a very low value, which places Russia below the 89th place in the global ranking.

ICT-related patents applications filed under the Patent Cooperation Treaty

According to the number of ICT-related patents applications per one million population (2,8), Russia ranked 38th in the Networked Readiness Index 2016 ranking [8], having similar values to Portugal and Greece, but by almost 2 orders of magnitude behind the leaders – Sweden (153.1) and Finland (149).

1.5.3 Assessment of the current status and findings

Indicators for the whole section are presented in the diagram below. The specific values are contained in the table in Annex 1.



Russia needs to prioritize improving the performance of its R&D and innovation efforts in the digital economy. The existing elements of the innovation ecosystem should be integrated under a federal strategy. Russia's universities and national R&D organizations need to be incentivized to collaborate with business. Efforts are needed to raise levels of ICT research to match overall national levels of scientific research and encourage R&D within the ICT sector and cybersecurity. Russia needs to improve measures of innovation such as R&D expenditure as a percentage of GDP, business share of R&D, business innovation, ICT-related patents applications filed under the Patent Cooperation Treaty and the availability of the venture capital needed to fund startups.

In general, the level of research and development and innovation in the digital economy in the Russian Federation can be assessed as ***moderate***.

References

1. The Global Innovation Index 2017: Innovation Feeding the World. – Ithaca, Fontainebleau, and Geneva: Cornell University, INSEAD, WIPO, 2017. – 432 p. URL: https://www.globalinnovationindex.org/
2. Индикаторы науки: 2018: статистический сборник / Н. В. Городникова, Л. М. Гохберг, К. А. Дитковский и др.; Нац. исслед. ун-т «Высшая школа экономики». – М.: НИУ ВШЭ, 2018. – 320 с. URL: https://www.hse.ru/data/2018/02/12/1162058327/Science_and_Technology_Indicators_2018.pdf
3. The Global Competitiveness Index 2017-2018. URL: http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/#series=EOSQ072
4. Мониторинг эффективности инновационной деятельности университетов России 2016. – М.: Российская венчурная компания, 2017. – 130 с. URL: https://www.rvc.ru/upload/iblock/596/universities_monitor.pdf
5. Индикаторы инновационной деятельности: 2018: статистический сборник / Н. В. Городникова, Л.М. Гохберг, К. А. Дитковский и др.; Нац. исслед. ун-т «Высшая школа экономики». – М.: НИУ ВШЭ, 2018. – 344 с. URL: https://www.hse.ru/data/2018/03/23/1164003717/Indicators_of_Innovation_2018.pdf
6. Национальный доклад об инновациях в России 2016. – М.: Российская венчурная компания, 2017. – 104 с. URL: https://www.rvc.ru/upload/iblock/b6d/RVK_innovation_2016_v.pdf
7. The Global Competitiveness Report 2016-2017. – Geneva. The World Economic Forum, 2017. – 382 p. URL: https://www.weforum.org/reports/the-global-competitiveness-report-2016-2017-1
8. The Global Information Technology Report 2016 URL: http://reports.weforum.org/global-information-technology-report-2016/

1.6 Business environment

The development of any sector of the economy requires institutional conditions that contribute to the discovery of new forms of entrepreneurship, and innovative development of existing companies. In the digital economy, a conducive business environment is particularly important. In Russia, development of a robust private sector environment

is due to the activity of both large private corporations as well as small innovative firms. Successful activity of the latter depends heavily on a favorable tax environment, transparent and impartial law enforcement, availability of borrowed financial instruments, and other key characteristics. With a limited arsenal of instruments of financial support to companies, an unfavorable institutional climate may become an insurmountable barrier for the development of the digital economy.

1.6.1 Economic factors

Doing Business overall ranking

According to the World Bank's 2018 Ease of Doing Business Index, Russia ranked 35th place [1, p.4], after rising 5 places from the previous year. The strongest positions are in the area of Getting Electricity (10th place), property registration (12th place) and Enforcing Contracts (18th). Among the most problematic aspects of doing business in Russia are dealing with construction permits (115th place) and the ease of international trade (100th). The Ease of Doing Business index is taken into account at the highest level of public administration: in accordance with the Presidential Decree on May 2012, Russia must rise to 20th place in 2018.

Intensity of local competition

Competition on the domestic market is still not sufficiently developed, as evidenced by Russia's 72nd ranking on the WEF Global Competitiveness Index [2]. After rapid growth in 2013 and 2014, this figure has stabilized at 5 points out of a possible 7. To strengthen the position of domestic ICT companies' government agencies are implementing a number of protectionist measures: the register of domestic software maintenance, the purchase of state-owned equipment by domestic processors "Elbrus" and "Baikal", and others.

The total tax rate

In terms of the overall tax burden (47.4% profits) Russia lags behind its global partners (101th on the WEF Global Competitiveness Index) [2]. The reason for this is the rapid global trend towards reducing the overall tax rate. In Russia, there continues to be a moratorium on the increase in the business tax burden imposed by the Russian President.

Availability of financial services

The ability of the financial sector to provide the products and services that meet the needs of businesses is an important feature of the business environment. Experts interviewed in the course of the Executive Opinion Survey: The Voice of the Business rated this parameter rather low – Russia ranks 101st in the rating of 137 countries, behind Kyrgyzstan, Brazil, Senegal and Tanzania [2].

Affordability of financial services

Answering the question "In your country, to what extent does the cost of financial services (e.g. insurance, loans, trade finance) impede business activity," managers of Russian enterprises evaluated this parameter of the business environment by 3.4 points out of 7, which corresponds to 94th place globally in the WEF Global Competitiveness Index 2017-2018 [2]. The drop of the value (in 2014-2015, Russia ranked 69th with 4.1) is

associated, inter alia, with the sanctions imposed in 2014 which introduced restrictions on borrowing on foreign markets for Russian financial institutions.

Ease of access to loans

The recent global financial crisis and sanctions also affected the assessment of how easy it is for Russian businesses to obtain a bank loan. In the Global Competitiveness Index 2014-2015 Russia ranked 56th, but in the 2017-2018 rating it moved to the 110th place [2]. It is easiest to obtain a bank loan in New Zealand, the USA and Singapore.

1.6.2 Rule of law

Intellectual property protection

Despite the proactive stance of public authorities in the development of the intellectual property market, intellectual property protection is still at a low level (93th place in the WEF Global Competitiveness Index 2017-2018) [2]. Among the significant measures to strengthen the intellectual property protection system is the allocation of subsidies to compensate part of the costs of patenting Russian development abroad [3].

Software piracy rate

The damage for the legal owners on account of pirated software usage by russian customers is estimated at about USD $1.3 billion., which is one of the largest worldwide [4] and influences the market of russian legal software negatively. In the World Economic Forum's global rankings, Russia is in 56th position in the Networked Readiness Index by the share of pirated software (62% unlicensed program units of the total number of installed software units) [5].

Judicial independence

It is a customary problem in Russian society to attribute partiality and bias to the judicial system, which has an extremely negative impact on business services with the environment. This is confirmed by Russia's 90th place ranking on this indicator («independence of the judicial system from influences of the government, individuals, or companies») of the WEF Global Competitiveness Index 2017-2018 [2].

Efficiency of legal framework in challenging regulations

Legal efficiency also impedes business development. Now Russia occupies 77th place in the WEF Global Competitiveness Index for this indicator [2], whereas it was 91st in the previous year.

1.6.3 Institutional factors and support for entrepreneurs

Availability of the latest technology

The tense geopolitical situation greatly complicates the availability of new technologies (Russia is at the 84th place in the WEF Global Competitiveness Index 2017-2018 between Colombia and the Gambia) [2]. The most destructive effect is observed in the fuel and energy sectors: for example, an embargo on deliveries of Russian technologies for deepwater drilling, development of the Arctic shelf and the exploitation of hard-to-recover oil resources has negatively impacted Russian industries in this field.

High status to successful entrepreneurs

According to the rating of trust in professional groups (VTsIOM) [6], Russian society has a greater distrust of politicians (2.84 points out of a possible 5) than entrepreneurs and businessmen (2.74 points). However, from 2010 to 2015, there is a trend toward increased confidence in business activity (0.26 points over the whole period). The results of sociological research by the Public Opinion Foundation [7] indicate the positive role of private enterprise in Russia for the last 30 years: 42% of respondents believe that business did more good than harm, while only 13% believed the reverse.

Irregular payments and bribes

The WEF indicator "Irregular payments and bribes" is estimated on the basis of an expert survey of managers of enterprises and describes how often business in the country has to make undocumented extra payments or bribes connected with (a) imports and exports; (b) public utilities; (c) annual tax payments; (d) awarding of public contracts and licenses; (e) obtaining favorable judicial decisions. The average score across the five components for Russia was 3.8 on a 7-point scale, placing Russia in 76th place (out of 137 countries) after Kazakhstan, Panama and Indonesia in the WEF Global Competitiveness Index 2017-2018 ranking [2]. In 2016, Russia fully complied with 10 of the 21 Council of Europe recommendations on the fight against corruption (GRECO) [8], and the remaining 11 were partially implemented. In particular, Russia has successfully solved the problem of the criminalization of bribery of arbitrators and international parliamentarians.

Efficiency of customs clearance process

The efficiency of customs clearance process is understood as the speed, simplicity and predictability of formalities by customs officials. This important parameter of the business environment is assessed according to the specified criteria on the basis of an expert survey regularly conducted by the World Bank to build a Logistics Performance Index. The efficiency of customs clearance process in Russia is low, at the 131rd position in the Logistics Performance Index 2016 [9]. Additional difficulties are related to the "war of sanctions" that swept the country in 2014.

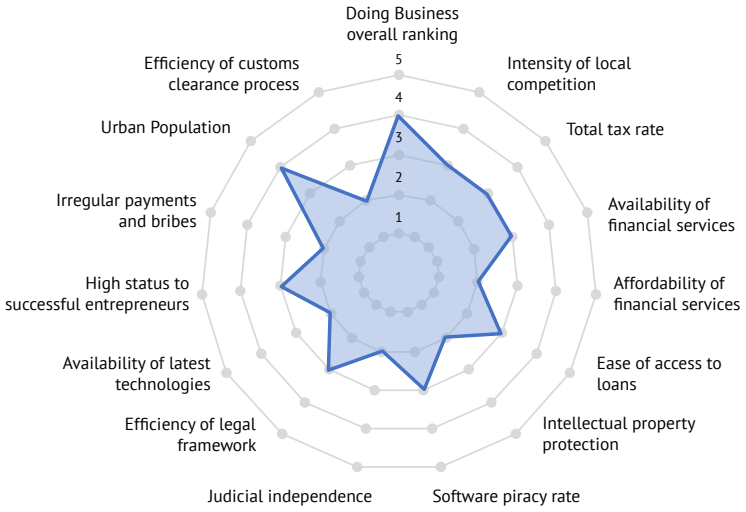
Urban population

The level of urbanization is an important prerequisite for the development of the digital economy. The human capital indicators are higher, the infrastructure and other factors of digitalization are better in cities. According to the World Bank, the share of urban population in Russia in 2016 was 74.1%, so the country ranked 70th among 215. Its neighbors in the ranking are Bulgaria, Switzerland and Turkey. This indicator in Russia is stable – it has grown less than 1 percentage point since 1990 (73.4%) [10].

1.6.4 Assessment of the current status and findings

Indicators for the whole section are presented in the diagram below. The specific values are contained in the table in Annex 1.

Russia has made impressive gains in the World Bank's Ease of Doing Business Index, rising eleven places between 2016 and 2017 and five places between 2017 and 2018, and the government has set ambitious targets for further improvement. Public



opinion polling demonstrates relatively positive attitudes of the population towards entrepreneurs contribution to the development of the country.

Russia needs to improve its performance on measures of intellectual property protection, irregular payments and bribes, efficiency of customs clearance process, and the independence of the judiciary. It also needs to address some structural challenges. Incentives for innovation and the expansion of the online platform and content and media space may be constrained by the Internet blacklist and content controls. Sanctions imposed in 2014 reduced the availability of the latest technology and of the financial resources while increasing the relative customs burden. Russia would benefit from encouraging domestic competition and reducing the total tax burden to bring it into line with major trading partners.

In general, the level of development of the business environment in Russia can be considered as ***moderate***.

References

1. Doing Business 2018: Reforming to Create Jobs. Economy Profile. Russian Federation. Washington, DC: The World Bank. URL: http://www.doingbusiness.org/~/media/WBG/DoingBusiness/Documents/Profiles/Country/RUS.pdf
2. WEF Global Competitiveness Index 2017-2018. URL: http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/?doing_wp_cron=1526217510.0914869308471679687500#series=GCI
3. Постановление Правительства Российской Федерации от 17.06.2016 г. № 548 «Об утверждении Правил предоставления из федерального бюджета субсидий российским организациям на возмещение части затрат, связанных с уплатой пошлин при патентовании российских разработок производителей и экспортеров за рубежом» URL: http://government.ru/docs/all/107023/

4. Seizing Opportunity Through License. Washington: BSA | The Software Alliance, May 2016. – 16 p. URL: http://globalstudy.bsa.org/2016/downloads/studies/BSA_GSS_US.pdfWEF Networked Readiness Index 2016. 1.07 Software piracy rate. URL: http://reports.weforun.org/global-information-techonoly-report-2016/networked-readiness-index/
5. Всероссийский центр изучения общественного мнения. Пресс-выпуск № 3013. URL: https://wciom.ru/index.php?id=236&uid=115542
6. Фонд «Общественное мнение». Отношение к предпринимательству и предпринимателям. URL: http://fom.ru/Ekonomika/12735
7. The Group of States against Second Compliance Report on the Russian Federation. Strasbourg: Council of Europe, 2016. – 27 p. URL: https://rm.coe.int/16806cc128
8. The World Bank. World Development Indicators, Logistics performance index. URL: https://data.worldbank.org/indicator/LP.LPI.CUST.XQ
9. The World Bank. World Development Indicators. Urban Population (%of total). URL: http://databank.worldbank.org/data/reports.aspx?source=2&series=SP.URB.TOTL,SP.URB.TOTL.IN.ZS,SP.URB.GROW,EN.URB.MCTY.TL.ZS,EN.URB.LCTY.UR.ZS,SH.STA.BASS.UR.ZS,SH.STA.BASS.RU.ZS#

1.7 Trust and security in the digital economy

Availability, integrity, confidentiality and authenticity of online transactions, encouraging the development of a secure information infrastructure for the promotion of reliable, stable and uninterrupted online applications are key factors in the development of the digital economy.

1.7.1 Public policy and regulation

National policy on cybersecurity

State policy on cybersecurity is defined in the Information Security Doctrine, approved by Presidential Decree in 2016 [1]. The Information Security Policy is updated continuously and is carried out in full.

Raising the awareness of citizens and organizations to ensure information security in the use of digital technologies

There are no individual programs to raise awareness about cybersecurity in the Russian Federation. Relevant activities are carried out mainly through the promotion of protected digital products and services, such as Internet banking, and providing state and municipal services in electronic form.

1.7.2 Organizational measures to ensure information security

Emergency response teams for cybersecurity

In the Russian Federation various computer emergency response teams (CERT) have been established and are functioning. For example, the Bank of Russia established the Center for Monitoring and Responding to Computer Attacks in the Credit and Financial Sphere (FinCERT), which collects information from financial institutions on cyber-attacks, analyzes the information received and provides feedback to credit and financial

organizations [2]. In accordance with the law [3], the Russian Federation should have a national focal point for computer incidents.

In Russia, there are no such groups to respond to cyber-attacks on the population. The population may be exposed to computer attacks, including through social networks and instant messengers that are not within the jurisdiction of the Russian Federation.

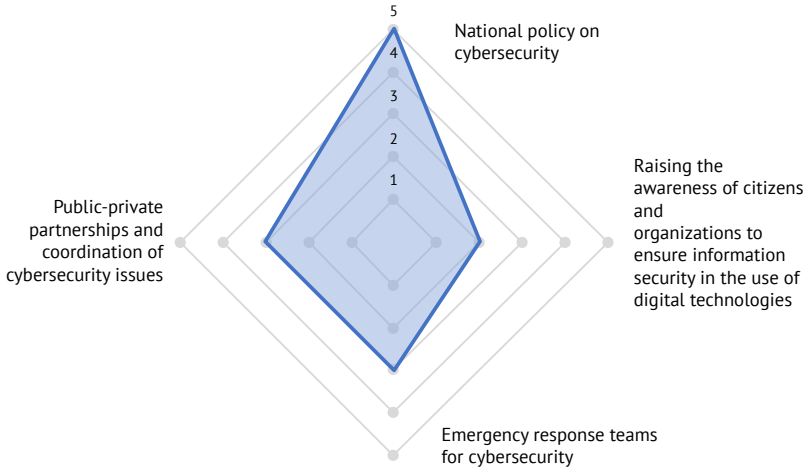
Public-private partnerships and coordination of cybersecurity issues

The security of critical information infrastructure of the Russian Federation is carried out in accordance with the law [3] and the requirements to ensure the protection of information in automated control systems for production and technological processes in critical facilities, potentially hazardous facilities, as well as objects posing an increased danger to human life and health and for the natural environment [4].

Almost all activities to protect critical infrastructure are carried out using public-private partnership mechanisms. The activity of the authorities in this area is reduced to the control and supervision of compliance with relevant legal acts.

1.7.3 Assessment of the current status and findings

Indicators for the whole section is presented in the diagram below. The specific values are contained in the table in Annex 1.



Russia is actively engaged in information security. In this case, not enough attention is paid to the involvement of the population, which is detached from the problems that creates threats to information security due to lack of basic awareness. The consequence of this problem is the people's distrust of online business, e-commerce and other similar manifestations of the digital economy.

In general, the level of trust and security in the digital economy in the Russian Federation is to be judged as ***developed***.

References

1. Доктрина информационной безопасности Российской Федерации. Утверждена Указом Президента Российской Федерации от 05.12.2016 № 646. URL: http://www.kremlin.ru/acts/bank/41460
2. «ФинЦЕРТ» Банка России URL: https://www.cbr.ru/credit/Gubzi_docs/main.asp?Prtid=fincert
3. Федеральный закон «О безопасности критической информационной инфраструктуры Российской Федерации» от 26.07.2017 № 187-ФЗ
4. Требования к обеспечению защиты информации в автоматизированных системах управления производственными и технологическими процессами на критически важных объектах, потенциально опасных объектах, а также объектах, представляющих повышенную опасность для жизни и здоровья людей и для окружающей природной среды. Утверждены приказом Федеральной службы по техническому и экспортному контролю от 14.03.2014 № 31.

2. Digital foundations of the digital economy

2.1 Digital Infrastructure

A well-developed digital infrastructure is a prerequisite for digital economy development. Technologies underneath the digital transformation includes not just telecommunications, the most important components of the digital infrastructure of the modern economy are data centers, digital platforms, cloud computing services and services related to the new digital technologies such as data analytics, blockchain and artificial intelligence. For the development of the digital economy, the requirements for traditional telecommunications infrastructure are also changing. First and foremost is the widespread availability of broadband access and, above all, mobile broadband access, since the use of smartphones is today one of the main technological trends that determine the direction of digital transformation. Digital transformation in all areas of the economy also demonstrates the need for increased requirements for ensuring cybersecurity.

2.1.1 Broadband access to the Internet

Fixed-broadband Internet subscriptions

In 2017, with the score of 18.6 [1] on fixed broadband subscribers per 100 population, Russia lost almost one point from 2016 with 19.47 subscribers and 60th place out of 197 countries and territories that provided data to ITU (in 2015 – 67th place). Russia's indicators are higher than the average (11.9 subscribers), but lower than those in developed countries (average – 30.1 subscribers), where the ten leading countries indicators exceed 40 fixed broadband subscribers per 100 inhabitants. The scores of Russia's indicators are closest to the scores of Azerbaijan, Montenegro and Grenada [2]. The improvements in the ranking are linked in particular to implementation of 2014 resolution stipulating a novel universal service (provision of settlements from 250 to 500 inhabitants with broadband access at a speed of not less than 10 Mbit / s, mainly fiber optic) and affordability of fixed broadband. As part of the universal service plan, 34 thousand kilometers of optical fiber was laid out in 2016 connecting almost four thousand settlements [3, p.22].

Active wireless-broadband subscriptions

In 2017, with the score of 71.1 [4] active mobile broadband subscribers per 100 inhabitants Russia lost more than one-point relative to 2016 with 72,4 active subscribers per 100 inhabitants [5], which is greater than the world average (49.4 subscribers), but lower than in developed countries (90.3 subscribers) [6]. In recent years, a number of restrictions on the development of mobile communication were lifted, allowing shared use of the communications infrastructure, active equipment and radio frequencies, technological neutrality, and stimulus measures to expand the penetration of mobile broadband were adopted (linking the allocation of frequencies with commitments to expand the coverage area) that should lead to further improvements in the index.

International Internet bandwidth per Internet user

The capacity of Russia's international communication channels in 2015 amounted to 26 845 bit / s for 1 user. The index score for Russia is close to that of a number of African and Latin American countries, and among the European countries to Albania and Serbia. Of countries comparable in terms of population the figures were similar in Mexico and Vietnam (24 374 bit / s). In developed countries, the bandwidth per user is 3-4 times as much: in the United States 99,017, Germany – 117,540, and Japan – 62,618 bit / s for 1 user. [7]

Percentage of the population covered by at least a 3G mobile network

According to ITU in 2016 proportion of the population covered by 3G mobile communication services in Russia was 73% [8]. In 2017 a program is nearing completion, under which settlements with more than 10 thousand residents are provided with UMTS / LTE.

Percentage of the population covered by at least a 4G mobile network

In Russia there is no tracking of 4G coverage of the population, but in concordance with ITU data in 2016 the proportion of the population covered by 4G mobile services in Russia was 50%. The number of LTE base stations at the beginning of 2018 stood at about 160 thousand [3]. This statistic represents about one third of all stations, which are placed mainly in the cities and towns. The Russian Ministry of Communications is considering development of a LTE network as one of its priorities. In 2016 regulations were passed that allow the use of LTE in the frequency range of 450 MHz (a range which previously was used only for second generation communications), which along with other measures is designed to stimulate the development of this technology [3]. According to the forecast by Ericsson, by the end of 2017, 69% of Russia's population will live in areas with LTE (4G) coverage. [9]

Average speed of Internet connection

According to Akamai [11] the average Internet connection speed for Russian subscribers at the beginning of 2017 was high – 11.8 Mbit / s, a speed comparable to most EU countries. Similar speeds are accessible in Estonia, Luxembourg and Australia, while slightly faster rates can be found in Portugal and Poland. In the countries of Northern Europe, the connection speed is almost twice as fast, and in the United States speeds are one and a half times faster (18.7 Mbit / s).

Targets the development of broadband access to the Internet up to 2020 included in the national strategies and programs

The goal of the State program “Information Society” [12] is to reach 95 mobile broadband subscribers per 100 population by 2020. If successful, access to broadband in 2018 should be available for 97% of the population.

2.1.2 Mobile networks

Mobile cellular telephone subscriptions per 100 inhabitants

According to Rosstat data in 2017 Russia has 197,8 [10] mobile subscribers per 100 people, an increase of more than 30 points from 2016 according to the International Telecommunication Union’s index [13]. Russia ranked 12th out of 200 countries and territories, with 163.26 subscribers per 100 inhabitants (if only countries are counted, then Russia is at the 10th place). Russia has traditionally been one of the leaders of this indicator, and its ranking is increasing: in 2015 it occupied the 17th place. High rates of mobile penetration are conditioned by competition of federal operators (MTS, Beeline, MegaFon and Tele2), and the above-mentioned measures that promote cooperation of operators in the construction and use of communications infrastructure. Sharing of active equipment and radio frequencies also reduces the costs of deployment and maintenance of communications networks, lowering the cost of services.

Mobile network coverage – percentage of population

Statistical observation of mobile penetration is not conducted. The existing expert estimates indicate that more than 90% of the population lives in areas with mobile service. According to the forecast by Ericsson, by the end of 2017 91% of Russia’s population will be mobile users. [9] In Russia, the problem of covering all localities with mobile services is complicated by the country’s sheer size and geography covering a large number of remote and sparsely populated areas. Russia uses a number of tools to solve this problem,in particular, in remote regions authorities are financing the creation of the communication infrastructure as a method of public private partnerships.

2.1.3 Affordability of broadband access

Fixed broadband service basket as a percentage of GNI per capita

Russia ranks 12th in the world (from 182 countries) and has one of the cheapest prices on a basket of fixed broadband services (0.6% of GNI per capita of the population). As part of the universal service in towns more than 250 residents of the connection to the access point at a speed of 10 Mbit / s, the monthly fee is about 70 US cents. [7]

Mobile-broadband prices, prepaid handset-based

Russia ranks 20th globally and is one of the leaders in affordability of prepaid mobile broadband (PMB) (0.3% of GNI per capita), which is the favorable factor of the PBM development [7]. Its scores are similar to those of Netherlands, Hong Kong, Qatar and Belgium.

Mobile-broadband prices, postpaid computer-based

Russia holds the 24th place in mobile post-paid broadband (0.5% of GNI per capita) globall. Similar scores are seen in Estonia, Kazakhstan, Romania and the Republic of Korea. Leaders (Denmark, Austria, Luxembourg) have price to per capita GNI ratios that are two to three times lower [7].

2.1.4 Data centers and cloud computing services

Maturity and competitiveness of the cloud computing market

Domestic suppliers of cloud services are well represented on the Russian market. [14] Russian companies operate under almost all models, but private cloud service providers have been developing quickly in recent years. By 2016, Rostelecom became the largest provider of data center services (3900 rack spaces). The top 10 commercial suppliers of data center services in the Russian Federation have more than 1,000 racks each. In 2016 this market has accelerated the growth of its services from 30% to 43% [15].

The various segments (type) of cloud computing providers demonstrate differing levels of development. The largest share of the Russian market of cloud computing is taken up by Software as a Service (SaaS) and infrastructure as a Service (IaaS), and to a lesser extent – Platform as a Service (PaaS) [14]. Russian companies are represented in all segments.

According to IDC [16] the size of the Russian market for cloud services, including public and private hybrid clouds, amounted in 2015 to 370 million US dollars. The market growth rate in rubles in the reporting period remained high – 66.9% against the previous year and reached 22.7 billion rubles in 2016. The growth in foreign currency is forecast at 8.9%.

Territorial data center network is yet insufficiently developed, initially most of the centers were stationed closer to consumers and concentrated in Moscow and St. Petersburg.

In the ranking of the top 500 supercomputers in 2017, Russia had four supercomputers, compared to the United States' 143 and China's 204. The most powerful domestic supercomputer "Lomonosov-2" (2.102 petaflops) has fallen to the 64th place in international speed rankings from the 41st position in 2016. The most powerful supercomputer in the ranking currently is a Chinese computer (93 petaflops) [19].

2.1.5 Data analytics

Maturity and competitiveness in the data analytics market

The Russian data analytics market is in its infancy but growing rapidly. The main suppliers of analytical platforms are presently foreign companies, but there are also well-known domestic firms (Yandex Data Factory, IBS, etc.).

2.1.6 Cybersecurity

Maturity and competitiveness in cybersecurity services market

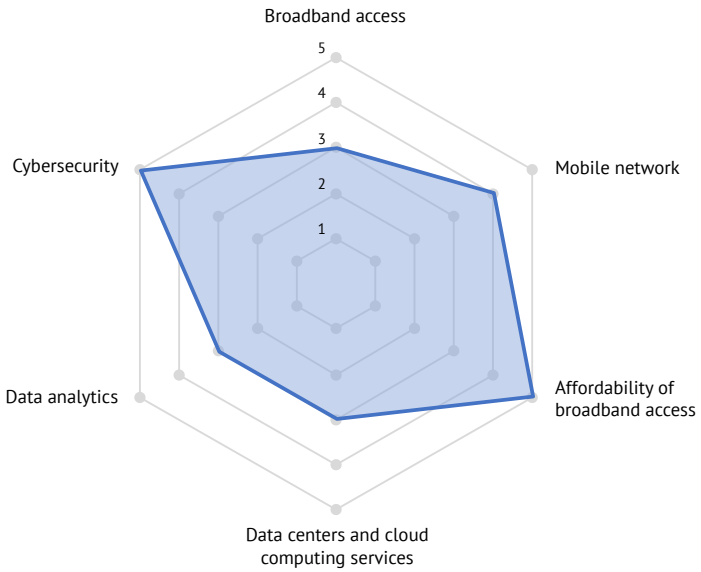
In 2017, the market size of the cybersecurity services market in Russia reached 55 billion rubles (USD $0.9 billion), with about 40 billion rubles (USD $0.65 billion) in government contracts, the rest in the private sector. About 66% of the market is antivirus software and software for Internet security [17]. On average, the Russian market of information security services is growing by 7-10% per year.

In Russia, the market of cybersecurity services is developed and exists in a competitive environment. Users can choose a cybersecurity service provider from more than 20 companies, with vendors represented by domestic firms (Agnitum, Doctor Web, Kaspersky Lab, Online Solutions) aboth nd foreign (Avast Software – Czech Republic,

Avira – Germany, BitDefender – Romania, Emsisoft – Austria, Eset – Slovakia, F-Secure – Finland, McAfee – USA, Microsoft – USA, Panda Security – Spain, PC Tools – Ireland, Qihoo 360 – China, Sophos – United Kingdom, Symantec – USA, Trend Micro – Japan, TrustPort – Czech Republic, VirusBlokAda – Belarus, Check Point – Israel, Comodo – USA, G Data – Germany). The most popular cybersecurity tools are antivirus software, firewalls, anti-rootkits and parental controls. According to CNews magazine [18], the most popular antivirus is Kaspersky Internet Security, chosen by 58% of users, followed by NOD32 from ESET with 14% of users, Dr.Web with 10% of users and Avast with 9%, Products from other developers such as Panda, Norton, Comodo (2% for each) are less common on Russian market, other programs in total accounted for 3% of Russian market.

2.1.7 Assessment of the current state and conclusions

Figures for the section are presented in the diagram below, detailed scores are included in a table in Annex 1.



In Russia, a sufficiently advanced digital infrastructure exists. Its strengths are the competitiveness of the telecommunications market (except for fixed-line telephony), high rates of penetration of mobile communications, broadband affordability, and the state of cybersecurity. The country has introduced in recent years regulations reducing barriers and stimulating the development of broadband infrastructure.

Relatively weak points are the development of fixed-line, 4G mobile networks, the territorial distribution of data centers and the development of domestic companies in the data analytics market.

The overall assessment of the digital infrastructure can be estimated as ***developed***.

References

1. Росстат: Мониторинг развития информационного общества в РФ. URL: http://www.gks.ru/free_doc/new_site/business/it/mon-sub/1.3.8.xls
2. International Telecommunication Union. Country ICT data (until 2016). Fixed-broadband subscriptions. ITU. URL: http://www.itu.int/en/ITU-D/Statistics/Documents/statistics/2017/Fixed_broadband_2000-2016.xls
3. Министерство связи и массовых коммуникаций РФ: Годовая расширенная коллегия Министерства связи и массовых коммуникаций РФ. Апрель 2018. – 386 стр. URL: http://minsvyaz.ru/uploaded/presentations/msbooklet2018site_e00NuAs.pdf
4. Росстат: Мониторинг развития информационного общества в РФ. URL: http://www.gks.ru/free_doc/new_site/business/it/mon-sub/1.3.9.xls
5. Министерство связи и массовых коммуникаций РФ. Статистика отрасли. Абоненты фиксированного доступа к сети Интернет (данные за 4 квартал 2016 г.). URL: http://minsvyaz.ru/uploaded/files/abonentyi-shpd-1216.xlsx
6. International Telecommunication Union. Global and regional ICT data. URL: http://www.itu.int/en/ITU-D/Statistics/Documents/statistics/2016/ITU_Key_2005-2016_ICT_data.xls
7. Measuring the Information Society Report 2016. Geneva:256 p. URL: http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2016/MISR2016-w4.pdf
8. World Telecommunication/ICT Indicators database URL: https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx
9. Мобильный ШПД интернет. Рынок России. URL: http://www.tadviser.ru/index.php/%D0%A1%D1%82%D0%B0%D1%82%D1%8C%D1%8F%3A%D0%9C%D0%BE%D0%B1%D0%B8%D0%BB%D1%8C%D0%BD%D1%8B%D0%B9_%D0%A8%D0%9F%D0%94_%D0%B8%D0%BD%D1%82%D0%B5%D1%80%D0%BD%D0%B5%D1%82_%28%D1%80%D1%8B%D0%BD%D0%BE%D0%BA_%D0%A0%D0%BE%D1%81%D1%81%D0%B8%D0%B8%29
10. Росстат: Мониторинг развития информационного общества в РФ. URL: http://www.gks.ru/free_doc/new_site/business/it/mon-sub/1.3.2.xls
11. Akamai's Latest State of the Internet / Connectivity Report. URL: https://content.akamai.com/gl-en-pg9135-q1-soti-connectivity.html
12. Государственная программа «Информационное общество (2011–2020 годы)». Утверждена Постановлением Правительства Российской Федерации от 15.04.2014 № 313 «Об утверждении государственной программы Российской Федерации «Информационное общество (2011 – 2020 годы)» (в редакции от 21.02.2015 № 157, от 17.06.2015 № 602, от 21.10.2016 № 1083, от 17.02.2017 № 203, от 03.03.2017 № 256, от 31.03.2017 № 380). URL: http://government.ru/programs/218/events/
13. International Telecommunication Union. Country ICT data (until 2016). Mobile-cellular subscriptions. URL: http://www.itu.int/en/ITU-D/Statistics/Documents/statistics/2017/Mobile_cellular_2000-2016.xls
14. Облачные сервисы 2016. CNews. URL: http://www.cnews.ru/reviews/oblachnye_servisy_2016

15. Облачные услуги в корпоративном секторе, Россия 2017: Текущее состояние и перспективы развития: в 2 кн. – М.: Компания in4media/ Forrester Russia при поддержке SAP и ассоциации «АСТРА», 2017. – 2 кн.

16. IDC Russia. Cloud services market is growing thanks to government initiatives. URL: https://www.idc.com/getdoc.jsp?containerId=CEMA42087217

17. Объем российского рынка информационной безопасности оценили в 55 млрд рублей. Информационно-аналитический журнал «РУБЕЖ». URL: https://ru-bezh.ru/news/2017/11/28/ obem-rossijskogo-ryinka-informaczionnoj-bezopasnosti-oczenili-v

18. Антивирусы – самые популярные лицензионные программы среди россиян. CNews URL: http://www.cnews.ru/news/line/antivirusy__samye_populyarnye_litsenzionnye

19. Top500 List – November 2017 URL: https://www.top500.org

2.2 Shared digital platforms

Due to a fairly large user market in Russia, global companies providing online platforms are in place. At the same time, the traditionally high quality of human capital, infrastructure access and the availability of a large number of high-level experts in web technologies have influenced the emergence of competitive domestic online platforms.

2.2.1 Global digital platforms

Localization of global digital platforms

Spealing of global digital platforms localization, we need to distinguish marketplaces and e-commerce platforms. This primarily is AliExpress, which has been active on the Russian market for more than six years. According to TNS Global estimates, AliExpress consistently ranks among the top 10 most visited websites in Russia. AliExpress' mobile application is the most downloaded e-commerce application in Russia and among the top free apps.

The Amazon platform in Russia is not very popular because of issues with delivery, which is more expensive compared to AliExpress and is not always reliable.

eBay has a Russian office, and Russian shops are present on the eBay platform. The platform is localized and the delivery process is reliable.

Localized and fully available for Russian consumers (as users of mobile applications and developers) are Google Play, App Store, and others. According to estimates by research company App Annie [1, 2], the revenue of mobile app stores in Russia in 2016 totaled almost USD $300 million, and will exceed USD $400 million in 2021.

The localization of global Web search engines (Google, Bing etc.) is complete in Russia. According to the service "StatCounter" [6] in December 2017, the most popular search engine in Russia is domestic search engine Yandex with 53.15% share of users, followed by by Google with 43.07% users. The remaining market players occupy lower positions: mail.ru (2.52%); Bing (0.55%); Yahoo (0.33%); and Baidu (0.17%). Over the past year, the situation has changed slightly. In May 2017, the most popular search engine in Russia was Google (47.81% of users). Almost the same percentage was taken by Yandex, with 46.92%. These two search engines almost completely covered the Russian market. The audiences of remaining top search engines, mainly Bing (0.32%) and Yahoo (0.26%), were negligible

and Baidu is almost never used. Information about the popularity of search engines derives from the largest Russian Internet statistics services such as Yandex Metrika, SpyLog / Openstat, LiveInternet, Hotlog, Reiting@Mail.ru (they count visits to websites originating from search engines). It is quite accurate and is actively used by online ad companies.

Major global social media networks and content platforms, such as Facebook, WhatsApp, YouTube, WeChat, Instagram, Twitter are localized. By number of users the leader is the domestic social media network VKontakte[3]. Instagram is on the second place, further come Facebook and Twitter. According to ComScore, the largest and most popular video portal in Russia is YouTube. As per the data of mobile operators the most popular mobile messenger in Russia is WhatsApp.

However, there are issues with social media networks and messengers becoming blocked in Russia. Currently LinkedIn and Telegram are unavailable.

In Russia, among the global online advertising platforms there are only a few available: Google AdWords is localized and actively used, and DoubleClick is supported as a Google product. Facebook Ads is also localized and used. Bing Ads is not very relevant in the country because of limited number of Bing users (See above.)

2.2.2 National digital platforms

Russia is one of the few countries that created its own search engines which can compete as equals to Google Search. Domestically, local online advertising platforms also successfully compete with global platforms.

Amongst a number of domestic marketplaces and e-commerce platforms, Yandex. Market stands out as a service that helps to make purchases on the Internet. Its monthly audience exceeds 20 million people, with coverage of over 20 thousand stores.

in the beginning of 2018 Yandex and Sberbank closed the deal to establish a joint venture on the basis of "Yandex.Market". The new company will focus on three areas of activity. The first will be the creation of a marketplace, an online platform where consumers will have access to the large selection of goods, and sellers will receive high-quality operating, financial and logistics services. Processing of orders, customer service, organization of logistics and delivery of goods will be handled by the platform itself. The second direction will be the development of the cross-border online trade segment. Finally, the company will also continue to develop the service "Yandex.Market", which will continue to work as a platform for selecting goods and comparing prices.

The Russian Post has launched a trading platform, Pochtamarket ,uniting the website market.pochta.ru and paper catalogue shopping in 42 thousand postal offices. Potentially this service can be considered as an analogue of AliExpress.

Companies such as Yulmart and Ozon have announced the establishment of national marketplaces, including cross-border ones. Among the large marketplaces are ad aggregating services – Avito, Price.ru, Torg@mail.ru.

Separately it is necessary to note the online export of Russian goods abroad. According to a joint study by PayPal and Data Insight, the total volume of retail online-exports from Russia (PayPal transaction data was used for this study) in 2016 amounted to about 2 billion US dollars. [7] According to the Russian Export Center this represents about 2% of the total volume of Russian non-primary, non-energy exports [8].

In Russia there is Yandex.Store app store for Android devices, launched by the Russian Internet company Yandex. It was launched on 25 February 2013 and is an alternative to

Google Play, the official Android store of Google. With the help of the Yandex.Store service, users can download and install free and paid applications on their devices. Other app stores for mobile operating systems for use in Russia, most notably, by state authorities are Sailfish and Tizen.

As noted above, the domestic search engine Yandex competes with Google at both the national and global levels. Their share in Russia are about the same and fluctuate from time to time. Other russian search engines own a negligible share of the market: mail.ru has 3.45%, and Rambler 0.52%.

The main advertising platform of social media networks is the Russian Yandex. Direct, owing to the market position of Yandex. Also worth mentioning are the domestic advertising systems, inter alia Vkontakte.Ads and myTarget. They allow advertising on the country's largest social media networks (VKontakte, Odnoklassniki), as well as in media projects by the Mail.Ru Group and on the advertising network myTarget.

There is no Russian state program for development of online communities which would be analogous to the EU program Digital Single Market [4]. However, the list of sectors and markets of the Russian economy, which use national and localized online digital platforms and services is quite extensive. This includes above all the subject areas where there is intensive interaction with the consumer (individual), and the degree of state influence and control is minimal: taxi services, tourism, sale and lease of real estate, trade, adult education, among others. The spheres of video and game content distribution are also at the forefront of using online platforms and services.

Digital platforms for transport that are in use in Russia include taxi aggregators (Uber, Gett, Yandex.Taksi) travel companion search platforms (beepcar.ru, ridesharing24.ru, blablacar.ru) and online platforms for freight (vezetvsem.ru, icandeliver.ru, ati.ru). There are also numerous transportation aggregators (e.g. transport.orgp.spb.ru), which can provide personalized traffic information for registered users.

According to the Russian Ministry of Telecom and Mass Communications [5] 80% of the transportation software is imported, but among online platforms and, in particular, the aggregator platforms domestic solutions lead the market.

The logistics sphere has seen the emergence of online communities of experts (e.g. logist.ru with offers from logistics companies), websites and portals of major transport companies (e.g. dellin.ru) providing with personalized services to registered users, as well as logistics aggregators (e.g. Yandex.Dostavka).

The sector of marketplaces in the Russian segment of the Internet is developed. Among the online platforms is Yandex.Market as well as B2B-Center. In the area of e-commerce local leaders are OZON, Wildberries, and Lamoda.

In insurance and financial services there are portals or aggregators which allow customers to compare and order a variety of financial or insurance services. Examples include banki.ru, banker.ru in the financial sector, and cherehapa.ru, kasko.ru, and sravni.ru. in the insurance sector. It should be noted that considering the predominance of imported software for finance (about 70% according to the Russian Ministry of Telecom and Mass Communications [5]), domestic players have a very large share within the online-component of the financial and insurance software market.

Tourism services are one of the most represented within the Russian Internet ecosystem. There is the domestic ticket booking system "Sirena", the ticket integrators (e.g. tutu.ru), tour aggregators (e.g. Yandex.Puteshestviya), and booking systems (e.g., Ostrovook, Trivago).

In February 2012, Airbnb – a global online platform for placement, retrieval and short-term rentals of private housing – registered its representative office in Moscow as the LLC "Airbnb Russia". According to analyst firm SimilarWeb, Airbnb traffic in the .ru domain zone totaled by March 2017 3.85 million users. However, for business optimization reasons Airbnb closed its Russian subsidiary and now Russian users only work through the global platform.

Currently, the real estate sector is widely represented among domestic web solutions (e.g. ad services for sale/lease cian.ru, domofond.ru and search systems, such as https://realty.mail.ru).

The renovation and construction services sectors make use of such services as profi.r and youdo.ru which allow finding workers for renovation/construction, and portals to find building materials and contractors such as stroyportal.ru and gvozdik.ru.

It is important to bear in mind that construction belongs to the sectors where import substitution of software is also relevant. According to the Russian Ministry of Communications estimates made in the sectoral program of import substitution, the share of imports in the software solutions used in the design (e.g., BIM, CAD, CAM) is 80%.

Domestic solutions in this area are available (e.g., NEOLANT), but are very few in number. No cloud solutions and cloud libraries (e.g., bimobject.com/ru) exist, which is extremely important for the digital economy.

Online portals for agriculture are often in form of bulletin boards (eg, rynok-apk.ru, fermer.ru, agroserver.ru).

Leisure industry (theaters, cinemas, museums, concerts) is represented on online platforms by ad (e.g., afisha.ru) and ticket aggregators (e.g., parter.ru, ticketland.ru).

Detailed information about digital healthcare platforms is given in section 4.2.1.

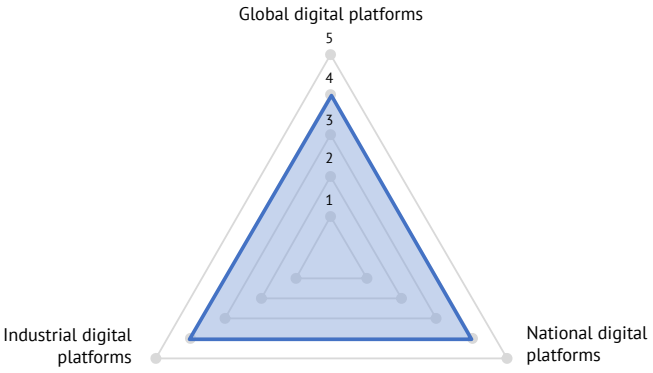
Detailed information about digital education platforms is given in section 4.2.2.

Detailed information about digital culture platforms is given in section 4.2.3.

2.2.3 Assessment of the current status and findings

Indicators for the section are presented in the diagram below, the detailed scores are presented in the table in Annex 1.

For most parameters Russia occupies a stable position and all the necessary components are available in local configurations. The lack of mobile ecosystems, for



example, is connected, first of all, to the fact that they are tied to the mobile operating systems, which are obviously manufactured outside Russia.

Level of shared digital platforms in Russia can be assessed as ***developed***.

References

1. Russia's Mobile App Economy: A New App Superpower in the Making? URL: https://www.appannie.com/en/insights/russias-mobile-app-economy/
2. Расходы в магазинах мобильных приложений растут. URL: https://www.kommersant.ru/doc/3261124
3. Социальные сети в России, осень 2016. URL: http://blog.br-analytics.ru/sotsialnye-seti-v-rossii-osen-2016/
4. Online Platforms URL: https://ec.europa.eu/digital-single-market/en/policies/online-platforms
5. План импортозамещения программного обеспечения Министерства связи и массовых коммуникаций Российской Федерации. URL: http://minsvyaz.ru/uploaded/files/plan-importozamescheniya.pdf
6. Search Engine Market Share Russian Federation, Apr 2017 – Apr 2018. URL: http://gs.statcounter.com/search-engine-market-share/all/russian-federation/#monthly-201704-201804
7. Исследование PayPal и Data Insight: объём трансграничных онлайн-продаж в России в 2016 году превысит $2 млрд. URL: http://www.paymentcouncil.ru/single-post/2016/10/17/%D0%98%D1%81%D1%81%D0%BB%D0%B5%D0%B4%D0%BE%D0%B2%D0%B0%D0%BD%D0%B8%D0%B5-PayPal-%D0%B8-Data-Insight-%D0%BE%D0%B1%D1%8A%D1%91%D0%BC-%D1%82%D1%80%D0%B0%D0%BD%D1%81%D0%B3%D1%80%D0%B0%D0%BD%D0%B8%D1%87%D0%BD%D1%8B%D1%85-%D0%BE%D0%BD%D0%BB%D0%B0%D0%B9%D0%BD-%D0%BF%D1%80%D0%BE%-D0%B4%D0%B0%D0%B6-%D0%B2-%D0%A0%D0%BE%D1%81%D1%81%D0%B8%D0%B8-%D0%B2-2016-%D0%B3%D0%BE%D0%B4%D1%83-%D0%BF%D1%80%D0%B5%D0%B2%D1%8B%D1%81%D0%B8%D1%82-2-%D0%BC%D0%BB%D1%80%D0%B4
8. Доля несырьевого неэнергетического экспорта России выросла до 38,2%. URL: https://www.exportcenter.ru/news-letter/dolya-nesyrevogo-neenergeticheskogo-eksporta-rossii-vyrosla-do-38-2/

2.3 New / emerging digital technology

The use of new / emerging digital technologies in the country demonstrates the availability of a base experience and trained specialists, which facilitates, accelerates and reduces the cost of the transition to a digital economy.

2.3.1 Awareness and motivation for the use of new technologies

Awareness, motivation and plans for the use the new and emerging technologies

Awareness in Russia about the major new digital technologies (data analytics, artificial intelligence, Internet of Things, additive technology, robotics, blockchain) is quite high.

However, interest in them and technical expertise prevail over their demand and real application.

2.3.2 Domestic producers of new digital technologies

Presence of companies producing new / emerging technologies in the country

Data analytics
These technologies see demand in virtually all areas of activity, with banks and telecoms among leaders. For example, Russian mobile operators use the same software and analytical tools as their overseas counterparts. There is high demand for specialists in this field, so the analysis of the data subject is becoming very popular in universities, which began to offer relevant basic educational programs and additional professional education programs. For the development of the data analytics technologies in Russia, a good base exists in the form of mathematical schools at universities that can treat this area as an applied topic.

Artificial intelligence
In areas such as image processing, computer vision, speech recognition and synthesis, there are already a number of popular Russian products. Several projects aimed at creation of unmanned vehicles (Yandex, KAMAZ) have launched. However, there are still no programs or organizations that could compete with Google AI or Facebook Artificial Intelligence researchers.

Internet of Things
The application of this technology is mainly taking place in production and business to develop solutions for "smart city" solutions. Development on the basis of these solutions services is still hampered by lack of necessary standards. There are also no developed local cloud platforms like Amazon Web Services and others.

At the state level there were several declarations about the need to prepare roadmaps and standards in the field of Internet of things, but publicly available information on their further development is missing. Therefore, a state policy in this area is premature.

There are a number of educational initiatives in the field of Internet of things, but they belong to large manufacturers (eg, IBM and Samsung) and mostly serve the purpose of commercial promotion of their solutions.

Additive manufacturing and robotics
Awareness of these technologies in Russia, as well as the interest of enterprises in their implementation, is very high. A number of technologies (eg, 3D-printing) are currently used in manufacturing industry, medicine, and construction. There is support for development of these technologies at the national level: the Ministry of Industry and Trade of the Russian Federation established the Department of Machine Tools, Additive Technologies and Robotics. State Corporation "Rostech" organizes experts to create new mechanisms for development of additive technology in the manufacturing industry.

Robotics is one of the most rapidly developing areas. The most dynamic and successful process is evident in the field of education. Unmanned aviation is another sector of note. Open access publications suggest that a lot of attention is being paid to development of robotics in the defense sector.

In recent years, there are actively developing projects related to production of unmanned vehicles (State Corporation "Rostech", Cognitive Technologies) and unmanned harvesting tractors (Rostselmash and Cognitive Technologies). At the same time industrial robotics is developing in the context of strong competition from industrialized countries – according to expert estimates, the number of industrial robots in Russia is less than 1% of the world total.

Distributed Ledger Technology (Blockchain)

This technology generates great interest among experts of different specialties, but such interest clearly is ahead of its real use. The Ministry of Telecom and Mass Communications of the Russian Federation marked 2019 as the deadline for adoption of normative legal acts necessary to ensure the use block-chain technologies in Russia. In accordance with the developed action plan for the direction of "regulatory regulation" of the digital economy program, a number of activities are envisaged to develop the necessary regulatory legal acts [1]. At the same time, it appears that in this respect Russia has no problems with technologies and specialists. The problem lies with the use of models and determination to implement them.

Neurotechnology

As part of the National Technology Initiative, Neuronet is being promoted, which is considered as a market for tools of human-machine communications, based on cutting-edge developments in neuroscience and increasing the productivity of human-machine systems, performance, mental and cognitive processes. Key segments include neuroassistants, neuro-education, neuromedicine, neuro entertainment and sport, neurocommunications and marketing, and neuropharma. A working group was formed for preparation and implementation of Neuronet's road map. There is a pilot project – CoBrain, aimed at studies related to the expansion of the human brain's resources (primarily through integration with the technosphere).

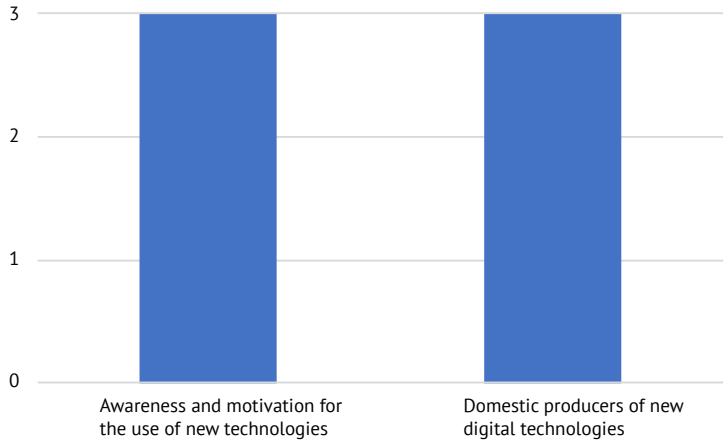
BIM-Technology

Deputy Prime Minister Dmitry Kozak signed off in April 2017 a roadmap for implementation of technology of information modeling (BIM) at all stages of the life cycle of buildings. The document envisions the development of national standards for BIM during the design, construction, operation and demolition of buildings, as well as the normative and technical documents and estimation standards, used in construction, in accordance with the classifier for construction resources. The plan also involves the expansion of the functionality of the federal state information system of pricing in construction, in the direction of operation and demolition of capital structures [2]. Today the country has a BIM-association, individual companies are using these technologies in their work, and training is offered for users.

In Russia and the CIS region, there are 140 authorized partners, 80 authorized training centers and 40 development partners of the international producer – Autodesk. There are domestic software vendors (e.g., NEOLANT). The state corporation "Rosatom" has several units with appropriate experience, involved in BIM design.

2.3.3 Assessment of the current status and findings

Indicators for the entire section are presented in the diagram below, detailed scores are given in the table of Annex 1.



One should note a very high interest in emerging digital technology, but the level of awareness is not so high, for instance the reason is high cost of access to research and engineering publications. Russian-language literature is almost non-existent. No strategy and methodology for breakthrough is in place and there is no specific implementation of innovations. The country has no large-scale projects involving a large number of companies. In most of the projects there is little original content, instead a reliance on following market leaders and use of foreign intellectual product. Yet, in a number of areas, such as artificial intelligence and robotics, there are already a number of popular Russian products.

The overall assessment of the level of awareness and development of new/emerging digital technologies in Russia can be evaluated as ***moderate***.

References

1. План мероприятий по направлению «Нормативное регулирование» программы «Цифровая экономика Российской Федерации». URL: http://static.government.ru/media/files/P7L0vHUjwVJPlNcHrMZQqEEeVqXACwXR.pdf
2. BIM-технологии в России. URL: http://www.tadviser.ru/index.php/%D0%A1%D1%82%D0%B0%D1%82%D1%8C%D1%8F:BIM-%D1%82%D0%B5%D1%85%D0%BD%D0%BE%D0%BB%D0%BE%D0%B3%D0%B8%D0%B8_%D0%B2_%D0%A0%D0%BE%D1%81%D1%81%D0%B8%D0%B8

3. Digital sector of economy

In terms of economic classification, the digital sector of economy (the information industry) is understood as the types of economic activity related to the production of equipment, the provision of services, the wholesale trade in ICT and telecommunications goods (ICT sector), as well as activities in the field of broadcasting and television, production, showing films, publishing and the operation of news agencies (the content and media sector). The composition of these sectors by types of economic activity is determined by collective groupings developed by the OECD and approved by the Russian Ministry of Telecom and Mass Communications [1]. In 2015, the share of the digital sector of the Russian economy was 3.3% of GDP [2].

3.1 Enabling environment for the digital sector

Strategic objectives and indicators of the digital sector development

The strategic planning documents adopted in the Russian Federation up to 2017 (Forecast of the scientific and technological development of the Russian Federation for the period up to 2030 [3], the Information Technology Development Strategy for the Russian Federation for 2014-2020 and for the future until 2025 [4], Strategy of scientific and technological development of the Russian Federation [5], The main activities of the Government of the Russian Federation for the period until 2018 [6]) provide goals, indicators and measures to achieve them, both concerning the development of ICT and their use in various sectors of the economy.

Objectives are defined not only for the ICT component of the digital sector. For example, in the sphere of mass communications, priority tasks include developing new kinds of television broadcasting, promoting public access to the media environment, supporting the development of regional media, establishing a significant presence in the global information space for Russian media, and others. In the Strategy for the Development of the Information Society in Russian Federation for 2017-2030 years, the following objectives for the development of the digital sector are set in the priority area "Ensuring National Interests in the Digital Economy":

1. create conditions for the development of large Russian organizations in the field of ICT (digital economy ecosystems);

2. ensure the creation of cross-sectoral consortia in the digital economy comprising the largest Russian Internet companies, banks, telecoms (including postal), payment system operators, participants in the financial market, state companies and corporations;
3. provide support for the access of Russian organizations to foreign markets for goods and services;
4. create conditions for localization by foreign organizations in the territory of the Russian Federation of the processes of production and use of products in the field of ICT.

Implementation of strategy of the digital sector development

In the framework of the above-mentioned strategic planning documents, there are programs (action plans, road maps, etc.) for digital sector development.

To implement the Strategy for the development of the IT-industry as subsector of the digital sector of economy, a roadmap "Development of the Information Technology Industry" [7] was developed and approved with specific measures that federal authorities should implement to ensure the rapid development of the domestic IT-industry. In particular, it defines the tasks of developing human capital; facilitating the employment of foreign highly qualified specialists in the IT-industry; improving the legislation of the Russian Federation for the operation of cloud computing; the development of international cooperation in the field of information technology; the development of mechanisms to support the export of Russian products of the IT-industry; the expansion of research activities in IT; support for business development, including the improvement of mechanisms for financing companies in the early stages of development (grants, seed funding); the creation of technology parks and others. The strategy defines measurable indicators that track the ratio of the growth rate of the IT-industry to the growth rate of the gross domestic product, the volume of export of products of the IT-industry, the volume of production in the IT-industry and the amount of venture investment in IT companies.

Among other programs, one can point to the state program "Information Society (2011 – 2020 years) [8] in terms of the development of digital television, and the state program "Development of the electronic and radio-electronic industry in 2013-2025 years" [9].

Public procurement policies, which provides an opportunity for small / medium enterprises to easily compete for the provision of ICT products and services to the state

Government procurement policy provides an opportunity for small/medium-sized enterprises (SMEs) to compete for the provision of ICT products and services to the government. For example, according to the federal law on procurement of goods, works and services for state and municipal needs, customers should purchase from SMEs at least 15% of goods and services from the total annual volume of purchases. Government decree number 1352 for companies with state participation determines if the company's revenue is more than 2 billion rubles, in which case from 2016 such customers should buy SMEs products and services to 18% of total purchases. Thus 10% of contract must be concluded strictly among ICPs.

Provisions or rules establishing preference for local ICT providers or limiting the ability of public institutions to procure ICT products and services from foreign enterprises

In the Russian Federation, there are rules and regulations establishing a specific preference for local ICT suppliers or restrict the ability of government agencies to purchase ICT products and services from foreign enterprises. Thus, the Russian government set the priority of goods for Russian origin, works and services performed or rendered by Russian persons [10]. Another statutory provision restricts software purchases for state and municipal needs to Russian software [11].

Tax benefits for the digital sector

Tax breaks for the digital sector are set in Russia, primarily for IT subsectors. From 2010 to 2023 the IT companies enjoy preferential pricing of insurance premiums at 14% (for other industries – 30%). Also, accredited IT companies have the right to include the costs of acquiring electronic computing equipment in the material costs (for profits tax purposes) in the amount of the full cost of such property as it enters into operation (without depreciation), subject to additional conditions on the share of "profile" income and number of employees [12, 13].

The Russian Ministry of Telecom and Mass Communications proposed in 2016 to distribute a reduced VAT rate of 10% for certain print media and book products related to education, science and culture, to all types of media, including digital media [14]. But the draft law with corresponding amendments has not yet been included to the taxation law.

3.2 ICT sector

ICT sector share in the gross value added

According to data for 2016, the share of the ICT sector is 2.9% of Russia's GDP [15]. At the same time, since 2005 this indicator has fallen from the value of 3.6% and in 2011-2015 was 3.0-3.1% [2]. As follows from the data of the above-mentioned study, the contribution of ICT in Russia's GDP is almost four times fewer than South Korea (11%) and two times than Japan, Sweden, and the United States (6-7%). Indicators of 2016, comparable with the indicators of Russia, were in Poland (3,22%), Lithuanna (2,96%), Estonia (4,91%), Hungary (5,79%), Great Britain (5,95%)[16].

According to the structure of gross value added in the ICT sector (as of 2017, not including the wholesale trade), the following can be noted [15]: 47% – activity in the field of telecommunications, 50% – information technologies and provision of other informational services in the ICT sector (61% for France and Norway, 60% for Netherlands, 57% for Great Britain), 9.5% – production of ICT equipment (this indicator is decreasing), 23.9% – wholesale trade (remains at the same level). Separately for the IT-industry, the Gross Value Added Rate is 0.9%, compared to 2010-2014, it slightly increased. And for European countries, a higher share in GDP is the component of the IT-industry [17].

Proportion of total business sector workforce involved in the ICT sector

Another key indicator is the share of the labor force employed in the ICT sector, of the total workforce. According to Rosstat data for 2016, it is 1.9% [15]. For Europe, the average is 3.5% [18].

According to statistical data, 32.7% of those employed in the ICT sector of Russia are involved in the production of ICT equipment, 31% in the provision of ICT services, 30.9% in telecommunications, and 5.4% in wholesale trade and work in telecommunication field [2].

ICT goods and services imports as a percentage of total imports

An important indicator of the development and structure of the ICT sector is the share of ICT goods and services imports from the country's total imports. The World Bank indicates a rather high figure: 9.13%. According to Russian data, the share of ICT imports in the total volume is slightly lower: 7.8%; the leading positions in imports are communication equipment (37.1%) and computers and peripheral equipment (31.6%) [2].

ICT goods and services exports as a percentage of total exports

The level of maturity of the ICT sector in the country is also indicated by the share of exports of ICT goods and services from total exports. According to the World Bank, the share of ICT exports in total exports in 2015 is 0.80% [19]. Russoft gives significantly higher figures: 1.2% of all Russian exports [20], which are already comparable with other export shares (for example, the share of food products is 3.8%, non-ferrous metals and products made of them – 3.2%, armaments – 3.1%). The general volume of exports of gods and services, that refer to ICT, is growing and amounted $6,85 billion in 2017."

Ratio of exports and imports of ICT goods and services

We also note that according to [15], in general, the ratio of exports of ICT goods amounted to 9.7% of imports in 2016 (in 2014 – 17.7%). In 2015, the worst ratio is in communication equipment (exports amount to 3.8% of imports); the best is in computers and peripheral equipment (exports account for 26.2% of imports) [2].

In 2016, the ratio of exports and imports of services related to ICT is much better: 73% [15]. At the same time, exports of computer services accounted for 89% of imports in 2015, and this figure is growing significantly (in 2014 – 74%). In 2015, the export of telecommunications services accounts for 59% of imports [2].

Share in the total volume of world exports of ICT goods and services

The important export indicator is the share of Russia in the total volume of world exports of ICT goods and services. In 2016, exports of Russian ICT goods amounted to USD $1.559 million, or 0.1% of global exports (the leader is China with 32.3%), while ICT services exports reached USD $3.936 million, or 0.8% of global exports [15].

Business enterprise expenditure on R&D in the ICT sector

The share of the business enterprise expenditure on R&D in the ICT sector in the Gross Domestic Expenditure on R&D in Russia has been growing in recent years and amounted to 3.6% in 2016 (in 2010 it was three times less – 1.2%) [15].

Innovative activity of enterprises in the ICT sector

In Russia, the proportion of enterprises of the ICT sector engaged in technological innovation is small, and in 2016 it was 9.5%, while in 2015 it was 11.1% [15]. This is slightly higher than the indicator value for the entire economy (7,3%). Adverse trends are a constant reduction of innovative activity of enterprises in the ICT sector: in 2010, technological innovation was carried out by 13.3% of organizations and in 2005 – 18.9% [15].

3.3 Content and media sector

Share of the content and media sector in gross value added

The contribution of the content and media sector is evidenced not just in the increase in the value of public goods made by the contribution of the producers and distributors of content, but also by the extent to which the increasing role of the information component in social wealth is manifested in the country.

From this perspective, we need to point, that Russia is lagging behind: in 2015 the gross value added by the content and media sector as a percentage of GDP in the was almost 5 times higher than in Russia (1.4% and 0.3% respectively [15, c. 286]. Moreover, this indicator was consistently low from 2011-2014, and decreased compared to 2010, when it was 0.5% [24, p. 96]. Note that the contribution of the content and media sector to the GDP of Great Britain is 1.7%, Hungary, Greece, Germany, Denmark – 1.1-1.5%, Italy, Slovenia, Belgium – 0.8-0.9% of GDP.Russia is far behind most developed countries. For example, in the UK and South Korea, this figure was 1.7% in 2015, while in Ireland it was 4.2%, which is much higher than in Russia. It should be noted that the value of this indicator could be affected by differences in methods of evaluation of the sector. In accordance with the international standard industry classification of economic activities, sound recording and distribution of musical recordings are also included in this sector [25, p. 20], which can be carried out by companies registered in countries with significant tax benefits and other favorable conditions for these types of activities.

It is difficult for Russia to compete with other countries successfully attracting content producers to their jurisdiction, but there is another way: stimulating the development of its own content sector and the media, which is still at a low level both in this and in other indicators.

Proportion of total business sector workforce involved in the content and media sector

The proportion of the workforce employed in the content and media sector in 2015 in Russia was 0.5%, which is one of the lowest among developed countries: for example, in the United States the percentage is almost twice as high (0.9%) [15, c. 286]. The importance of this indicator should not be overestimated, since in this sector technical equipment is more important than the number of employees.

However, it should be noted as a negative trend that the percentage and number of employees have declined from 2010 to 2014: from 0.6% to 0.5%, and from 261.2 thousand to 213.8 thousand people respectively.

It is important to stress that the reduction in employment in the sector has been uneven. From 2010-2014, the greatest decline was among people employed in publishing, from 148.5 thousand to 96.4 thousand people, or by one third [24, c. 98].

The number of people employed in the sphere of production, distribution and showing of films declined much less, from 37.2 thousand to 35.5 thousand, while the number of people employed in the field of broadcasting and information agencies increased: from 64.7 thousand to 69.2 thousand and 10.8 thousand to 12.7 thousand, respectively. [24, c. 98].

To assess the prospects for the development of the content and media sector, it is important to understand how investments in the sector as a whole and the activities

that make it up, primarily in high-tech areas, are changing. In this indicator in Russia, there are wide gaps between the components of the sector.

In publishing, investments grew from 2010 to 2014 from 636 to 778 million rubles, but fell compared to 2013, when the total investment amounted to 920 million rubles. The corresponding figures for the activities related to film production and distribution were 897 million rubles in 2010, 911 million rubles in 2013, but only 824 million rubles in 2014. Thus growth was observed over the intermediate period with a fall towards the end of the period [24, p.102].

In investment in the activities of news agencies, the trend is more positive, but the absolute amount is significantly lower: in 2010 – 88 million rubles, in 2013, 101 million rubles, in 2014, 201 million rubles [24, p.102].

The most significant and high-growth investments have been made in the field of broadcasting: 2010 – 3804 million rubles, in 2013 – 15 385 million rubles, in 2014 – 19 150 million rubles [24, p.102].

It should be noted that the data presented in investments in the content and media sector do not take into account small businesses and the self-employed, which can significantly affect the assessment of the outlook for the sector. A special assessment of growth in the new technological niches, related primarily to the development of the Internet and social networks, where traditional media are channeled to enhance interaction with users, is also needed.

Share of imports of products and services of the content and media sector from total imports

The import share of information services, including content and media sector products, is insignificant, and in 2015 it was about 0.2% [15, p. 92; 27, p. 624]. From 2010 to 2014 there was an increase in the volume of imports of information services from 246 to 426 million dollars, but in 2015 the total fell to 361 million dollars [15, p. 92].

Share of exports of products and services of the content and media sector from total exports

The export share of information services, including content and media sector products, is even smaller than the share of imports and amounted in 2015 to 0.03% [15, p.92; 27, s.624]. From 2010 to 2014 there was an increase in exports of information services from $86 to $121 million, but this fell in 2015 to $99 million [15, p.92].

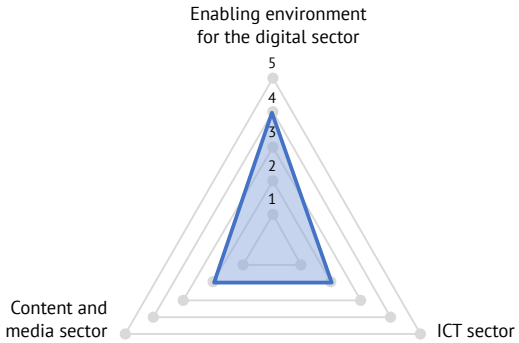
It is important to take into account the ratio of imports and exports. For the content and media sector it is indicative that the ratio of export and import information services amounted to 28% in 2014, and in 2015 – 27% [15, p.89].

Although there have been some recent trends towards increasing exports, they are relatively few, such as the increase in sales of Russian animated productions [29].

3.4 Assessment of the current status and findings

Indicators for the whole section is presented in the diagram below. Specific values are contained in the table in Annex 1.

In general, government support for the digital economy both in terms of defining objectives, programs, parameters, and in terms of preferences can be evaluated as good. Values of the development of the digital economy, including the ICT sector and



the content and media sector, are far from world level. Especially disturbing is the low share of R & D expenditure.

The export potential of the Russian ICT sector (US $7 billion in 2016) is not comparable to the export of ICT products and services, for example, from India (US $110 billion in 2015).

In general, the level of development of the digital sector of economy in Russia can be assessed as ***moderate***.

References

1. Приказ Минкомсвязи России от 07.12.2015 № 515 «Об утверждении собирательных классификационных группировок «Сектор информационно-коммуникационных технологий» и «Сектор контента и средств массовой информации». URL: https://minjust.consultant.ru/documents/17644
2. .Индикаторы цифровой экономики: 2017: статистический сборник / Г.И. Абдрахманова, Л.М. Гохберг, М.А. Кевеш и др.; НИУ «Высшая школа экономики». – М.: НИУ ВШЭ, 2017. – 320 с. URL: https://www.hse.ru/primarydata/ice2017
3. Прогноз научно-технологического развития Российской Федерации на период до 2030 года URL: http://government.ru/news/9800/
4. Стратегия развития отрасли информационных технологий в Российской Федерации на 2014 – 2020 годы и на перспективу до 2025 года. URL: http://minsvyaz.ru/uploaded/files/Strategiya_razvitiya_otrasli_IT_2014-2020_2025%5B1%5D.pdf
5. Стратегия научно-технологического развития Российской Федерации URL: http://kremlin.ru/acts/bank/41449/page/1
6. Основные направления деятельности Правительства Российской Федерации на период до 2018 года URL: http://government.ru/news/18119/
7. Дорожная карта в области информационных технологий URL: http://government.ru/media/files/41d4b29db7c74fb9ad46.pdf
8. Государственная программа «Информационное общество (2011–2020 годы)». Утверждена Постановлением Правительства Российской Федерации от 15.04.2014 № 313 «Об утверждении государственной программы Российской Федерации «Информационное общество (2011 – 2020 годы)» (в редакции от 21.02.2015 № 157, от 17.06.2015 № 602, от 21.10.2016 № 1083, от 17.02.2017 № 203, от 03.03.2017 № 256, от 31.03.2017 № 380) URL: http://government.ru/programs/218/events/

9. Государственная программа «Развитие электронной и радиоэлектронной промышленности на 2013–2025 годы» URL: http://government.ru/programs/249/events/

10. О приоритете товаров российского происхождения, работ, услуг, выполняемых, оказываемых российскими лицами, по отношению к товарам, происходящим из иностранного государства, работам, услугам, выполняемым, оказываемым иностранными лицами URL: http://government.ru/docs/24553/

11. Об установлении запрета на допуск иностранного программного обеспечения при закупках для государственных и муниципальных нужд URL: http://government.ru/docs/20650/

12. IT-отрасль Минкомсвязь России URL: http://minsvyaz.ru/ru/activity/directions/418/

13. Аккредитация ИТ компаний URL: http://minsvyaz.ru/ru/activity/govservices/1/

14. В Минкомсвязи предложили предоставить СМИ налоговые льготы URL: https://www.pnp.ru/economics/v-minkomsvyazi-predlozhili-predostavit-smi-nalogovye-lgoty.html

15. Цифровая экономика: краткий статистический сборник / Г.И. Абдрахманова, Л.М. Гохберг, А.В. Демьяненко и др.; Нац. исслед. ун-т «Высшая школа экономики». – М.: НИУ ВШЭ, 2018. – 96 с.URL: https://www.hse.ru/data/2018/02/19/1165383719/ice2018kr.pdf

16. Percentage of the ICT sector on GDP URL: http://ec.europa.eu/eurostat/web/products-datasets/-/tin00074

17. OECD Key ICT indicators URL: http://www.oecd.org/sti/ieconomy/oecdkeyictindicators.htm

18. ICT specialists in employment URL: http://ec.europa.eu/eurostat/statistics-explained/index.php/ICT_specialists_in_employment

19. Индикаторы цифровой экономики: 2018 : статистический сборник / Г. И. Абдрахманова, К. О. Вишневский, Г. Л. Волкова, Л. М. Гохберг и др.; И60 Нац. исслед. Ун-т «Высшая школа экономики». – М.: НИУ ВШЭ, 2019. – 268 с. URL: https;//www.hse.ru/data/2018/08/20/1154812142/ICE2018.pdf.pdf

20. Экспорт ПО из России URL: http://www.tadviser.ru/index.php/Статья:Экспорт_ПО_из_России

21. Экспорт российской индустрии разработки программного обеспечения URL: http://www.russoft.ru/files/RUSSOFT_Survey_12_rus.pdf

22. Послание Президента Федеральному Собранию URL: http://kremlin.ru/events/president/news/53379

23. OECD ICT Goods Export URL: https://data.oecd.org/ict/ict-goods-exports.htm

24. Ежегодный мониторинг средств, выделенных из федерального бюджета на финансирование НИОКР URL: http://ac.gov.ru/files/publication/a/4889.pdf

25. Индикаторы информационного общества: 2016: статистический сборник / Г.И. Абдрахманова, Л.М. Гохберг, М.А. Кевеш и др.; НИУ «Высшая школа экономики». – М.: НИУ ВШЭ, 2016. – 304 с. URL: https://www.hse.ru/data/2016/03/14/1124859837/Индикаторы информационного общества 2016.pdf

26. Международная стандартная отраслевая классификация всех видов экономической деятельности: Четвертый пересмотренный вариант. Нью-Йорк, Организация Объединенных Наций, 2009. – 353 с. URL: https://unstats.un.org/unsd/cr/registry/regdntransfer.asp?f=195

27. Мировой атлас данных URL: http://knoema.ru/atlas/Российская-Федерация/topics/Исследования-и-разработки/Затраты-на-НИОКР/RandD-expenditure-as-a-share-of-GDP

28. The World Bank ICT goods export. URL: http://data.worldbank.org/indicator/TX.VAL.ICTG.ZS.UN

29. Российский статистический ежегодник. 2016: Стат.сб. / Росстат. – М., 2016. – 725 с. http://www.gks.ru/free_doc/doc_2016/year/year16.pdf

30. Мультфильм «Маша и медведь» начнут показывать в Китае и Японии URL: http://www.interfax.ru/culture/564701

4. The digital transformation of the public sector

4.1 Digital Government

4.1.1 Policy and regulation for public administration

Strategic goals and indicators of the digital government development

Strategic development of digital government in Russia is defined in the new Strategy for the Information Society Development in the Russian Federation for 2017-2030 [1]. New indicators of development and use of ICT in public administration and local self-government have not yet approved by the Government. Until the adoption, the indicators set in the corresponding subprogram of the state program "Information Society (2011 – 2020 years)" [2] aimed at implementing the previous Strategy for the Information Society Development [3] will operate.

Action plan for the digital government development

This is implemented within the framework of a separate sub-program of the state program "Information Society (2011 – 2020 years)" [2] and departmental activities. These activities are coordinated at the federal level by the Russian Ministry of Telecom and Mass Communications in accordance with the Government's decision. [4]

A detailed action plan for the development and use of digital technologies in public administration and local self-government is formulated in the Systemic Project of e-Government Development until 2020, which was developed in late 2015 and has not yet been approved.

Architectural approach used in designing and managing the digital government development

There is no systematic use of an enterprise architecture approach to designing and managing the digital government development in the Russian Federation. This task is set in the Systemic Project of e-Government Development until 2020, which has not yet been approved.

Regulations on equivalence of or priority to digital transactions, notifications and documents in relation to non-digital forms

In most cases digital (electronic) transactions, notifications and documents have equivalence with non-digital forms, but do not have priority over them.

4.1.2 Human capital for digital government

Digital competences included in the qualification requirements for civil servants

In accordance with the Federal Law "On the Civil Service of the Russian Federation" No. 79-FZ, the qualification requirements for professional knowledge and skills necessary for civil servants to perform their official duties are determined by a normative act. Following the recommendations of the Government Commission on Government Commission on the Introduction of Information Technologies in the Activity of State Authorities and Municipalities adopted in 2012 [5], many authorities at the federal and regional levels include digital competencies in qualifying requirements for civil servants.

Civil servants training and retraining in use of digital technologies

Training is conducted independently by the state authorities and municipalities, and there is no centralized system. Particularly problematic, according to experts, is the level of digital (re)training of municipal employees.

Share of civil servants in central government organizations who regularly use computers and the Internet

Level of employee computer use in the Russian government relatively high, although employees of municipalities are somewhat behind federal/regional civil servants. According to Rosstat data for 2016, 64.4% of the employees of federal executive authorities and 38.7% of the staff of the regional executive authorities used computers weekly, whereas among municipalities, the figure is 75.2% [6].

In the use of the Internet, the situation is similar: according to Rosstat in 2016, 48.0% of all employees of federal executive bodies and 29.8% of all regional executive authorities used the Internet, while in local government, this value was 70.6% [6].

4.1.3 Digital infrastructure for government

Share of central government organizations with broadband access

Almost all federal state authorities are provided broadband access to the Internet, but the bandwidth is not always adequate for modern requirements. In 2016, according to Rosstat, a total of 22.2% of organizations (including all branches and subdivisions) have a bandwidth exceeding 30 Mb/s [6].

Share of regional governments and municipalities with broadband access

Broadband internet access for regional authorities and municipalities is similar to that of federal authorities: almost all are connected, but only 22.28% of the regional authorities and 18.3% of local governments have a bandwidth of 30 Mb/s and above [6].

National government cloud and data center infrastructure

In 2012, the national telecom operator PJSC "Rostelecom" created the National Cloud Platform for public authorities and private enterprises, providing services in the areas of health, education, security, housing and utilities, property and land relations. By 2016, Rostelecom became the largest provider of data center services (3,900 rack locations) [7].

At the same time, the creation of the government cloud infrastructure is at the level of concept formation and pilot projects in individual agencies [8].

Interoperability Framework with mandatory standards for government information systems

Different types of interaction between federal authorities are provided by the system of interdepartmental electronic document circulation (for federal and pilot regional executive bodies). The Russian Unified e-Service Bus System (SMEV) offers digital interaction of federal authorities in the provision of state and municipal services. In 2017, the number of transactions in SMEV was 20.2 billion. Currently, 14.6 thousand participants are connected to SMEV. In all subjects of the Russian Federation, regional segments of the federal SMEV have been created and are functioning [9].

However, in the Russian Federation there is no comprehensive profile of standards, protocols, data formats and metadata that guarantee the interoperability of government information systems [10].

National databases and their mandatory use in public administration

The Russian Government has identified [11] a list of national databases (basic state information resources) and maintains their register on the portal of the Unified System of Reference Information [12], which, as of 2018, has 11 resources. At the same time, the Russian Federation lacks a number of critically important national databases, such as a single database of citizens.

Since 2012, the Russian Government has determined the requirements and procedure for the formation, updating and use of national databases [11], prescribing their use in an interagency information exchange for the provision of state and municipal services or for performing state and municipal functions.

Further development and use of national databases will be carried out through the creation of a unified information environment for information systematization and coding, which will be put into operation starting from 2019 [13].

Provision of open application programming interfaces to government data and digital services

For machine-readable government data sets on open data portals, there are open application programming interfaces (API). In addition, APIs for data from the Public Procurement Portal, the Bank of Russia, and some other government data have been opened.

Open software interfaces for e-government applications are used by some commercial organizations (usually banks involved in processing payments for the provision of public and municipal services) [14].

New/emerging technologies used for the digital government development

State and municipal authorities in the Russian Federation have no restrictions in access to advanced, emerging digital technologies.

At the federal and regional levels, separate pilot projects are being implemented, for example, on the use of predictive analytics to support decision making in the public administration [15]. However, there is no incentive system for the use of emerging digital technologies in the public administration system.

4.1.4 Digital government services

e-Government Online Service Index

In the 2016 E-Government Development Index (EGDI) [16], conducted by the UN Department of Economic and Social Affairs, the Russian Federation dropped eight positions compared to 2014 and ranks 35th. In the Online Service Index (a sub-index of the EGDI), the country occupies 23rd place and is among the 37 countries that divided the first 23 places (with ties for some places between one or more countries).

Priority sectors for improving the quality of state and municipal services delivery

Priorities for improving the quality of state and municipal services until 2017 are defined by the Concept of development of mechanisms for the provision of state and municipal services in electronic form [17] and the action plan for its implementation [18].

For 2017-2018 years the Russian Government has also identified priority areas for improving the quality of services provided through a system of multi-service centers [19].

Unified entry point (portal) for provision of state and municipal services

A single portal of state and municipal services is operational in Russian Federation (www.gosuslugi.ru). The number of users of online government and municipal services has doubled in just one year to reach 40 million in 2016 and 70 million by 2018 [9]. At the same time, some services are provided through regional portals of state services, and websites of federal agencies, regional authorities, and municipalities. Unified requirements for the design and functionality of web presence at various levels of state authorities and municipalities have not been formulated and are not complied with (such requirements [20] for individual federal and regional authorities were adopted for the first time in June 2017).

Complex services for life and business events

At the moment, services for life and business events in Russia are not provided. There are only groups of individual state and/or municipal services in categories related to certain life or business events.

Automatic provision of services without human intervention in real time

Some information services are provided on-line without human intervention, such as information on tax debts or fines. For transactional state and municipal services, this is not possible.

Proactive approach to the provision of services

This feature is currently not available in the Russian Federation, partly because of regulatory barriers. In accordance with the Federal Law “On the organization of state and municipal services” [21], state and municipal services can only be provided at the applicant’s request.

Mobile applications for state and municipal services

The mobile application "Government Services", available through the site m.gosuslugi.ru for all mobile devices running on iOS, Android and Windows Phone operating systems, offers state and municipal services.

In 2017, the active monthly audience of the Government Services Apps was 5.4 million people [9].

Continuity of state and municipal services provision across different channels

Data on the provision of state or municipal services is recorded in the user's personal account on the Unified Portal of Public Services, with which the mobile application is integrated, ensuring continuity of interaction with the government on any of these channels. However, through other channels (multifunctional centers, contact center), this information is not available.

4.1.5 Open government

UN E-Participation Index

In the overall ranking of citizens' electronic participation [16] conducted by the UN Department of Economic and Social Affairs, Russia shared 14th place with four other countries in 2016. However, Russia received a low ranking (28.6%) in the use of ICT in the third, the most mature stage of e-participation, participation in decision making.

National open data portal

Russia has a national open data portal (www.data.gov.ru). Machine-readable, open datasets are also available on regional open data portals and the websites of state authorities and local self-government. In the 2016 World Wide Web Foundation's international Open Data Barometer, the Russian Federation took 25th place [22].

4.1.6 Digital government platforms

Use of government digital tools and services by civil society and business to support their own activities

At present, the tools and services of the e-government of the Russian Federation are not used by citizens and business to support their own activities and interaction with each other.

4.1.7 Impact of government digital services

Share of citizens satisfied with the government digital services

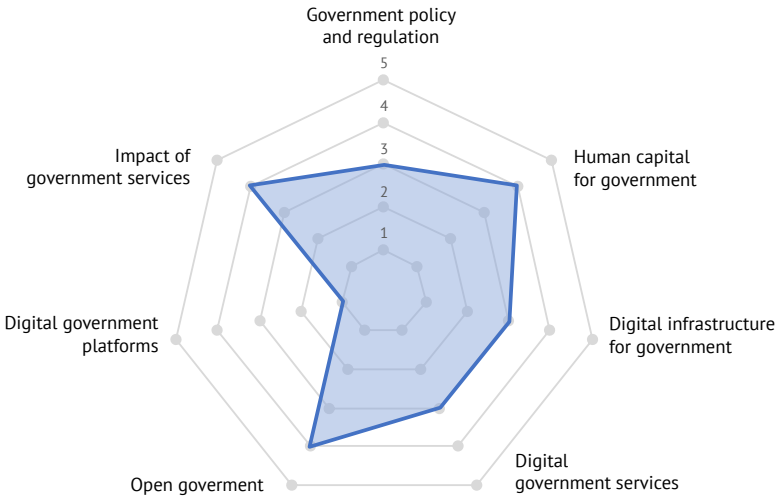
According to a Rosstat survey in 2017, the share of citizens fully satisfied with the quality of state and municipal digital services was 70.5%, with 28.4% partially satisfied [6].

Share of businesses satisfied with the government digital services

According to a Rosstat survey in 2016, only 33.7% of businesses were fully satisfied with the quality of state and municipal services; with 43.4% partially satisfied [6].

4.1.8 Assessment of the current status and findings

Indicators for the whole section are presented in the diagram below. Specific values are contained in the table in Annex 1.



In the development of digital government, in recent years the Russian Federation has achieved some successes, most notably an increase in the number of state and municipal services provided using the e-government infrastructure, and an increase in the number of registered users of the Unified Public Services Portal.

At the same time, a significant transformation of the current e-government architecture will be required to move to the next stage of the maturity of digital transformation and the use of ICT in the public sector [23], requiring the re-engineering of administrative processes and the emphasis on the use of national databases, sharing of digital services by state authorities and municipalities, and provision of digital government platform services to citizens and businesses for interaction with each other.

In general, the level of development of digital government in the Russian Federation can be assessed as ***moderate***.

References

1. Стратегия развития информационного общества в Российской Федерации на 2017-2030 годы. Утверждена Указом Президента Российской Федерации от 9 мая 2017 г. № 203 URL: http://kremlin.ru/acts/bank/41919
2. Государственная программа «Информационное общество (2011–2020 годы)». Утверждена Постановлением Правительства Российской Федерации от 15.04.2014 № 313 «Об утверждении государственной программы Российской Федерации «Информационное общество (2011 – 2020 годы)» (в редакции от 21.02.2015 № 157, от 17.06.2015 № 602, от 21.10.2016 № 1083, от 17.02.2017 № 203, от 03.03.2017 № 256, от 31.03.2017 № 380) URL: http://government.ru/programs/218/events/

3. Стратегия развития информационного общества в Российской Федерации. Утверждена Президентом Российской Федерации 7 февраля 2008 г. № Пр-212 URL: https://rg.ru/2008/02/16/informacia-strategia-dok.html

4. Постановление Правительства Российской Федерации от 24.05.2010 № 365 «О координации мероприятий по использованию информационно-коммуникационных технологий в деятельности государственных органов» (в редакции от 06.07.2017) URL: http://pravo.gov.ru/proxy/ips/?docbody=&nd=102138552

5. Рекомендации по включению в нормативные акты государственных органов, которыми утверждены квалификационные требования к профессиональным знаниям и навыкам, необходимым для исполнения государственными гражданскими служащими должностных обязанностей, требований к знаниям и навыкам в области информационно-коммуникационных технологий. Одобрены Правительственной комиссией по внедрению информационных технологий в деятельность государственных органов и органов местного самоуправления (протокол от 6 марта 2012 г. № 4).

6. Данные Главного межрегионального центра Росстата, 2016.

7. Облачные сервисы 2016. CNews Analytics. – Ноябрь 2016. URL: http://www.cnews.ru/reviews/oblachnye_servisy_2016

8. Распоряжение Правительства Российской Федерации от 7 октября 2015 г. № 1995-р «Концепция перевода обработки и хранения государственных информационных ресурсов, не содержащих сведения, составляющие государственную тайну, в систему федеральных и региональных центров обработки данных» URL: http://government.ru/docs/20034/

9. Министерство связи и массовых коммуникаций РФ: Годовая расширенная коллегия Министерства связи и массовых коммуникаций РФ. Апрель 2018. – 386 стр. URL: http://minsvyaz.ru/uploaded/presentations/msbooklet2018site_e00NuAs.pdf

10. Петров О.В., Бунчук М.А., Стотт А., Хохлов Ю.Е. Цифровое правительство 2020: Перспективы для России. 2016. – Washington, D.C.: World Bank Group. 79 с. URL: http://documents.worldbank.org/curated/en/2016/05/26367059/digital-government-2020-prospects-russia-цифровое-правительство-2020-перспективы-для-россии

11. Постановление Правительства Российской Федерации от 14 сентября 2012 г. № 928 «О базовых государственных информационных ресурсах» (в редакции от 22.11.2013 г. № 1056; от 21.07.2014 г. № 680) URL: http://pravo.gov.ru/proxy/ips/?docbody=&nd=102159327

12. Единая система нормативно-справочной информации URL: http://nsi.gosuslugi.ru

13. Постановление Правительство Российской Федерации от 1 июня 2016 г. № 487 «О первоочередных мерах, направленных на создание государственной информационной системы «Единая информационная среда в сфере систематизации и кодирования информации» (в редакции постановления Правительства Российской Федерации от 15.03.2017 г. N 301) URL: http://government.ru/docs/23278/

14. Минкомсвязь России. Применение инфраструктуры электронного правительства для взаимодействия с банковскими организациями. Декабрь 2015. http://minsvyaz.ru/ru/activity/directions/750/

15. Итоги конкурса «Лучшие информационно-аналитические инструменты – 2017»: М., Аналитический центр при Правительстве Российской Федерации, 2018. – Часть 1: 24 с.; Часть 2: 48 с. URL: http://itcontest.ac.gov.ru/an2017/about/docs/files/otchet2017.pdf

16. United Nations E-Government Survey 2016. – UN, New York, 2016. – 218 p. https://publicadministration.un.org/egovkb/en-us/reports/un-e-government-survey-2016

17. Распоряжение Правительства Российской Федерации от 09.06.2014 № 2516-р «Об утверждении Концепции развития механизмов предоставления государственных и муниципальных услуг в электронном виде» (в редакции распоряжения Правительства Российской Федерации от 25.05.2017 № 1027-р) URL: http://government.ru/docs/9462/

18. Распоряжение Правительства Российской Федерации от 09.06.2014 № 991-р «Об утверждении плана мероприятий («дорожной карты») по реализации Концепции развития механизмов предоставления государственных и муниципальных услуг в электронном виде» (в редакции от 25.05.2017 № 1027-р) URL: http://government.ru/docs/12985/

19. Распоряжение Правительства Российской Федерации от 2017-04-21 № 747-р «Об утверждении плана развития системы предоставления государственных и муниципальных услуг по принципу «одного окна» на базе многофункциональных центров» URL: http://government.ru/docs/22819/

20. Единые функционально-технические требования к порталу Правительства Российской Федерации и веб-сайтам министерств, а также Единому порталу государственных и муниципальных услуг (функций). Одобрены подкомиссией по использованию информационных технологий при предоставлении государственных и муниципальных услуг Правительственной комиссии по использованию информационных технологий для улучшения качества жизни и условий ведения предпринимательской деятельности (протокол от 27 июня 2017 г. №244пр)

21. Федеральный закон от 27.07.2010 № 210-ФЗ «Об организации предоставления государственных и муниципальных услуг» (в редакции от 28.12.2016) URL: http://www.kremlin.ru/acts/bank/31584

22. Open Data Barometer – Third edition. The World Wide Web Foundation, April 2016. – 48 p. URL: http://opendatabarometer.org/doc/3rdEdition/ODB-3rdEdition-GlobalReport.pdf

23. Introducing the Gartner Digital Government Maturity Model. September 2015. URL: https://www.gartner.com/doc/3135317/introducing-gartner-digital-government-maturity

4.2 The digital transformation of the social sector

4.2.1 Digital healthcare

In the digital economy, each member of society's period of active creative participation in the economy acquires special significance. Since the mid-60s, there has been a sufficient increase in mortality in Russia (RSFSR) compared to European countries. The same trend is also characteristic for European socialist countries, while in Western European countries in the period 1965-1980, the opposite picture was observed, for example, in cardiovascular diseases and accidents [1]. Therefore, digital healthcare's focus on accessibility, quality of medical care provided, growth in productivity of medical

personnel, and reductions in unit costs per patient (with an overall increase in health care expenditure) has become the main direction of development of many countries. The mechanism of such development is the transition to digital healthcare, which will really allow the achievement of the above goals.

4.2.1.1 *Public policy and regulations for digital healthcare*

Strategic goals and indicators for the digital healthcare development

The healthcare development strategy of the Russian Federation has been repeatedly defined in various policy documents and the current program is the state program "Development of Healthcare for 2013-2020" [2,22]. The key principles of the strategy formulated in the Federal Law "On the foundations of protecting the health of citizens in the Russian Federation" [3] are:

- observance of citizens' rights in the field of health protection and provision of state guarantees related to these rights;
- prioritization of the patient's interests in the provision of medical care;
- prioritization of protecting children's health;
- social security of citizens in case of loss of health;
- responsibility of public authorities and local self-government bodies and officials for ensuring the rights of citizens in the field of health protection;
- accessibility and quality of care;
- inadmissibility of refusal to provide medical assistance;
- prioritization of prevention in the field of health protection;
- compliance with medical confidentiality.

At the same time, the national Unified State Healthcare Information System (EGISZ) is defined as a tool that promotes access to and quality of medical care. It was legally entrenched in the newly adopted Federal Law "On Amendments to Certain Legislative Acts of the Russian Federation on the Application of Information Technologies in the Sphere of Healthcare" [4], 6 years after the adoption of the fundamental federal law "On the foundations of protecting the health of citizens in the Russian Federation". As a follow up of the Federal Law, the Russian Ministry of Health together with industry experts prepared number of regulatory documents that form the basis for the practical application of innovations in the field of telemedicine [19] and the further development of the Unified State Healthcare Information System [23], which fundamentally changes the architecture of EGISZ on the federal level.

To assess the state of the industry and its individual elements, various ratings are often used, including those that assess and directly indicate the level of availability and quality of medical care as strategic development directions. In the 2016 world health systems ranking compiled by Bloomberg analysts based on data from the World Health Organization, the United Nations and the World Bank, Russia was in last place among the 55 countries surveyed [5].

Understanding of digital health at the strategic level, and goals and indicators of its development in the Russian Federation, is just emerging. At the same time, the first elements of ICT development planning as a tool for managing the healthcare sector were laid out in the Concept for the Creation of a Unified State Healthcare Information System, developed in 2010-2011 [6].

Action plan for the digital healthcare development

Within the framework of the state program "Development of Healthcare for 2013-2020" [2] a number of subprograms and priority projects are implemented, including separate measures for the development of digital health. However, these activities are concentrated exclusively in subprogram D, "Management of the development of the industry", whereas they also should be in other subprograms of the State Program "Development of Healthcare" where the use of digital media and services health can give real results in increasing efficiency, including subprogram 3, "Development and implementation of innovative methods of diagnosis, prevention and treatment, as well as the foundations of personalized medicine"; subprogram 9 "Examination and control and supervisory functions in the field of health protection"; subprogram 2, "Improving the provision of specialized, including high-tech, medical care, ambulance, including emergency specialist medical care, medical evacuation" and others.

In 2017, the new version of the program "Development of Healthcare" was adopted, which includes seven priority and three departmental projects as well as nine directions. Three new priority projects have been approved, which are aimed at promoting a healthy lifestyle, creating a new model of medical organization providing primary healthcare on the principle of lean production, and enhancing the professional development of healthcare workers [2]. The Government of the Russian Federation has preliminarily approved a new direction of the Digital Economy program – the Digital Healthcare subprogram.

The problem is that the development programs are undertaken periodically, but new programs are adopted to correct the existing program before the results of the previous one have been carefully analyzed. As a result, work on existing bugs is only nominally or partially carried out.

Harmonization with international standards and reference data for the digital healthcare development

Such standards are not presently available in the Russian public health services, apart from the use of the International Classification of Diseases of the Tenth Revision (ICD-10), but without clinical modifications (ICD-10-CM), which reduces the possibility of statistical treatment of the results. At present, only individual directories have been implemented by the organizations of the Ministry of Health of Russia. The leading organization in this area is the Federal Research Institute for Health Organization and Informatics, but the classifications created by it have narrow specialization and, as a result, limited application and small distribution. Some instances of successful classifications have been produced within the Russian Federation, such as a reference book for laboratory research created by the St. Petersburg Medical Information and Analytical Center, but only confirms the severity of the problem since it requires harmonization with the international reference "Nomenclature of Laboratory and Clinical Research (LOINC)" [7].

Mandatory requirements for interoperability of healthcare information systems

Interaction in health care is carried out within the framework of procedures established by by-laws of the federal bodies of executive power for health care, on the basis of medical documents on paper[20]. The implementation of the Electronic Health Records / Integrated Electronic Health Records, the federal system of normative and reference information, and the rules for the interaction of medical organizations [21] with each other and with authorities in the field of health on the basis of protocols of interaction will ensure the effective interaction of medical organisations. The clinical protocols and clinical recommendations currently being developed will play an important role, along with the already developed procedures and standards for the provision of medical care, to constitute an integral framework for formalizing and standardizing the activities of medical personnel and the health system as a whole.

The draft federal law No. 711-p "On Amendments to the Federal Law "On the Fundamentals of Health Care of Citizens in the Russian Federation" on Clinical Recommendations" was introduced by the order of the Government of the Russian Federation on April 21, 2018.

Simultaneously with the normative regulation at the federal level we can observe the appearance of grounds for reengineering the management processes of the medical organization and the possibility of digitizing these processes with the ultimate goal of the transition to digital healthcare. Methodological materials of the Unified State Healthcare Information System (EGISZ) were elaborated by the Russian Ministry of Health in 2011-2012, partially specified in the systemic development project of the EGISZ in 2013 [8], but today they need a radical revision, taking into account modern concepts of the scale of digital transformation of the health system.

To some extent, such a revision is outlined in the Regulation on the EGISZ, which was approved by Decree of the Government of the Russian Federation No. 555 of May 5, 2018 [23]. The document establishes the legal basis for the operation of the EGISZ, including the tasks of the system, the basic functions, the procedure for access to information, the procedure and terms for the presentation and exchange of information, the operators and participants, and others. This provision reinforced the change in the architecture of the EGISZ with regard to the exclusion of regional segments of medical information systems and information systems of medical organizations from the EGISZ.

4.2.1.2 *Human capital for digital healthcare*

Inclusion of digital competences in the qualification requirements for healthcare workers

The requirements for basic ICT competencies of healthcare workers are included in federal educational standards (FES) in 6 specialties of fundamental and clinical medicine, and a FES specializing in "Medical cybernetics (30.05.03)" [9] was established.

In general, the situation with the training of specialists in related professions remains very problematic. Experts say that this is due to the general decline in the quality of medical education (low prestige of the teaching profession, which is expressed in the level of salaries, restrictions on the teaching staff for clinical activities and a number of other problems). Another factor influencing the situation is the lack of qualified teachers and quality training programs in subjects related to digital competencies due to the

lack of targets for digitalization of health care to ensure the quality and availability of medical care and increased productivity.

Training and retraining of health professionals in digital technologies

There are individual projects and programs at different levels of the education system, but they generally relate to training for policy makers, as well as the specialized training of professionals working with robotic surgical systems.

An exception is the large-scale retraining of primary care specialists in Moscow in the implementation of EMIAS [10].

Percentage of employees of healthcare organizations who regularly use computers and the Internet

According to Rosstat, in 2017 the number of medical personnel equipped with computers on average reaches 75-85%. Most of these computers were delivered in 2011-2012, so this equipment should be updated in 2018 due to obsolescence.

Computers are distributed unevenly at different levels of healthcare organizations, with the level of equipment in primary care in the Russian Federation substantially lower than required, and the CRH and their branches poorly equipped. The workplaces of administrative staff are better equipped with computers than medical staff, and access to information systems from doctors' workplaces is available only in 30% of healthcare organizations.

According to Rosstat, in 2015 the number of healthcare organizations to use the Internet reached 97.5% [11], but the connection bandwidth for 35-40% of these is only 0.5-1 Mbit/s. The number of employees actually connected to the broadband, is fairly small.

4.2.1.3 *Digital healthcare infrastructure*

Proportion of healthcare organizations with broadband access

More than 50% of healthcare organizations have broadband Internet access, and by the end of 2019 there are plans to provide broadband access for all healthcare organizations (more than 27 thousand organizations and their affiliates). [12] In 2017-2019, a program is being implemented to provide broadband access to the Internet to all the organizations and their branches: in 2017, 14 thousand connections will be provided and by the end of 2019 their number will exceed 27 thousand.

Proportion of medical equipment (devices) with an interface for data transfer

All new equipment manufactured after 2010 has a digital interface, while 30% of hardware made between 2005-2010 have digital interfaces. Modern hospitals present a wide range of expert-level equipment: ultrasound (US), X-ray machines, computerized tomography, magnetic resonance imaging (MRI), positron emission tomography (PET), single photon emission computed tomography (SPECT-CT), and equipment for laboratory research including molecular genetic diagnosis of cancer. All this equipment includes digital interfaces, which allow them to exchange information with the healthcare information systems.

Mandatory use of national databases within healthcare

Basic (nosological and territorial-population) registers have been used in the Russian Federation for more than 25 years. Between 2008-2010 a new generation of federal registers were created that were updated in 2016. In 2017-2018, they were legally enshrined as part of EGISZ to mandate compulsory conduct and will affect the quality of management decisions of health sector authorities [4, 23].

Federal registers are divided into administrative registers (registers of medical and pharmaceutical personnel, medical organizations, orphan diseases requiring centralized drug procurement ("7 nosologies"), high-tech medical care, children in difficult situations, etc.) and nosological registers (registers of patients with tuberculosis, cancer, HIV infection, hospitalized patients with neurological diseases, etc.) – all these registers of different levels of reference, according to experts, there are up to 60).

Basic federal registers provide research and study of the impact of new technologies and the use of drugs on the effectiveness of medical care for patients with certain diseases, to allocate and control groups of randomized trials.

Presence of domestic producers of digital medical technologies and equipment

Domestic companies produce certain digital equipment, in very small batches and for the most part assembled from imported components. These companies include manufacturers of certain types of prostheses, prototypes of medical robots, and some patient monitoring devices. Domestic developments are experimental and local in nature. The Russian market for medical devices is import-oriented, with most of the market comprised of products from foreign manufacturers.

In the medical equipment market in 2016, the volume of imports exceeded domestic production by 2601.5 times, and the trade balance was negative and amounted to 58,629,822 units of equipment.

The main producers of medical equipment are: JSC "CAMPO", JSC "Elatomsky Instrument Plant", LLC "Lensmaster", JSC "SIPX ELECTRON", JSC "Tambovmash", LLC "MZMO", JSC "Corporation ROSKHIMZASCHITA", "Company ELTA", LLC "SEVKAVRENTGEN-D", JSC "RENTGENPROM" and several other companies. In Russia today, there are about three thousand companies, mainly small and medium-sized, producing medical devices. In 2013, the output was 27.9 billion rubles. The largest volume of products was produced in the Central Federal District (36%), followed by the Volga (17%), North-West Federal District (14%) and Ural (12%).

The directions of their production are extensive: from consumables to bactericidal, laboratory, resuscitation and diagnostic equipment. Russian manufacturers are leading only in the sector of general hospital products: here their share in government purchases is 79% [13]. The result in dentistry is 35%, in radiology about 15%, surgery 5%, and in radiation therapy 1%. The largest share of the market and the dynamics of growth are in diagnostic equipment and products with a high degree of visualization: since 2004, the segments of equipment for mammography and nuclear medicine have grown sevenfold, angiography five times. At the same time, multiparametric diagnostic equipment is not produced in Russia.

4.2.1.4 *Using digital technology for healthcare*

National integrated electronic health records

In December 2013, a set of metadata elements of the Electronic Health Records (EHR) was approved [14], and in 2014 the first version of the integrated EHR (IEHR) was implemented in the EGISZ, which exists federally, but in accordance with the trend of storing depersonalized data at the federal level, the IEHR will really be used apparently only at the regional level. Moreover, starting from January 30, 2013, a new service, the Electronic Medical Documents Registry (EMDR), exists as a subsystem of EGISZ. It is targeted for storing primary electronic documents signed by a strengthened qualified electronic signature of the practitioner, and as for the federal level, only information about these documents (links in the regional segment) will be transferred to the EGISZ. A full set of standardized electronic medical documents for filling the EMDR has not yet been developed; the planned date for the creation of such a set in a full-fledged form is 2019.

Telemedicine consultations between healthcare providers, and between doctors and patients

The federal system of telemedicine consultations was established in 2016 through the secure data transfer network of the All-Russian Center for Disaster Medicine "Zashchita" and merged 21 FGBUs of various profiles, ensuring the organization of consultations from the regional level (regional state clinics), which in turn carry out advisory activities for regional medical organizations in the doctor-doctor mode. Doctor-patient consultation became possible after the adoption of a federal law that will take effect from 1.1.2018 [4]. The practical implementation of such consultation requires the development and approval of a number of bylaws by the Russian Ministry of Health, including determining the order of the processing of personal and medical data provided by the patient himself or his agent, as well as the procedure for their identification. A set of by-laws sufficient for doctor-patient interaction is planned to be developed by the beginning of 2019.

Availability of information systems for healthcare system management

Administrative management systems (accounting, personnel records, inventory management, pharmacy stocks and accounting of medical services) are used in all medical organizations, but the maturity of such systems is different, and the transition to cloud-based regional solutions in order to save resources and improve business processes is very slow despite the presence in the EGISZ of federal components: administrative and economic activities, the register of medical and pharmaceutical personnel, passports of medical organizations [8]. As an independent service, the Administrative and Economic Activity Support System was excluded from the federal subsystems in accordance with the Regulation on EGISZ [23]. Now the information that previously constituted the content of the system is included in the federal register of medical organizations.

Use of new/emerging digital technologies in the healthcare

Cloud computing is used in regional medical information systems, which are implemented in approximately 35% of the RF subjects in the form of a unified system, without localization at the MO level. The most effective of these solutions are applied in Tyumen, Chukotka, Moscow (EMIAS in the outpatient department). Mobile applications

(apart from several pilots), artificial intelligence system, and the internet of things have not been developed. Medical robotics is used locally on the basis of robots like da Vinci.

Analytical data processing in EGISZ is now very limited. Promising areas of research and practical application of innovative technologies are the development and implementation of decision support systems at various levels, primarily for the clinical systems of medical organizations, the creation of domestic prototypes and serial production of robotic equipment and its use for minimally invasive operations, the development and implementation of diagnostic complexes and new technological solutions for diagnosing diseases.

Currently, there are popular solutions, providing doctor appointment services, for example, docdoc.ru, which, according to RBC research [24], covers 53% of the market for doctor appointments via the internet. Specialized social media networks for doctors are in place (the largest – Doctor at work), as well as free services for health monitoring (e.g., ONDOC), and online pharmacies (Piluli.ru, Apteka.ru et al.). There are solutions for medical advice (for example, Yandex.Health). Online portals in the field of healthcare can get an additional impetus for development as a result of adoption of the Federal Law 242-FZ dated 29/07/2017 "On Amendments to Certain Legislative Acts of the Russian Federation on the use of information in health care technology."

Telemedicine services exports as a percentage of total exports of medical services

The Russian export of medical services in 2016 amounted to approximately 21 thousand patients [15], which is about 2.5-3 times less than imports, but this export does not take into account CIS citizens who receive many more medical services than Russians leaving for treatment abroad (these services are not included in official statistics). "Birth tourism" in the Russian Federation has become popular in recent years for the citizens of the CIS. In Moscow alone, every year the costs to state medical organizations of helping "unidentified" patients, i.e. foreigners who do not have a health insurance policy, reach about $100 million.

The amount of telemedicine services in the volume of medical exports is negligible and still at the level of individual marketing actions.

4.2.1.5 *Impact of digital technologies on healthcare*

Impact on access to healthcare services through the use of digital technology

Digital technology has a significant impact on the availability of medical services through the implementation of technologies and healthcare organizational processes:

- preliminary (remote) access to doctors and to medical procedures (organization of electronic queue);
- scheduling patients' flow to an outpatient clinic, to consulting and diagnostic centers, to hospitals;
- remote consultations (doctor-doctor and doctor-patient).

Impact on quality of healthcare through the use of digital technology

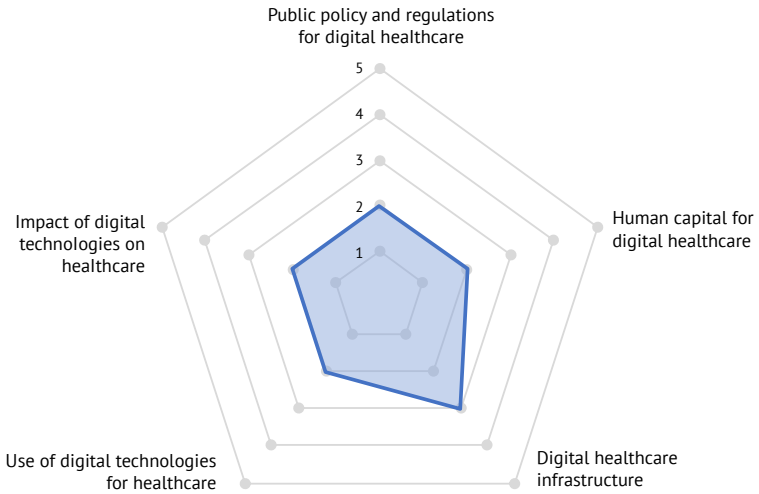
The use of medical information systems and IEMC allows for the on-line monitoring of the quality of the implementation of medical standards of care, clinical recommendations

and clinical protocols. The use of special algorithms for processing information about the services provided to the patient allows the most developed systems of territorial funds of compulsory medical insurance to analyze the quality of services provided, provide the necessary level of their provision, and control the costs of medical care. Such a project was implemented in 2017 in the largest territorial fund, Moscow.

Decision Support Systems (DSS) can improve the quality of medical services directly at the doctor's workplace. As examples, one can point to the introduction of several systems at the same time to solve the problem of drug interactions. A federal service with such functionality was developed in 2012 [16], a commercial service of a radar company with similar functions in 2014 [17], and in 2015 an international professional system for personalized screening of medicinal prescriptions Wolters Kluwer was introduced and available [18]. Mass implementation of DSS in the healthcare system is planned for 2020.

4.2.1.6 *Assessment of the current status and findings*

Indicators for the whole section is presented in the diagram below. Specific values are contained in the table in Annex 1.



In the development of digital healthcare, the Russian Federation is at the initial stages. Although healthcare data has to some extent been orchestrated in the country in the last 40-45 years, practical results on a mass rather than a focal scale have been realized only since 2008. The initial level of ICT use can be considered achieved, from the point of view of the creation of basic ICT infrastructure in most medical organizations and the creation of conditions for the transition from primary informatization to an integrated solution of the Concept of Development of the EGISZ in 2011, the goals and the creation of the starting conditions for the transition to digital healthcare. The conditions for creating the infrastructure of the digital healthcare stage and the transition to electronic medical document circulation based on the Electronic Health Records and creating for each citizen of the Russian Federation an integrated Electronic Health Records and the provision of a whole range of digital healthcare services [3] are created.

At the same time, to move on to the next, digital stage of maturity of development and the use of ICT in the national healthcare system with the maximum effects for achieving accessibility and quality of medical care, a significant transformation of the current EGISZ architecture will be required, which will significantly improve the accessibility and quality of care through use of digital health services in all orders and standards of medical care in the necessary and sufficient amount, which should ensure the effective use of the available resources of the health care system in the conditions of the existing resource deficit and in view of the growing demand for these resources through natural demographic processes related to the growth of the life expectancy of the population and a decrease in the proportion of the working-age population.

In general, the level of development of digital healthcare in the Russian Federation can be estimated as ***emerging***.

4.2.1.7 *References*

1. Продолжительность жизни при рождении по регионам России (ожидаемая) за 2014 год (Обн. 2016)963 URL: http://www.statdata.ru/spg_reg_rf
2. Государственная программа Российской Федерации «Развитие здравоохранения на 2013-2020 годы». Утверждена постановлением Правительства Российской Федерации от 15.04.2014 г. № 294 (в ред. от 07.05.2017 г. № 539)
3. Федеральный закон от 21.11.2011 г. № 323-ФЗ «Об основах охраны здоровья граждан в Российской Федерации» (с изменениями и дополнениями)
4. Федеральный закон от 29.07.2017 г. № 242-ФЗ «О внесении изменений в отдельные законодательные акты Российской Федерации по вопросам применения информационных технологий в сфере охраны здоровья»
5. Россия заняла последнее место в рейтинге эффективности здравоохранения URL: https://ria.ru/society/20160929/1478148746.html
6. Концепция создания единой государственной информационной системы в сфере здравоохранения (утверждена Приказом Минздравсоцразвития России от 28.04.2011 г. № 364)
7. Справочник «Номенклатура лабораторных и клинических исследований (LOINC)» URL: http://loinc.org/
8. Системный проект Единой государственной информационной системы в сфере здравоохранения. 2013 URL: http://portal.egisz.rosminzdrav.ru/materials
9. Приказ Минобрнауки России от 12.09.2016 N 1168 «Об утверждении федерального государственного образовательного стандарта высшего образования по специальности 30.05.03 Медицинская кибернетика (уровень специалитета)» (Зарегистрировано в Минюсте России 26.09.2016 № 43814) URL: http://www.consultant.ru/document/cons_doc_LAW_205378/
10. Единая медицинская информационно-аналитическая система(ЕМИАС) URL: http://zdrav.expert/index.php/Продукт:Единая_медицинская_информационноаналитическая_система_(ЕМИАС)
11. Росстат. Данные ГМЦ за 2015 г.

12. [Поручения Президента Российской Федерации – Пр-2346, п.3 http://kremlin.ru/acts/assignments/orders/53425].
13. Медицина бессильна, Эксперт, Москва, 07.07.2017 URL: http://expert.ru/ural/2014/26/meditsina-bessilna/
14. Основные разделы электронной медицинской карты» (утв. Минздравом России 11.11.2013 № 18-1/1010) URL: http://www.consultant.ru/document/cons_doc_LAW_154815/
15. Российский постиндустриальный экспорт: вызовы и перспективы. Докл. к XVIII Апр. междунар. науч. конф. по проблемам развития экономики и общества, Москва, 11–14 апр. 2017 г. / рук. авт. кол. Н. В. Акиндинова, Л. И. Якобсон; НИУ «Высшая школа экономики». — М.: Изд. дом Высшей школы экономики, 2017. — 41, [3] с.
16. Государственный онлайновый сервис «Взаимодействие лекарственных средств» URL: https://www.pharmvestnik.ru/publs/lenta/v-rossii/minzdrav-rossii-zapuskaet-servis-vzaimodejstvie-lekarstvennyx-sredstv.html#.WZnzkdOLRE4
17. Коммерческий онлайновый сервис «Взаимодействие лекарственных средств» URL: https://www.rlsnet.ru/help_pheq.htm
18. Международная профессиональная система персонифицированного скрининга лекарственных назначений URL: http://www.wolters-kluwer.ru
19. Приказ Минздрава России от 30 ноября 2017 г. № 965н, Об утверждении порядка организации и оказания медицинской помощи с применением телемедицинских технологий.
20. Приказ Минздрава России от 9 января 2018 г. № 2н, «О внесении изменений в Приказ Министерства здравоохранения Российской Федерации от 15 декабря 2014 г. № 834н «Об утверждении унифицированных форм медицинской документации, использующихся в медицинских организациях, оказывающих медицинскую помощь в амбулаторных условия, и порядков по их заполнению»
21. Постановление Правительства РФ от 12 апреля 2018 г. № 447 “Об утверждении Правил взаимодействия иных информационных систем, предназначенных для сбора, хранения, обработки и предоставления информации, касающейся деятельности медицинских организаций и предоставляемых ими услуг, с информационными системами в сфере здравоохранения и медицинскими организациями”
22. Постановление Правительства Российской Федерации от 26 декабря 2017 г. № 1640 «Об утверждении государственной программы Российской Федерации «Развитие здравоохранения»
23. Постановление Правительства РФ №555 от 05.05.2018 «О единой государственной информационной системе в сфере здравоохранения».
24. http://publication.pravo.gov.ru/Document/View/0001201805070034
25. Онлайн-портал DocDoc.ru занимает лидирующие позиции на московском рынке онлайн-записи к врачам URL: https://marketing.rbc.ru/articles/196/

4.2.2 Digital education

The intensive development of digital technologies and their penetration into all spheres of life poses challenges for the education system to create a flexible digital learning environment. Today, the usual understanding of the learning process and all its components

is subjected to digital transformation, including educational materials, competencies of teachers, and educational methods and content. Digital technology creates conditions for the development of the education system through remote work and training opportunities for inclusive education, removing territorial and material barriers to access to quality education services. Extracting the advantages of using digital technologies in education should be supported by a developed digital infrastructure, normative legal and scientific and methodological base.

4.2.2.1 *Public policy and regulation for digital education*

Strategic objectives and indicators of the digital education development

Educational issues are a priority in the formation of strategic public policy objectives [1]. The existing legal and regulatory framework is insufficient for the development of digital education, although all experts are unanimous on the need to develop and adopt a state policy in the field of digital education. [2] There is no separate development strategy for digital education in the Russian Federation.

Action plan for the digital education development

Since the mid-1990s, Russia has been implementing state programs aimed at creating separate elements of the ICT infrastructure for the education and use of ICT for education. Currently, the state program "Development of Education for 2013-2020" is underway [3]. Several projects have been implemented aimed at use of ICT by the educational institutions at all levels, at creating digital educational content and developing relevant web resources.

Council for Strategic Development and Priority Projects was established under the President of the Russian Federation [4] to ensure the interaction of public authorities of all levels, local self-government bodies, public associations, scientific and other organizations when considering issues related to the strategic development of the Russian Federation and the implementation of priority projects. The Council defines a list of the main areas of strategic development, within which such priority projects and programs are developed and implemented. The following priority projects are included in this list in the field of education: "Modern educational environment"; "Modern digital educational environment in the Russian Federation"; "Training of highly qualified specialists and workers with regard to modern standards and advanced technologies", "Universities as innovation centers", "Additional education for each child". The "Digital School" project is at the final stage of its development.

In accordance with Federal Law No. 273-FZ of December 29, 2012 (as amended on 07.03.2018) "On Education in the Russian Federation" (Article 98 "Information Systems in the Education System" [19] several state information systems are being created, formed and maintained for the purpose of information management in the education system and state regulation of educational activities in the Russian Federation. These systems are maintained in accordance with common organizational, methodological, software and technical principles, which ensures the compatibility and interaction of with other state information systems and information and telecommunications networks.

A rating of regional information systems in sphere of general education was made up within the framework of the project "Development and maintenance of a single information system for collecting quality and accessibility indicators of general education in

the Russian Federation". The purpose information systems mentioned is to provide the support, of management decisions in the field of managing the quality and accessibility of educational services" [14].

E-learning platforms are implemented using various learning management systems (LMS, Learning Management System). The products of SabaSoftware, Docent, WBT Systems, Click2Learn and IBM are traditionally considered to be most popular foreign LMS systems. The domestic market offers the "Прометей", "REDCLASS", "ГиперМетод" и "NauLearning".

One of the leading domestic IT companies in the field of educational technologies is "Dnevnik.ru" [5]. This company has developed several solutions for creating a single electronic educational environment for teachers, students and their parents, administrations of educational organizations, as well as representatives of executive authorities. It developed a multipurpose automated information system "Contingent-Region" for the collection and management of data on students in the framework of preschool, primary, secondary and higher education in the Russian Federation.

Harmonization with international standards, normative and reference information necessary for the development of digital education

Since 2004, the Technical Committee for Standardization TK-461 "Information and Communication Technologies in Education" has been operating in the Russian Federation [6]. A set of national standards has been created, harmonized with the set of international standards "Standardization of Information Technologies in Education, Education and Training (IT LET)". Among them are the main provisions and terminology, processes and technologies of e-learning, information systems, educational technology, adaptability and accessibility of e-learning, electronic educational resources, and quality management. The level of activity in the activities of this committee is currently unacceptably low.

Mandatory requirements for interoperability of information systems in education

The requirements for the use of ICT in education are contained in a series of national standards that characterize: federal educational Internet portals, electronic educational resources, electronic educational and methodological complexes, and metadata of electronic educational resources [7]. For the compatibility of e-course modules and their subsequent use in various e-learning environments in the Russian Federation, the requirements of a set of specifications and standards for distance learning systems (SCORM) are widely applied [8].

In addition, in recent years, the creation of federal and regional information systems for education (such as AIS Contingent, AIS Experts) has been accompanied by the development of unified functional and technical requirements that are mandatory for use to ensure interoperability of the newly created regional segments of public systems [9].

4.2.2.2 *Human capital for digital education*

Inclusion of digital competencies in the qualification requirements for educators

Competence requirements for the use of information and communication technologies are contained in professional standards for teachers. Professional standards in the field of education were among the first approved by the Ministry of Labor and Social Protection of the Russian Federation [9]. At the same time, experts note the gulf between

requirements provided for by professional standards, and the competencies necessary for the development of digital education. Digital technologies in education are developing much faster than professional and educational standards.

Teacher training and retraining in the use of digital technologies

A system of training and retraining of teachers in the field of ICT has been created in all regions of the Russian Federation. The development of digital education requires the training of new specialists who will be able to develop and manage the educational program, the learning process, and interaction with students and teachers using digital technologies. Training of personnel in the necessary digital education is currently being carried out on the insufficient scale.

The developers of the "Atlas of New Professions 2.0" [10] singled out education as one of the areas that require significant transformation, which leads to the emergence of new professions.

In the action plan for the direction "Human Resources and Education" of the Russian Digital Economy Program [11], a number of measures are envisaged to expand the competences and qualifications of teachers and educators in the use of digital technologies.

Proportion of teachers with ICT skills in schools

In general, teacher ICT skills for working with documents and libraries of digital (electronic) educational resources is at a high level. According to experts, however, most teachers have ICT skills at a level insufficient for using digital technologies in the educational process. A comparative analysis of Russian curricula for teachers in accordance with the UNESCO framework recommendations on ICT competence of teachers showed that only individual courses meet these requirements, but even these courses are not of a mass nature [12].

4.2.2.3 *Digital education infrastructure*

Proportion of secondary educational institutions with broadband

The digital divide between educational institutions in the Russian Federation in terms of Internet access and use of ICT is almost overcome. Educational institutions have been equipped with computer classes and access to the Internet as part of the "Education" priority national project. Most educational institutions have free wireless Internet access, but in some cases, there may be restrictions on users or available services. Since 2009, the access of schools to the Internet has been entrusted to the regional government bodies.

Proportion of higher education institutions with free broadband wireless internet access

In the educational section of the Digital Economy program [11], it is stipulated that the share of educational organizations that have free broadband wireless Internet access on campuses will reach 100% by 2020.

Number of students per computer used for educational purposes

According to data as of the end of 2015 [13], the number of personal computers used for training purposes per 100 students in educational organizations of Russia was 24.3 in higher education, 17.6 in secondary vocational education and 13, 2 – in schools.

Mandatory use of national databases in education

In education, there are several federal registers [14] including: FIS of the unified state examination (USE) and admission; a federal register of certificates of USE results; a consolidated register of licenses for the conduct of educational activities; a register of accredited educational organizations; a federal register of education and (or) qualification documents, training documents, a database for verifying educational certification (Apostille), and a database of quality evaluations of education.

Digital library of educational resources for different levels of education

Since 2002, the system of federal educational portals has been developing in the Russian Federation [15], which includes digital libraries for different areas of knowledge and levels of education for secondary, professional and higher education.

Digital learning platform

A special place in digital education is occupied by platforms that support the educational process and educational activities. The first online digital platform in the Russian Federation with national status is "Intuit" [16].

In 2015, with the support of the Ministry of Education and Science of the Russian Federation, the "Open Education" online educational platform was created by the association "National Platform for Open Education", established by leading universities (MSU, SPbPU, SPbSU, NITU MISIS, HSE, MFTI, Ural Federal University and ITMO) [17], offering online courses on basic subjects taught in Russian universities. For general secondary and secondary vocational education there are no such educational platforms.

Along with this, several popular non-state digital educational platforms operate in the Russian Federation: Lektorium (www.lektorium.tv), Universarium (universarium.org), Uniweb (uniweb.ru), etc. Overview "Educational Portals and Open Educational Resources in Russia" was published by the UNESCO Institute for Information Technologies in Education in 2012 [18].

The leading Russian universities also are represented on the global educational platforms Coursera and EDX.

Percentage of educational institutions with a website

The Federal Law "On Education in the Russian Federation" [19] requires that any educational organization has a website, i.a. for publishing public open data. By 2015, 100% of educational institutions at all levels of education already had websites [20].

4.2.2.4 *Use of digital technologies in education*

Proliferation of digital teaching methods

Digital technology in education can significantly improve development and delivery of educational content, but the multiplier effect of the penetration of digital technologies will be achieved through the dissemination of new teaching methods (gamification, inverted classroom, project learning). The application of new pedagogical methods in most Russian educational institutions takes place in separate disciplines thanks to enthusiastic teachers. The wide dissemination of new pedagogical methods begins with curricula of educational programs, which are so far being created in the classroom or lecture-seminar system.

Use of digital technologies in the exams and certification

The use of digital technologies for conducting certification activities is regulated by the normative documents of universities. Computer testing programs, as well as programs for checking the originality of the individual work of the listeners (anti-plagiarism system), have become widespread. Expert assessments point to a lack of dissemination of digital technologies in examinations.

Proportion of educational institutions providing distance learning services

Despite the increased needs of society for remote educational services, the share of the budget of educational institutions available for online education is very low. In the market for online education, a significant share is occupied by private companies and educational start-ups: for example, 82% of students undertaking higher education programs (bachelor's and master's programs) via e-learning attend private universities [21].

The online education segment [21] has the following shares in the Russian market: 2.7% additional school education, 1.8% higher education, 0.4% secondary vocational education, and 6.7% additional vocational education.

Proportion of students in higher education programs mastering at least 50% of the content in a massive open online course (MOOC) format

The implementation of higher education programs is regulated by a set of normative documents. In some universities, the results of training in mass open online courses (MOOC) can be counted (in credit units) towards the fulfillment of the curriculum by the student in some disciplines. However, the number of MOOCs offered by Russian universities is less than 250 [17]. Legislative and educational-methodological limitations do not allow students to master any significant part of the higher education program in MOOC format.

Proportion of educational organizations in which paperwork is done electronically

Information technologies are widely used for administrative tasks of educational institutions. 69% of universities use electronic document circulation [14]. Higher education institutions, as a rule, use a set of information systems, including electronic document management systems, personnel records, etc. On the basis of the information infrastructure created by universities, various online services such as an electronic statement and an electronic record book are developed and provided to students and teachers.

Digital services at the level of secondary education (electronic diary, journal) are widely used by schools, and their application and development are regulated at the level of the subject of the Russian Federation. The fears of experts are that many online services are provided by private companies that collect and store large amounts of personal data of students and teachers.

Use of new/emerging digital technologies for education

New digital technologies are gradually coming into education. Data analysis is widely used for monitoring the performance of listeners. Distribution of additive technologies and robotics is supported by the Association of Educational 3D (http://3dobrazovanie.ru/) and the All-Russian educational-methodical center of robotics (http://fgos-igra.rf). Blockchain and artificial intelligence technologies are considered by the Russian

educational community as the most promising areas in which only the first steps have been taken.

The use of emerging digital technologies in education is actively supported by the Agency of Strategic Initiatives, including through the creation in 2017 of the National University Technology Initiative, where the priority will be artificial intelligence [22].

Highly developed platforms for tutoring, for example, repetitors.info. There is a federal educational portal http://www.edu.ru/ and private projects in this area, for instance http://edu-inform.ru, http://arzamas.academy/ and others. There are aggregators of training courses, such as http://www.eclass.cc. In recent years, a lot of resources appeared popularizing science and including e-learning courses, as for example postnauka.ru. The authors (teachers) can post their rates on such portals as http://www.intuit.ru (National Open University).

Share of exports of distance digital educational services in total distance educational services

The global online education market shows high growth rates [17] over the past few years. 70% of students of Russian universities through international MOOC platforms are foreigners. For example, the total number of online students of the Higher School of Economics on the Coursera educational platform reached 1 million [23].

4.2.2.5 *Impact of digital technologies on education*

Impact of the use of digital technologies in the availability of educational services

The use of digital technology removes territorial, temporal and physical barriers, increasing access to education at all levels. The use of digital technologies in education is of special importance for people with disabilities. There are opportunities to improve the quality of home education and inclusive education.

Impact of the use of digital technologies on the quality of educational services

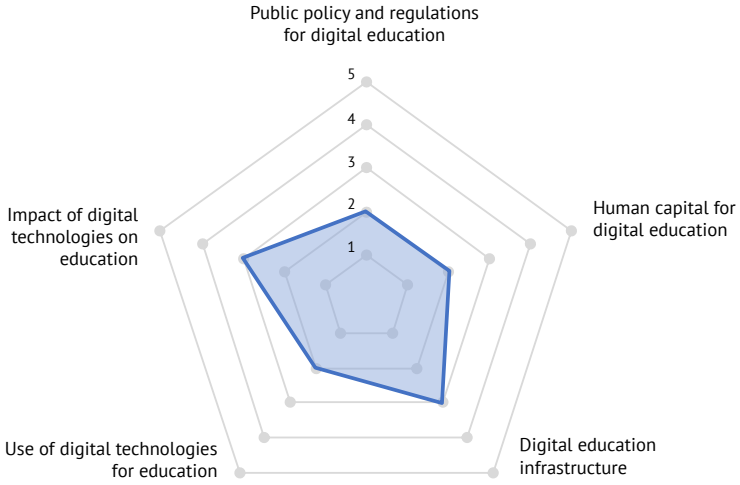
Using digital technology has a positive impact on the quality of educational services, giving access to digital educational materials used in the teaching process (interactive tutorials, simulations, simulators, etc.) and expanding the arsenal of teaching methods (inverted class, gamification, project work, etc.). The use of data analysis in monitoring student progress enables the recording of all kinds of student work (study material, a task, etc.). The collection of digital educational factors leads to increased motivation of students and teachers in the learning process, as well as improving the quality of the educational services.

Impact of digital technologies on students' opportunity to choose personalized routes of development of key competencies

At present, students can fully shape the individual trajectory of their additional education, including using MOOCs. However, within the framework of educational programs of higher or secondary vocational education, restrictions arise from the requirements of federal standards and approved curricula for the relevant programs.

4.2.2.6 *Assessment of the current status and findings*

Indicators for the whole section are presented in the diagram below. Specific values are contained in the table in Annex 1.



Digital transformation of the education sector in Russia is happening gradually with the formation of an appropriate regulatory and legal and scientific-methodological framework. At the moment, the necessary infrastructure of digital education has been created, characterized by a deep penetration of ICT into educational institutions of all levels. In the initial stage of implementation, there are a number of priority projects aimed at training pedagogical and administrative personnel for digital education, creating new educational materials and educational programs.

In general, the level of digital healthcare development in the Russian Federation can be assessed as ***moderate***.

4.2.2.7 *References*

1. Стратегия развития информационного общества в Российской Федерации на 2017-2030 годы. Утверждена Указом Президента Российской Федерации № 203 от 9 мая 2017 г. URL: http://kremlin.ru/acts/bank/41919
2. Стенограмма заседания Экспертного совета по информационным технологиям в сфере образования и науки Комитета Государственной Думы по образованию и науке. Здание Государственной думы. Зал 1444. 25 мая 2017г., в 10.00, Здание Государственной думы. Зал 1444.
3. Постановление Правительства РФ от 15.04.2014 № 295 (ред. от 31.03.2017) «Об утверждении государственной программы Российской Федерации «Развитие образования» на 2013 – 2020 годы» (в ред. от 31 марта 2017 г.) URL: http://programs.gov.ru/Portal/programs/passport/2
4. Федеральный проектный офис (Президиум Совета при Президенте Российской Федерации по стратегическому развитию и приоритетным проектам) URL: http://government.ru/department/361/events/ URL: https://dnevnik.ru

5. Технический комитет по стандартизации ТК-461 «Информационно-коммуникационные технологии в образовании» URL: http://tk461.stankin.ru/

6. ГОСТ Р 52657-2006 Информационно-коммуникационные технологии в образовании. Образовательные интернет-порталы федерального уровня. Рубрикация информационных ресурсов; ГОСТ Р 53620-2009 Информационно-коммуникационные технологии в образовании. Электронные образовательные ресурсы. Общие положения; ГОСТ Р 55751-2013 Информационно-коммуникационные технологии в образовании. Электронные учебно-методические комплексы. Требования и характеристики; ГОСТ Р 55750-2013 Информационно-коммуникационные технологии в образовании. Метаданные электронных образовательных ресурсов. Общие положения. URL: http://gost.ru/

7. The SCORM (Sharable Content Object Reference Model) URL: http://www.adlnet.gov/adl-research/scorm

8. Унифицированные функционально-технические требования к региональному сегменту единой федеральной межведомственной системы учета контингента обучающихся по основным образовательным программам и дополнительным общеобразовательным программам URL: http://контингент.дети/sites/default/files/materials/utverzhdennyie-uftt.pdf

9. Атлас новых профессий 2.0. – М.: Агентство стратегических инициатив, Московская школа управления СКОЛКОВО, 2014. – 288 с. URL: https://asi.ru/reports/34983/, http://atlas100.ru/

10. Программа «Цифровая экономика Российской Федерации» URL: http://government.ru/rugovclassifier/614/events/

11. Сравнительный анализ учебных программ для педагогических работников Российской Федерации на соответствие рамочным рекомендациям ЮНЕСКО по структуре ИКТ компетентности учителей (UNESCO ICT-CFT). – М.: ИИТО ЮНЕСКО, 2013. – 107 с. URL: http://iite.unesco.org/pics/publications/ru/files/3214731.pdf

12. Индикаторы науки: 2017: Статистический сборник / Ю.Л. Войнилов, Н.В. Городникова, Л.М. Гохберг и др.; НИУ «Высшая школа экономики». – М.: НИУ ВШЭ, 2017. – 304 с. URL: https://www.hse.ru/primarydata/in2017

13. Российское образование. Рейтинг субъектов Российской Федерации по уровню автоматизации образовательной деятельности URL: http://www.edu.ru/map/technology

14. Российское образование URL: http://www.edu.ru/

15. Национальный открытый университет «Интуит» URL: http://www.intuit.ru/

16. Национальная платформа открытого образования «Открытое образование» URL: http://npoed.ru/

17. Alexey Sigalov, and Alexey Skuratov. Educational Portals and Open Educational Resources. – M.: UNESCO IITE, 2012. – 84 p. URL: http://iite.unesco.org/publications/3214704/

18. Федеральный закон от 29.12.2012 № 273-ФЗ (ред. от 01.05.2017) «Об образовании в Российской Федерации»

19. Статистическая информация 2016. Высшее образование. Министерство образования и науки Российской Федерации. URL: http://минобнауки.рф/министерство/статистика/информация-2016/во-2016

20. Исследование российского рынка онлайн-образования и образовательных технологий, 2017. – 154 с. URL: http://edumarket.digital

21. Агентство стратегических инициатив. Образовательные проекты URL: http://asi.ru/projects/

22. 1 миллион слушателей записались на онлайн-курсы ВШЭ на Coursera // НИУ «Высшая школа экономики» (17.05.2017) URL: https://www.hse.ru/news/206022527.html

4.2.3 Digital culture

The development of digital technology has led to ease of replication of cultural works, with no detriment to their media (paper, film, gramophone records). As a consequence, the population is under more intense pressure from a variety of attitudes from popular movies, music, literature and visual arts. Under such conditions, the state's efforts to reduce the barriers to access to the national culture are understandable. Along with progress in informatization of cultural institutions and the digitization of cultural heritage, attention is focused on the dissemination of culture, in which copyright law plays an important role. It is the search for new business models and ways of interaction of the digital economy with rights holders that promises qualitative progress in the development of digital culture in the Russian Federation.

4.2.3.1 Public policy and regulation for digital culture

Strategic objectives and indicators of the digital culture development

Strategies for state cultural policy until 2030 [1], the development of the information society (for 2017-2030) [2], and the strategy for the development of culture in individual subjects of the Russian Federation were adopted. The strategies envisage an increase in the representation of the national culture on the Internet, the improvement of the quality of materials, the digitization of works, and explicitly mention current threats.

The dissemination of works, however, is confronted with copyright issues on the Internet [3], without the solution of which it is difficult to talk about a comprehensive policy in the field of digital culture [4]. But these issues are not mentioned in the documents.

Action plan for the digital culture development

At the state level, the program documents [5] and [6] have been adopted, which allow implementing a number of programs in the field of culture and, in particular, digital culture. The objectives of these programs relate to the culture as a whole, and the "digital" part is a means of achieving common goals by increasing the informatization of cultural institutions, upgrading data transmission networks, providing services electronically, digitizing cultural heritage and preparing electronic catalogs.

The analysis of state activity in the field of digital culture shows insufficient elaboration of the issues of distribution of works (cinema, music, literature, museum exhibits and archival holdings) in digital form.

Harmonization with international standards, normative and reference information necessary for the digital culture development

Filling of information systems in the field of culture with digital content and informatization of cultural institutions is carried out in accordance with international standards:

in the field of archival, library, museum business, relevant documents are in effect. However, there are no standards for the transfer and reproduction of some emerging forms of representation of works of culture, or the dissemination and popularization of already digitized arrays.

Mandatory requirements for interoperability of information systems

The state and the private sector have created a significant number of information systems in the cultural sphere, but it is not yet possible to talk about standards of interoperability. The Ministry of Culture of the Russian Federation put into operation in 2016 the Unified Integration Platform (Order No. 643 of March 21, 2016), which collects data from departmental systems and prepares them for publication, but automatic data exchange and their use by already developed systems has not yet been observed. At the same time, the information system "Unified Information Space in the Sphere of Culture" [7] was put into commercial operation (Order No. 637 of March 21, 2013), which provides interaction with external sites. Even there, however, the primary information is entered manually.

4.2.3.2 *Human capital for digital culture*

Inclusion of digital competencies in the qualification requirements for employees of cultural institutions

Digital competencies are included in the qualification requirements of employees who are directly faced with information technology (librarians, archivists, operators, etc.). In practice, there are difficulties in confirming the level of ownership of software packages (office applications, corporate portals, customer relationship management systems) for the administrative staff of cultural institutions.

Training and retraining in use of digital technology

To meet current requirements, leading universities in the field of culture are adapting the curriculum of existing specialties and offering new ones. Employees of cultural institutions run training courses, including on the use of ICT in culture. However, the level of use of digital technologies in education programs is inadequate.

4.2.3.3 *Digital culture infrastructure*

Proportion of cultural institutions with access to the Internet

As of 2016, 70% of libraries, 84% of museums, and 99% of theaters have access to the Internet (according to the calculation of [8]). The availability of a cultural heritage is more strongly influenced by the availability of online information about institutions, electronic catalogs and digital copies than the access of institutions to the Internet.

Proportion of cultural institutions with broadband access

Public information on this subject is quite scarce and does not detail the types of cultural institutions.In 2014, Rosstat reported that 68% of "recreation and entertainment, culture and sports" organizations had broadband access, with 79% of organizations connected to the Internet [9, p. 323-325]. In 2017, HSE reported on broadband access (its own calculations according to the Federal State Statistics Service) in the following categories:

“Libraries, archives, club-type institutions” (2014 – 36%, 2015 – 33%) and “Museums and protection of historical places and buildings “(2014 – 53%, 2015 – 46%) [10].

Mandatory use of national databases in cultural institutions

In virtually every segment of culture (museums, libraries, archives, music, film) there are common information systems (data registers). The procedure for using these registers are defined. This also applies to private institutions (eg, film studios), which define the procedure for depositing.

Digital platforms in culture

Digital platforms covering the sphere of culture are highly fragmented. There is a publishing platform, ticketing platform for events, and entertainment content distribution platform.

Share of cultural institutions having a website

As of 2016, 15% of libraries, 76% of museums, and 98% of theaters (calculation according to [8]) have websites. Web sites of cultural institutions are an important source of information about their activities for the public.

4.2.3.4 *Use of digital technologies in culture*

Proportion of cultural holdings with an electronic catalog

23% of library collections and 45% of museum funds (calculation according to the data from [8]) have electronic catalogs. Among archives, electronic catalogs already cover 43 million items (out of more than 500 million) [11].

Proportion of electronic catalogs accessible via the Internet

Electronic catalogs available through the Internet cover 19% of library holdings and 6% of museum catalogs (calculation according to [8]).

Proportion of digitized collections available via the Internet

In 2016, according to the Ministry of Culture [8] of 13 million digitized museum objects (of a total of 89 million) about 2 million are available over the Internet, or a little more than 2% of the total. Of 7.3 million electronic documents prepared by the libraries of all departments of Russia, 4.8 million are available via the Internet (66% of digitized holdings). Every year, about 150,000 units of archival storage are digitized, but only a small part of this is available through the Internet. By way of comparison, the European project offers access to approximately one third of the works from the electronic catalog, while Russian museums offer access only to 5% of the electronic catalog [12, 13].

Number of museums with virtual exhibitions

The number of virtual exhibitions is estimated according to the corresponding section of the portal culture.rf. In 2015, virtual museums numbered 115 (of 2758 total museums), and in 2016, 247 (with a total number of 2593). A fair estimate of the proportion of museums with virtual exhibitions is 9-10%. However, in the context of access to masterpieces of art, this indicator corresponds to worldwide practice.

Use of new/emerging technologies for the digital culture development

The largest cultural institutions comply with international peers on the use of new technology. Emerging technologies are very limited: the demand for them in the sphere of culture is limited to the number of tasks that can not be solved in any other way.

Additive technology is used in the preparation of museum exhibits (for example, models of buildings, as at Moscow Museum [14]).

Analysis of large data sets is used by sites for the distribution of works via the Internet (for example, online recommendations, analyzing users) [15].

The use of artificial intelligence technologies in culture is not widespread: instead, there are experiments to create programs that can generate music and poems (for example, the development of Yandex [16, 17]).

The Internet of Things helps organize routes for museum visitors. For example, the Multimedia Art Museum tracks the location of visitors with sensors that provide information about exhibits via a mobile application [18]. Robotics in the form of robotic cameras is used by museums as part of video surveillance systems, data storage systems and restoration work [19].

Experiments with distributed registry (blockchain) technology are just beginning: in culture they are associated with trying to establish accounting and royalties for authors (for example, the golos.io site [20]).

The greatest opportunities for using the emerging digital technologies are in the private sector, where technologies are used both in the creation and dissemination of works of culture.

4.2.3.5 *Impact of digital technologies on culture*

Impact of the use of digital technologies on the availability of cultural services

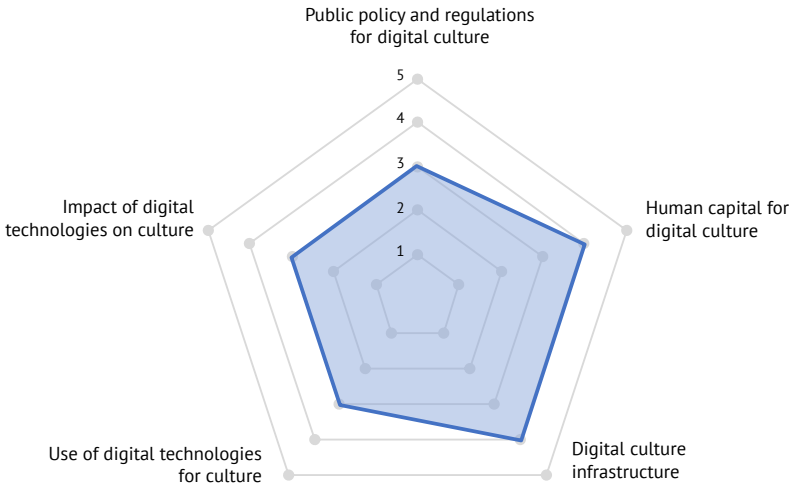
Digital technologies will certainly facilitate access to cultural materials through the removal of geographical barriers, a variety of channels and forms of content delivery, digital copies that allow access to rare editions without damage to the original, and convenience in planning visits or attendance at performances. However, a substantial proportion of the cultural heritage is still not represented in digital form.

Impact of the use of digital technologies on quality of cultural services

The quality of services provided with the use of digital technologies are broadly in line with international standards. Information portals allow you to measure the consumption of content, which contributes to targeted delivery, and the population gains convenient tools for planning cultural leisure. However, not all cultural institutions can make full use of digital technology due to limited funding. Significant success in improving the quality of services was achieved in those areas where there is an agreement on the sharing of income between the private and public sectors (cinema, music, literature). Such an arrangement facilitates the development of services for accessing and navigating through works, building a chain of service delivery.

4.2.3.6 *Assessment of the current status and findings*

Section indices in general are presented in the diagram below. Specific values are contained in the table in Annex 1.



In Russia, much has been done to develop digital culture: a number of important documents have been adopted, in practice programs for informatization of cultural institutions are implemented, and databases and formats of interaction are defined.

Significant problems are observed in the distribution of works: not all digitized works are available for viewing in the network, and the digital platforms in the field of culture are poorly developed. One of the factors hindering the active dissemination is the ongoing conflict between rights holders and representatives of the IT industry.

In general, the level of development of digital culture in the Russian Federation can be assessed as ***moderate***.

4.2.3.7 *References*

1. Стратегия государственной культурной политики на период до 2030 года утверждена распоряжением правительства от 29.02.2016 № 326-р URL: https://www.mkrf.ru/upload/mkrf/mkdocs2016/09_03_2016_01.pdf
2. Стратегия развития информационного общества в Российской Федерации на 2017-2030 годы. Утверждена Указом Президента Российской Федерации № 203 от 9 мая 2017 г. URL: http://kremlin.ru/acts/bank/41919
3. Общественное достояние. Как открыть доступ к культуре и знаниям / Сборник. Под ред. И. Засурского и В. Харитонова. — М., Екатеринбург: Ассоциация интернет-издателей, «Кабинетный учёный». — 240 с. URL: http://nauchkor.ru/pubs/obschestvennoe-dostoyanie-57ebeef25f1be739f5729bdb
4. Цифровое будущее культуры: измерения и прогнозы / Анатолий Николаевич Козырев [и др.]. — [б. м.]: Издательские решения. – 2016. — 350 с. URL: http://spz.socionet.ru/~nevolin/files/2016-Kozyrev-et-al.pdf
5. Государственная программа «Информационное общество (2011–2020 годы)». Утверждена Постановлением Правительства Российской Федерации от 15.04.2014 № 313 «Об утверждении государственной программы Российской Федерации «Информационное общество (2011 – 2020 годы)» (в редакции от 21.02.2015 №

157, от 17.06.2015 № 602, от 21.10.2016 № 1083, от 17.02.2017 № 203, от 03.03.2017 № 256, от 31.03.2017 № 380) URL: http://government.ru/programs/218/events/

6. Государственная программа Российской Федерации «Развитие культуры и туризма на 2013 – 2020 годы». Утверждена Постановлением Правительства РФ от 15 апреля 2014 г. № 317 (в редакции от 20 июля 2017 г. № 852) URL: http://programs.gov.ru/Portal/programs/passport/11

7. АИС «Единое информационное пространство в сфере культуры» URL: https://all.culture.ru/intro#events

8. Статистические данные по видам учреждений культуры, искусства и образования за 2016 год URL: http://mkrf.ru/deyatelnost/statistics/statdata/

9. Россия в цифрах. 2016 / Крат.стат.сб. М.: Росстат. – 2016. – 543 с. URL: http://www.gks.ru/free_doc/doc_2016/rusfig/rus16.pdf

10. Индикаторы цифровой экономики: 2017: статистический сборник / Г.И. Абдрахманова, Л.М. Гохберг, М.А. Кевеш и др.; НИУ «Высшая школа экономики». – М.: НИУ ВШЭ, 2017. – 320 с. URL: https://www.hse.ru/data/2017/08/03/1173504122/ICE2017.pdf

11. Доклад «Об итогах работы Федерального архивного агентства в 2016 году, задачах на 2017 год и среднесрочную перспективу». URL: http://archives.ru/sites/default/files/2017-doklad-itog.pdf

12. New Frontiers. Europeana Annual Report 2014 URL: http://pro.europeana.eu/files/Europeana_Professional/Publications/New%20Frontiers%20Annual%20Report%202014.pdf

13. Sharing the Beautiful Thing. Europeana Annual Report & Accounts 2015 URL: http://pro.europeana.eu/files/Europeana_Professional/Publications/europeana-annual-report-accounts-2015.pdf

14. Музей Москвы демонстрирует 3D-модели утраченных зданий Китай-города URL: http://tvkultura.ru/article/show/article_id/158117/

15. Как работает онлайн-кинотеатр? URL: https://www.popmech.ru/technologies/350602-kak-rabotaet-onlayn-kinoteatr/

16. Искусственный разум «Яндекса» записал альбом в стиле «Нирваны» URL: https://ria.ru/science/20170627/1497349203.html

17. «Яндекс» создал искусственный интеллект, пишущий музыку URL: https://ria.ru/science/20170530/1495389859.html

18. Музей в телефоне URL: https://www.gazeta.ru/culture/2015/04/29/a_6660565.shtml

19. Panasonic business: Новые технологии для культуры и искусства. URL: http://b2b.panasonic.ru/html/pdf/Culture&Art_Broch_2016.pdf

20. Голос: Русскоязычная Социально-медийная Блокчейн-платформа URL: https://golos.io/ru—golos/@golos/golos-russkoyazychnaya-socialno-mediinaya-blokchein-platforma

5. The digital transformation of the private sector

5.1 National policy and regulations of digital transformation of the private sector

The Russian Government plays an important role of a regulator, which removes barriers to the digital economy development and creates an incentive for digital business transformation.

5.1.1 Strategic goals and programs for digital transformation of the private sector

Strategic goals and indicators for digital transformation of private sector

The strategic goals of the development of digital business are defined in the Strategy for the Development of the Information Society of the Russian Federation, approved by the President of the Russian Federation in May 2017 [1]. Out of five priorities of the Strategy, two are directly connected with the digital transformation of business:

- creation of a new technological basis for development of economy and social sphere;
- ensuring national interests in the field of digital economy.

Included among the national interests are: creation of new markets based on use of ICT based on the development of Russia's digital economy ecosystem; strengthening of economic sectors in which the business development based on digital technologies will provide a competitive advantage to the Russian organizations; increase due to the use of new technologies of non-commodity volume of Russian exports [1].

Implementation of strategy for digital transformation of private sector

In the Russian Digital Economy Program [2], developed in 2017 at the request of the President of the Russian Federation there is a focus on creation of enabling environment for the digital economy development – secure digital infrastructure, regulation, human resources, research and development. In the initial version of the program there is no section associated with the digital transformation of the private sector. It is assumed

that the issues of digital business transformation and its sub-sectors will be added and tailored to the program. The process of elaboration the sectoral digital transformation plans began in February 2018 and to date, several additional program areas related to the digital transformation of business have already been supported by the Council for the Digital Transformation of the Economy. It's includes digital transport and logistics, digital healthcare, digital government and smart city [3]. Such areas as digital agriculture, industry, energy, construction, finance will follow.

5.1.2 Regulation of digital transformation of the private sector

Laws relating to ICT

In a survey of managers of enterprises conducted annually by the World Economic Forum, in 2016 Russia received an average rating of 3.8 points out of 7 possible on the maturity of legislation relating to the use of ICT (including in the fields of e-commerce, digital signatures, consumer protection) and occupies the 75th place on this indicator in the latest ranking [4]. The highest scores were given to Luxembourg and Estonia (5.9 points), while Georgia and Ukraine rank at the same level as Russia.

In Russia there is a practice of regular meetings between top government officials and representatives of the business community for public discussion of regulatory environment as part of the effort for executing the open government concept [5]. However, the effectiveness of existing mechanisms is not very high, primarily due to insufficiently developed legal and regulatory framework involving all stakeholders (in particular business) in decision-making, lack of a law on lobbying, and the weakness of civil society institutions.

5.2 **Human capital for business**

For digital transformation of the private sector, which is the key for the digital economy development, human capital, is in its turn a major factor to effect change. The quality of human capital determines the level of business readiness for digital transformation and the speed of necessary reforms. For business, quality of human capital is, first of all, about the competence of employees. The main criteria for evaluating the achievement of the task of using and improving human capital are the existence, relevance and active use of digital competencies and skills, as well as their consolidation in the professional standards.

5.2.1 Digital leadership and entrepreneurship

In Russia, the formation of the concepts and purposes of digital transformation largely took place not in the business sector, but within the scientific milieu. This is due to the Russian traditions of research in economics, development of such scientific fields as the theory of technological structures, kondratieff waves, the third industrial revolution, – fields, which had prepared the general view and conceptual approaches to the problems of digital transformation. Moreover, among the scientists who developed the first two directions, there have been active participants in the management activity at the federal level, who came to their posts in early 1990s, while the third direction's representatives

were actively involved in the practical management of large state corporations (Rosatom and others) and in preparation of regional development programs.

It should also be noted that in the second half of the 1990s, the Russian experts took an active part in international teams, outlining the principles for development of the information society at international and national levels. This provided the basis since the second half of the 2000s, for shaping public policy in the sphere of digital development, which largely determined the rather high level of availability of the information infrastructure during the transition to the digital economy, the certain amount of programmes in this domain were created and implemented (Electronic Russian 2002-2010. Informational Society 2011-2020), which .

At present, the important leadership role is played by companies that are actively exploring or are directly involved in the international practice of digital transformation. Among the leaders are the development institutions, as well as a number of think tanks and leading Russian companies, the management of which has been involved for various reasons in the processes of international cooperation in the field of emerging digital technologies.

Entrepreneurship innovation

According to The Global Innovation Index [6], which is calculated as the proportion of first-time entrepreneurs who are entering the market with new products and services and have no or few competitors, Russia holds the second last place among 64 countries participating in the survey (5.4%), behind the leading countries by an order of magnitude in this indicator.

Motivation of business leaders to execute digital transformation

As a whole, the understanding the potential of new business models is less of a motivating factor compared to fear of losing market share while lagging behind the competition in reforms. This leads to the formation of a position of keeping track of what others are doing. Foreign experience is not perceived as a direct sample to do the same, because the risks are exacerbated in Russia by many constraints that lie in regulatory and regulatory enforcement fields.

The share of enterprises in which there are decision makers responsible for digital transformation

The share of enterprises, where those, who are responsible for digital transformation, are present in top-management, is rising, due to the fear to miss the moment to start reforms. The share of companies where there is a formal or informal assignment of the respective areas of responsibility can be peer reviewed at around 50%.

The status and powers of the enterprise decision-makers responsible for digital transformation,

Such individuals tend to occupy a relatively high (level of deputy head) position, since the positive and / or negative expectations of the impact of changes are seen as very important and requiring a strategic understanding.

There is a growing (in the absence of understanding of how to achieve the digital transformation of the core business), phenomenon in which investments are made in entrepreneurial projects technologically more prepared for implementation of new

business models, that are not related to the core business or its branches, but have the potential to create spin-off companies.

Quality of management schools

Indirect indicator of the managers qualification in the state (including those, who are responsible for digital transformation) is the high level of their training in business schools. According to the results of annual questioning of enterprise managers conducted by WEF, Russian has the 65th place of Global competitiveness index marked as 4,2 points from 7 in business schools quality [4].

5.2.2 Digital competences of business personnel

Digital competences requirements for employers

In general, a competency model is used in their work by about 43% of Russian companies [7]. This is significantly less than the share of companies using the model of competencies among Western companies that are the leaders in the Fortune list, which is 74%. Almost 70% of Russian companies with relevant practices use completely new competence models that are not more than two years old, which suggests that they have the requirements for digital competencies [7].

Digital competencies models in management are primarily formed in the business development based on digital platforms, both produced by Russian companies, and promoted to the Russian market by foreign companies.

Although they were formed on the basis of previous ICT development concepts, the models of digital competency in execution activities continue to serve as a basis for development of digital competencies models.

The share of ICT professionals in the private sector

The share of ICT professionals in the total number of employees of the enterprises in the business sector is low and was estimated at only 2.18% in 2016 [10] while in EU the average share of ICT skills among all of the employed in 2016 was 3.7% [11].

The private sector enterprises are actively engaged in finding and attracting ICT specialists: 33.8% of small enterprises, reported in 2014 (last year, when Rosstat was asking this question) of having searched for such specialists, and 42.8% hired such specialists [10]. Among medium-sized enterprises (50 to 249 employees), 34.6% felt the need for ICT-specialists. Among large enterprises (more than 250 employees) it was 42.6%.

It should be noted that while ICT experts are mostly regarded as carriers of competencies that do not overlap with the competencies associated with deep understanding of the business models, specific business processes, and importantly the features of their digital transformation.

Share of employees who regularly use a computer and the Internet

An important characteristic of digital competence is the share of workers using digital technology.

On comparable data relating to large enterprises employing 250 people or more, Russia is significantly behind EU in terms of the share of employees using a computer on a regular basis it is 33.6% in Russia vs. 59% average in the EU [10, 11]. A similar

situation is observed with the staff, using the Internet on a regular basis (at least once per week) – 23.1% of large enterprises in Russia and 52% in the EU [10, 11].

Increasingly used instead of computers are mobile devices, which tend to have access to Internet. According to, in 2016 37.2% of the organizations of the business sector provided their employees with the technical means for mobile Internet access (in 2011 – 18.4%) [12p.40, table 2.4.]. Competencies for use of such digital devices are developed mainly through user skills not directly related to business activities, but often forming the skills that are important in the work of employees of companies.

Share of enterprises provided training to their personnel to develop/upgrade their ICT skills

A major shortcoming of the reproduction of digital competency is an underdeveloped system of professional development of the private sector workers in order to enable better use of digital technologies. In 2016, only 2.8% of small enterprises practiced digital skills training of their employees in one form or another [10]. For medium sized and large enterprises the value of this indicator is 5,6% and 14.9 while in EU such training was carried out by 39% of secondary and 68% of large enterprises [11]).

On the one hand, the search for ICT professionals, and on the other hand, unwillingness to improve the ICT skills already working in the company's employees shows among other observations the lack of long-term digital transformation strategies of companies.

Share of enterprises had hard-to-fill vacancies for jobs requiring ICT specialist skills

There is no accurate estimate of what proportion of businesses today are experiencing difficulties in recruiting professionals with digital competences, so the following information allows some conclusions about the severity of the problem. 1.092 million people were employed in the ICT sector in 2015 [12, p. 68 table 4.1.], and the domestic ICT sector needs 350-400 thousand more specialists [13]. Such an assessment of deficit should also reflect structural factors as the sectors and sub-sector, as well as specific businesses often require ICT professionals meeting their specifics. It is also necessary to take into account that the demand for specialists is not balanced across regions and low workforce mobility traditional to Russia further complicates the achievement of the required match.

5.3 Other non-digital factors affecting digital transformation of the private sector

5.3.1 R&D and innovations for digital transformation of the private sector

Accessibility of financial resources for private sector to innovation activities related to digital transformation

Lack of financial resources is the second most significant factor, which the surveyed enterprise pointed out as an obstacle to innovation (after the high cost of innovation), an issue for 18.3% of organizations [10].

Enterprises, engaged in acquisition of software

The share of enterprises that have realized in 2016 such kind of innovative activity as procurement of software, amounted to 2,3% for entities connected with mining and manufacturing, power generation and distribution, and 3,3% for enterprises carrying out activities in the field of communications, as well as those related to the usage of computer engineering and information technologies [8]. Accordingly, the share of the private sector enterprises engaged in innovation associated with the digital transformation, can be estimated to be very low.

5.3.2 Business environment for digital transformation of the private sector

Favorability of tax regime for the development and use of digital technologies by business

The current tax regime is not favorable for development and use of innovative digital technologies by Russian companies. In the country tax incentives tools for the digital economy are underused, in particular, in order to stimulate research and development, which is associated with the problems of tax administration. A number of measures to create a favorable tax regime for the digital economy development is provided in the Russian Digital Economy Program [2].

5.3.3 Trust and security for doing business digitally

Presence of industry actors responding to information security emergencies

RU-CERT – is the Russian Computer Emergency Response Team, whose main task is to reduce the level of information security threats to users of the Russian segment of the Internet [14]. To this end, RU-CERT provides assistance to Russian and foreign legal entities and individuals in identification, prevention and counteracting of illegal activities related to network resources within the Russian Federation. RU-CERT provides collection, storage and processing of statistical data related to the spread of malware and network attacks in the territory of the Russian Federation. There is also the governmental center for computer incident response in the information systems of state authorities of the Russian Federation GOV-CERT.RU.

Share of enterprises from the private sector had a formally defined ICT security policy

According to Eurostat from 10% (Hungary) to 51% (Sweden) of enterprises in European Union have officially approved information security policies [15]. In Russia, this depends on the field of the company – in the financial sector, in telecommunications, in the IT sector there is 100% compliance under this indicator. For the majority of enterprises from other industries – the situation is likely different. It should be noted that there are no exact data on this indicator in Russia – this issue is not included in the existing forms of statistical observation.

Share of enterprises from the private sector using information protection instruments

96% of Russian companies have registered incidents related to information security [16].

Some forms of information security instruments (anti-virus programs, spam filters, electronic signature tools, etc.) during the year 2016 were used by 87.3% of companies

in Russia, this level in recent years remained stable, and encryption instruments were used by 42,9% of companies [9].

5.4 Digital foundations for digital transformation of private sector

The importance of digital infrastructure for the development of digital business is very high. Access to infrastructure is what provides for use (and distribution) of technologies. In terms of infrastructure, we distinguish between two basic points. Firstly, it is broadband (mobile broadband). This is a telecommunications component, which should provide direct access to services. Secondly, it is cloud computing and cloud models (IT-component), which are the basis for joint digital platforms and global models (e.g., the Internet of Things). Proprietary digital platforms will be considered separately. The level of current use of new / emerging technologies, in this sense, is not so critical. Technology may change, something literally become unfashionable (or vice versa), but access to infrastructure is critical, since it determines the use of technology.

5.4.1 Broadband access to the Internet

Share of enterprises with broadband access

An important indicator of the level of maturity for digital infrastructure for business is the share of businesses using broadband access to the Internet (> 30 Mbit/s). According to the Rosstat data 40.0% of large enterprises (> 250 employees) in 2016 have broadband access [10]. For small and medium enterprises this figure is 25.2% and 29.6% respectively. The EU average for large enterprises in 2016 this figure was 62%, with the leader (Denmark) – 90% [11].

At the same time, it should be noted that broadband access to the Internet has traditionally received great attention in Russia. In 2016 in Russia the number of base stations, which support mobile broadband access to the Internet has exceeded the number of base stations used only for voice. In accordance with the indicators of the state program "The Information Society (2011-2020 years)" 98% of enterprises should have broadband access to the Internet by 2020 [17].

5.4.2 Data centers and cloud computing services

Businesses purchasing cloud computing services

According to Rosstat [10] 28.4% of large enterprises (> 250 employees) use cloud computing services. For small and medium enterprises (up to 249 employees) this share is 22.8% and 25.5% respectively. In the EU, for large enterprises this share reaches – 45%, with the maximum (Finland) at 87% [11].

The maximum market share of the cloud computing services is related to the model "Software as a Service" (SaaS) [18], pertaining to quite specific services for accounting and cloud telephony. This is followed by "Infrastructure as a Service" (IaaS). In Russia, as a rule, this represents hosting services, while the share of services by the model of "Platform as a Service" (PaaS), necessary for the Internet of Things is only 3.9%.

5.4.3 Data analytics

Share of enterprises using data analytics

According to IDC forecast, in 2017, the sales volume of the systems of big data processing and business intelligence systems will grow on average at 11,9% per year, and by 2022 it will reach $260 billion[46]. In 2016 9% of enterprises in EU analyzed big data that was obtained from various data sources. The leader was Netherlands with a 19% of all enterprises [15].

Russian market of data analytics is at the initial stage of development. The main consumers of such technologies are banks, telecom operators and large retail companies. The main problems are the lack of qualified personnel and sufficient experience of implementations in Russia [47].

According to Cnews [48], the aggregate revenue of the top 20 providers in the field of data analytics in 2015 was about 9,6 billion rubles.

5.4.4 Shared digital platforms for business

Enterprises which sold via a website or apps – via an e-commerce marketplace

This indicator shows the percentage of enterprises, which sales their goods or services via enterprise's website/application or an e-commerce marketplace (such as Booking, eBay, Amazon, Amazon Business, Alibaba, Rakuten, Yandex.Market and others).

In EU [11] for small enterprises average value is 40% and maximum is 57% (Italy). For medium sized enterprises average value is 35%. Maximum has Cyprus (60%). In Russian Federation the relevant statistics are not collected, but for the evaluation of using digital platforms degree for sales can be used Rosstat's indicator « The share of enterprises engaged in electronic sales» [10]. For small enterprises (up to 49 employees) the figure is 32.4%, for medium sized enterprises (up to 249 employees) – 36.6%, for large (250 employees and more) – 39.8%.

5.4.5 New / emerging digital technologies in business

To new/emerging digital technologies can be included data analytics, artificial intelligence, Internet of Things, distributed ledger technologies (blockchain), robotics, unmanned vehicles, additive manufacturing technologies, neurotechnologies and quantum computing technologies.

Awareness of enterprises about new / emerging technologies and their impact on the industry

Level of enterprises awareness about new / emerging technologies and their impact on the industry by the expert's opinion is middle and much lower than in EU and USA. The most popular technologies are data analytics, Internet of Things and distributed registry technologies. Less known are neurotechnologies and quantum technologies. Last time mentioned lever has been grown because of great variety of thematic events and government initiatives in digital economy. National companies start to understand the importance of implementation new/emerging digital technologies and risks of staying away from global trends.

Extent of new / emerging technologies use by enterprises

The degree of new / emerging technologies using new and emerging technologies also falls behind from advanced world countries. The reasons are shortage of qualified companies and personnel, inadequate maturity of new technologies, the unwillingness of company's management to restructure their business processes and lack of financial resources.

National enterprises-leaders in the implementation of new / emerging digital technologies

Traditional leaders in the implementation of new / emerging digital technologies are financial sector enterprises (Sberbank, VTB, QIWI, etc), large IT companies (Yandex, Mail.ru, etc), including telecoms operators (MTS, Megafon, Veon, Rostelecom), retail companies (Magnit, X5 Retail Group) and extractive industry enterprises (Lukoil, Evraz, Nornikel, etc).

5.5 Use of digital technologies by business

5.5.1 Use of traditional ICT by business

Share of enterprises using traditional ICT

According to Rosstat data for 2016 [10] the situation with the use of traditional ICT by business enterprises, is as follows (for small, medium and large enterprises).

Share of enterprises using ERP-systems for doing business

Share of medium and large enterprises using Enterprise Resource Planning (ERP) systems: 19.6% and 37.5%. The value among the EU [15] countries for small, medium and large enterprises were in 2017 28% (small enterprises), 57% (medium) and 76% (large). Herewith the maximum rate for medium enterprises reach 77,5% (Belgium) [22].

From the point of view of some experts, the use of traditional technologies in Russia, at least with respect to ERP-systems, is even more widespread, than it is adduced by Rostat. For example, the software "1C-Enterprise" manufactured by the Russian company "1C" belongs to the class of ERP-systems and is widely distributed in Russia. According to Expert [22], almost a third of the Russian market of ERP-systems in money terms and more than 80% in use in the workplace belongs to the company "1C".

Share of enterprises using CRM-systems for doing business

Share of small, medium and large enterprises using Customer Relationship Management (CRM) systems in Russia according to Rosstat: 16.4% medium and 22.8% large enterprises. The maximum value among the OECD countries [21] for small, medium and large enterprises is 43.35% (Germany), 62.18% (Netherlands) and 77.89% (Finland).

Share of enterprises using SCM-systems for doing business

Share of small, medium and large enterprises using Supply Chain Management (SCM) systems, according to Rosstat: 7.4%, 11.9%. The maximum value among the OECD countries [21] for small, medium and large enterprises is 41.62% (medium enterprises, Germany) and 65.89% (large enterprises, Belgium).

Share of enterprises using EDI-systems for doing business

Share of enterprises engaged in the Electronic Data Interchange (EDI) between their own and external information systems via standard formats: 77% [10].

Share of enterprises with a website

According to Rosstat [10], the share of small, medium sized and large enterprises having a website amounts to 43%, 57% and 70% accordingly. For large enterprises, the figure is 69.9%. This is a value. In the fairly low EU [11] on average 94% of large enterprises have websites (all enterprises – 75%).

Use of government services by business

Using of government services by business is characterized by the following indicators [12 p.63 table 3.8] (as share of the total number of business enterprises). Compared with EU statistics for 2015 [15]

- share of enterprises that sent completed forms for receiving government services via the Internet – 69,4% (75,7% in EU);
- share of enterprises that received information about the activities of public authorities via the Internet – 58,8% (71%);
- share of enterprises receiving public services fully online – 38,3%
- share of enterprises involved in public procurement – 26,9% (13.1% in EU).

5.5.2 Digital Commerce

The importance of e-commerce development of the digital economy us very high. In general, the Russian e-commerce is developing rather successfully. It is a growing market, with local software development, research companies and actively working industry associations. Russia is among the top 10 countries for the e-commerce market size (the volume of the e-commerce market is 20.30 billion US dollars) [24]. The largest market segments are “Consumer Electronics” (125.5 billion rubles), “Hypermarkets” (85 billion rubles), “Fashion” (74.2 billion rubles) [25]. Major Russian players in digital commerce: Ulmart.ru (hypermarket), Wildberries.ru (clothes, shoes and accessories), Citilink.ru (hypermarket) [26].

B2C eCommerce Index

The UNCTAD Index for B2C e-commerce [27] is calculated from the combination of following factors: use of the Internet, security servers, plastic cards penetration, reliability of the postal service. The highest rated country is Luxembourg, included in the top 10 are the economies of six other European countries, three countries in the Asia-Pacific region and one of the North American countries. Russia ranked 50th with an index of 58.0 out of maximum index value of 91.7. Nearby scores are assigned to Georgia – 56th place, Ukraine – 58th, Armenia – 59th.

Share of e-commerce in GDP

The share of B2C e-commerce in Russia’s GDP in 2016 according to the European e-Commerce Foundation [28] amounted to about 1.1%.

The ratio of online sales by geography

An important characteristic is the percentage of Internet sales by geography (internally / other countries). In 2015, an estimated NADT [29], the volume of online shopping in the Russian Internet stores amounted to 554 billion rubles, and foreign – 227 billion rubles. The growth of cross border segment compared to 2014 exceeded 160%. Also, there was changes in the ratio of domestic and cross-border online trade in the total market (in ruble terms) as the share of the latter increased to 29% from 13% in 2014. According to AKIT [25], cross-border trade has increased by 49% over the first half of 2017, and the inside is only 8%.

The share of retail online trade with China is about 50% in value terms and 90% in the total volume of parcels (in pieces). Europe's share (in value terms) is 25%, the US share is 13%.

Share of revenue generated by online advertising

The proportion of revenue generated by online advertising (% of the total advertising market) and growth rate can be assessed according to data from the Association of Communications Agencies of Russia [30]. In 2017, the Russian advertising market grew by 14% to 417 billion roubles. Expenditure on online advertising in 2017 increased by 22% to 166.3 billion roubles.

Share of enterprises receiving orders over the Internet

As regards the proportion of enterprises engaged in electronic sales (the share of enterprises in % receiving orders via computer networks), then according to the Rosstat [10] for large enterprises it was 39.8% in 2016. This value is comparable with the EU [15] average for similar large enterprises of 42%. The leader (Belgium) value of this indicator was 57%.

Proportion of businesses placing orders over the Internet

According to Rosstat [10] share of large enterprises engaged in e-procurement (placing orders via computer networks) amounted to 57.7% in 2016. For small and medium sized enterprises the figure was 43.3% and 49.6%. The EU average for large enterprises — 60%, for leader of the list, Austria, it makes 82% [15].

Value of e-commerce sales (percentage of turnover)

In Russia, according to Rosstat in 2016 [10]:

- 7.3% of all enterprises had value of e-commerce sales less then 10% of turnover;
- 2.9% of all enterprises had value of e-commerce sales from 10% to 29% of turnover;
- 1.5% of all enterprises had value of e-commerce sales from 29% to 49% of turnover;
- 1% of all enterprises had value of e-commerce sales from 50% to 69% of turnover;
- 1.3% of all enterprises had value of e-commerce sales from 70% to 100% of turnover.

In EU average percentof e-commerce sales from enterprises total turnover was 7% in 2016 (for all enterprises). The leader was Ireland with 16% [11].

5.5.3 The emerging phenomena of the digital economy

Starting positions in the development of new emerging technologies are very important in terms of digital economy assessment. The emerging trends of the digital economy will be discussed in the following directions: new forms of financing, new forms of payments, sharing economy, platform economy. A distinguishing feature of this section is that it in many aspects it is based on expert estimates.

Using digital platforms for crowdfunding

As the first indicator of the development of new funding norms, data on digital crowdfunding platforms were used. Expert assessments suggest that Russian entrepreneurs are using the platforms in the United States and China. However, crowdfunding platforms do exist in Russia. For example, according to analysts in 2016, more than a billion rubles were collected in Russia by initiators of interesting cultural, social and business projects [32].

Well-known domestic platforms are:

- *Planeta.ru* – in 2017 the amount of total funds collected has reached 840 million rubles (compared to 4.5 million rubles in 2012), launching more than 3000 projects [33]. The platform served famous Russian individuals and music groups – BI-2, Lapis Troubetzkoy, A. Troitsky, etc. The platform is the recipient of the Runet Prize in 2014.
- *Boomstarter* – in 2017 the amount of total funds collected has reached 358 mln. rub. About 100 projects registered every day by 13 categories, the most popular – music and videos [34].

This means, the Russian crowdfunding platforms exist with small turnovers, and one of the top concerns of founders is the marketing of such platforms, as well as creating an atmosphere of trust.

Using digital platforms for crowd-investing

In Russia there are some planforms for crowd–investing. Among them:

- *Napartner* – platform, which claims the highest figure among its Russian counterparts, attracted investments – $ 6.25 million [35]. There is a separate section with a list of successful transactions; among the latter – $ 250,000 for the Krivorukoff mobile games development studio and $ 200,000 for the mobile educational platform StudyApps.
- *StartTrack* – the leading Russian croud–investing platform with the turnover in 2017 more than 800 million rub. [36]

Digital peer lending instruments

In Russia, the peer-to-peer (P2P) lending market's development is hampered by regulation and lack of information. Problems of the Russian market of p2p-lending are primarily related to absence of a developed scoring system of the entire population in uniform and comparable format. One of the current examples – City Money [38].

Prevalence of equitable money exchange and the use of crypto currency

Also, an important indicator of the new rules of financing is relates to assessing the extent to which p2p currency exchange and cryptocurrency are used. Expert evaluation: Currency exchange is very opaque, and the use and exchange of cryptocurrency is not yet regulated in Russian Federation (in other countries there is also no fully operating regulation). It should be noted that in recent years, many young companies in Russia are actively discussing the Initial Coin Offering (ICO) process, there are successful examples of such ICO holding [39].

Share of the fintech industry in the total market volume

Talking about the new forms of payments in the first place, it is necessary to estimate how big the share of fintech industry is in the total market. Expert evaluation: the share is small, but the potential is great. In Russia, the volume of investments fintech start-ups in 2015 totaled $ 9.8 million ($ 22 billion worldwide) [39].

Using of digital payment systems

At the same time, in Russia there are global digital payment systems, such as PayPal and PayOnline (part of internation holding Net Element), as well as domestic – Qiwi and Yandex.Money.

It should be noted that the new Strategy of Development of the Information Society in the Russian Federation implies severe restrictions on foreign players in the Russian digital economy. All data should be stored on a Russian server, all payments should be carried out through the Russian payment systems, cross-border payments should be transparent, the rights of national logistics operators should be protected, etc. [1].

Using of digital sharing platforms

The main indicator of the digital sharing economy is the extent to which companies are developing due to this "sharing economy" provided by ICT (for example, services such as car sharing, bike and housing sharing). In Russia, there were the first examples which still have achieve a stable tendency for spread and further development. For example, only private investors develop car sharing services in Russia. Total investments of the two largest market participants exceed 1.2 bln. Rub. [40] At the beginning of 2017 the Moscow Department of Transportation has published statistics according to which the combined fleet of carsharing service providers (Delimobil, Car5, YouDrive, AnyTime, BelkaCar), is at 1.5 thousand units, but at the middle 2017 it's exeed 2.3 thousand units. More than 280 thousand subscribers were registered in the system of carsharing systems in the city.

The dynamics are demonstrated by the data available for June 2017. The number of registered users of the Moscow carsharing ecosystem exceeded 500 thousand people – data of the press service of the Moscow mayor [41].

On the other hand, it may be noted that the Airbnb apartment booking service works in Russia, but recently closed its Russian division (although it continues to work) [42].

Among other examples, non-profit services for sharing of goods can be noted. For example, Darudar or Rentmania.

5.5.4 Digital transformation of different sectors of the economy

According to a survey by Rosstat [10], the percentage of organizations that have websites ranges from 17% in agriculture, to 70-80% in the financial sector. The number of ICT professionals (in percentage terms, with the exception of ICT companies), is highest in the financial sector, telecommunications, and services, which moved their business to Internet (real estate, for example). The lowest number of ICT professionals is in agriculture. The same distribution can also be seen on other indicators reflecting digital transformation in the use of cloud services, specialized programs, etc.

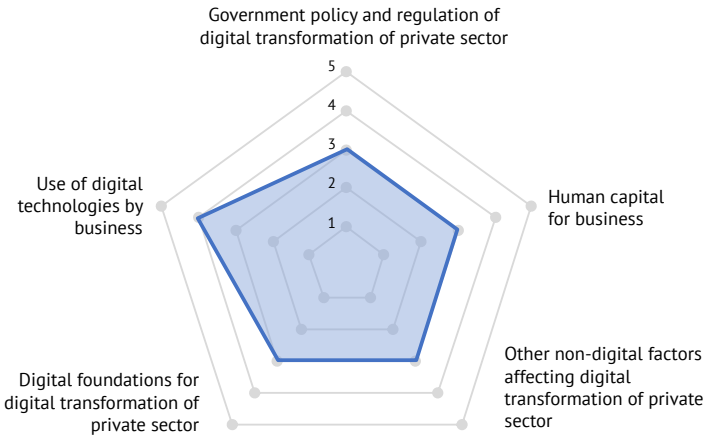
Assessment of the level of digital transformation of different sectors of the economy

It is evident that the ICT sector will be among the leaders of digital transformation. Also among the leaders are wholesale trade and finanical sector. The processes of digital transformation in the telecommnication sector of russian economy, as well as hardware, software and business usage models, are proceeding in the same way, as it is in Europe (in some cases with time delay). The same assumptions can be applied to financial sector and retail.

According to McKinsey estimates [44] of the level of digitalization, some of the sectors are closer to world levels (eg, ICT, education, finance), but in many key sectors (mining, manufacturing industries, and transport), Russia still lags behind the leading European countries.

5.6 Assessment of the current status and findings

The indicators for the entire section are presented in the diagram below, the specific details on scoring are contained in the table in Annex 1.



The strategic objectives of digital transformation of businesses have been identified, but the program on achieving those objectives has not been developed. Government regulation and, in particular, the tax regime is not conducive to development of digital business.

Digital leadership and entrepreneurship have not merged yet in Russia. Understanding the content of the digital transformation is now the prerogative of the scientific experts, and partially of politicians and public figures. The approaches formed are gradually transformed into government programs, covering primarily the ecosystem aspects of the conditions for business to work on changing their business models in the process of digital transformation. Examples of enterprise leadership are limited to a handful of companies. The problem lies with the poorly organized process for disseminating knowledge and experience of digital transformations among a wide range of entrepreneurs.

An integrated approach is missing with regards to development of human capital among the workers, who could consciously and thus more effectively participate in digital transformation of their employer companies. The Russian business is not yet ready for defining the requirements and for efficient use of resources with appropriate competencies for execution. The reason is that in the vast majority of companies, the digital competencies for management are not in place.

The share of R&D and innovation in the Russian business in general is very low compared with the European countries. Funding for development of the enterprises is not sufficient, and the tax regime in this regard is not favorable.

Somewhat better is the position of Russia in the field of information security in specific sectors of the economy, but this does not translate, for example, to the trust of end-users to digital services.

Interest in the new digital technologies in the Russian business is great, in organizations where there is a base (for example, the remaining scientific schools, training programs), the transformation process is faster. Lack of own scientific reserve, training programs and integration with the global scientific community slows down development.

In general, the e-commerce market in Russia can be described as actively-developing from the positions of amounts, in which it is used by populace and organisation. The problems in this market include the low purchasing power of the population, underdeveloped logistics channels throughout the country, absence of taxes on cross-border players and unequal conditions [for them] in comparison with domestic companies, the low level of confidence in online shopping and the quality of the products offered.

Virtually all areas of new / emerging technologies have Russian pioneer companies, and one can expect the intensification of the development of new business models in connection with the adoption of the program "Digital Economy in the Russian Federation."

Among the leaders of digitization are the sectors of the Russian economy, working either by the same model as their foreign counterparts (eg, the telecommunications industry), or experiencing a real competition with them (eg, ICT sector). These include the already mentioned ICT sector, finance, and to a lesser extent retail. Among the lagging sectors and subject areas include construction, agriculture, health, social sphere.

In general, the level of digital transformation of the private sector in Russia Federation can be assessed as ***moderate***.

References

1. Стратегия развития информационного общества в Российской Федерации на 2017–2030 годы. Утверждена Указом Президента Российской Федерации № 203 от 9 мая 2017 г. URL: http://kremlin.ru/acts/bank/41919

2. Программа «Цифровая экономика Российской Федерации». Утверждена распоряжением Правительства Российской Федерации от 28 июля 2017 г. № 1632. URL: http://government.ru/docs/28653/
3. Протокол заседания Совета по цифровой трансформации АНО «Цифровая экономика» от 12 февраля 2018 года URL: http://files.data-economy.ru/12022018.pdf
4. The Global Competitiveness Index 2017–2018. Competitiveness Rankings. URL: http://reports.weforum.org/global-competitiveness-index-2017–2018/competitiveness-rankings/#series=EOSQ131
5. Информационный портал об оценке регулирующего воздействия: URL: http://orv.gov.ru/
6. Global Entrepreneurship Monitor. Global Report 2016/17. 2017. Global Entrepreneurship Research Association, 177 p.
7. Модели компетенций есть у 43% российских компаний. URL: https://hh.ru/article/306502
8. Индикаторы инновационной деятельности: 2018: статистический сборник / Н.В. Городникова, Л.М. Гохберг, К.А. Дитковский и др.; Нац. исслед. ун-т «Высшая школа экономики».—М.: НИУ ВШЭ, 2018.— 344 с. URL: https://www.hse.ru/data/2018/03/23/1164003717/Indicators_of_Innovation_2018.pdf
9. Росстат. Мониторинг развития информационного общества в Российской Федерации. Показатели развития информационного общества в Российской Федерации. URL: http://www.gks.ru/free_doc/new_site/business/it/monitor_rf.xls
10. Росстат. Данные Главного межрегионального центра за 2016 г.
11. Eurostat URL: http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database
12. Цифровая экономика: краткий статистический сборник / Г.И. Абдрахманова, Л.М. Гохберг, А.В. Демьяненко и др.; Нац. исслед. ун-т «Высшая школа экономики».—М.: НИУ ВШЭ, 2018.— 96 с. URL: https://www.hse.ru/data/2018/02/19/1165383719/ice2018kr.pdf
13. Николай Никифоров выступил на Правительственном часе в Совете Федерации URL: http://minsvyaz.ru/ru/events/34918/
14. Центр реагирования на компьютерные инциденты RU-CERT URL: https://www.cert.ru
15. Eurostat URL: https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database?p_p_id=NavTreeportletprod_WAR_NavTreeportletprod_INSTANCE_pgrsK5zx6I84&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-2&p_p_col_count=1
16. Структура и состояние компьютерной преступности в Российской Федерации URL: https://cyberleninka.ru/article/n/struktura-i-sostoyanie-kompyuternoy-prestupnosti-v-rossiyskoy-federatsii;
17. Государственная программа «Информационное общество (2011–2020)». Утверждена Постановлением Правительства Российской Федерации от 15 апреля 2014 года № 313
18. Infrastructure as a Service, IaaS (рынок России) URL: http://www.tadviser.ru/index.php/Статья: Infrastructure_as_a_Service,_IaaS_(рынок_России)
19. IDC: рынок систем больших данных и бизнес-аналитики к 2022 году превысит четверть триллиона долларов // Computerworld Россия. URL: https://www.computerworld.ru/news/IDC-rynok-sistem-bolshih-dannyh-i-biznes-analitiki-k-2022-godu-prevysit-chetvert-trilliona-dollarov
20. 2016: Состояние российского рынка Big Data URL: http://www.tadviser.ru/index.php/Статья: Большие_данные_(Big_Data)_в_России#.D0.A1.D0.BE.D1.81.

D1.82.D0.BE.D1.8F.D0.BD.D0.B8.D0.B5_.D1.80.D0.BE.D1.81.D1.81.D0.B8.D0.B9.
D1.81.D0.BA.D0.BE.D0.B3.D0.BE_.D1.80.D1.8B.D0.BD.D0.BA.D0.B0_Big_Data

21. Бизнес-аналитика и большие данные в России 2016
URL: http://www.cnews.ru/reviews/bi_bigdata_2016/articles/
rossijskij_rynok_bi_ot_otchetov_k_transformatsii_biznesa
22. OECD. ICT Access and Usage by Businesses URL: http://stats.oecd.org/
23. «1С» усиливает позиции на рынке ERP URL: http://expert.ru/2016/07/5/1c/
24. CRM (рынок России) URL: http://www.tadviser.ru/index.php/Статья: CRM_(рынок_России)
25. Топ-10 e-Commerce рынков в мире URL: http://www.akit.ru/top10_ecommarket/
26. Рейтинг Топ-100 крупнейших интернет-магазинов
России URL: http://datainsight.ru/top100/
27. Information Economy Report 2015: Unlocking the Potential of e-Commerce
for Developing Countries. 2015 Geneva: United Nations, 120 p. URL: http://
unctad.org/en/Pages/Publications/InformationEconomyReportSeries.aspx
28. The Russia B2C Ecommerce Country Report 2017 URL: https://embed.
ecommercewiki.org/reports/93/russia-b2c-ecommerce-country-report-2017-free
29. Национальная ассоциация дистанционной торговли URL: http://ecomrussia.ru/
30. Объем рекламы в средствах ее распространения в 2017 году
URL: http://www.akarussia.ru/knowledge/market_size/id8180
31. Электронные торговые площадки в России: кто есть кто
URL: https://raexpert.ru/researches/etp/2017/
32. С мира по клику URL: https://rg.ru/2017/04/18/kak-rabotaet-kraudfanding-v-rossii.html
33. Народное финансирование: Краудфандинг в России URL: https://planeta.ru/about;
34. Российская краудфандинговая платформа Boomstarter URL: https://boomstarter.ru/
35. Проект «Napartner.ru» URL: http://www.napartner.ru/
36. Инвестиционная площадка StartTrack URL: https://starttrack.ru/
37. Платформа MYPIO URL: https://mypio.ru/
38. Город Денег URL: https://townmoney.ru/
39. Инвестиции через биткоины: что такое ICO и стоит ли
им воспользоваться? URL: http://www.forbes.ru/
finansy-i-investicii/339863-investicii-cherez-bitkoiny-chto-takoe-ico-i-stoit-li-im-vospolzovatsya
40. Каршеринг в России: обзор рынка URL: https://iot.ru/
gorodskaya-sreda/karshering-v-rossii-obzor-rynka
41. Услугами московского каршеринга воспользовались 500 тысяч человек
URL: https://iot.ru/gorodskaya-sreda/
uslugami-moskovskogo-karsheringa-vospolzovalis-500-tysyach-chelovek
42. Airbnb отказалась от российской прописки URL: https://www.kommersant.ru/doc/3267744
43. Экспертный совет представил своё видение концепции программы
«Цифровая экономика» URL: http://open.gov.ru/events/5515775/
44. Цифровая Россия: Новая реальность.—М.: Мак-Кинзи и Компания СиАйЭс, 2017.—
132 с. URL: http://www.mckinsey.com/~/media/McKinsey/Locations/Europe%20and%20
Middle%20East/Russia/Our%20Insights/Digital%20Russia/Digital-Russia-report.ashx

6. Digital citizens/consumers

Consumers of advanced technology play a significant role in shaping the digital economy, as they are often the first to give impetus to the development of new products and services. Their intentions and the demands for the possible applications of digital technology in everyday life are an extremely important source of technological innovations, which are in close cooperation with social media elements. For the widespread introduction of digital technologies that contribute to improving the quality of life, households and individual users must have unhindered access to them, and there must be the conditions for their mass and effective use. The willingness of consumers to participate in the digital ecosystem, and the constant interest in active participation in it, are the most important conditions for its dynamic and successful development.

6.1 Access to digital technology

Percentage of households with access to the Internet (ITU data) of 2016 put Russia (74.8%) immediately before Cyprus (74.4%), below Israel (75.7%) and significantly behind the leading countries: Norway (97.1%), Bahrain (98.0%) and the Republic of Korea (99.2%) [1, p. 138-141] in the rating of countries by this indicator. At the same time, the value of this indicator is growing quite rapidly: according to Rosstat, it grew almost 1.6 times in the last six years: from 48.4% in 2010 to 74,8% in 2016 and to 76.3% in 2017 [3, p. 244].

The most common means of access to the Internet are desktop computers (40,6% of households), laptops or netbooks (40,6%), tablets (26,8%), other mobile devices such as mobile phones, smartphones, PDAs, etc. (56%), smart TV (7,8%) [4, table 1.2], video game consoles (2,8%), At the same time, the share of households using "other mobile devices" (mostly smartphones) is growing rapidly: 32.8% in 2014 against aforementioned 56% in 2017.

The main impediments to the use of the Internet in households are "no need, unwillingness to use, no interest" (16,7% of all households), lack of skills (6,4%), high cost of connection (4,3%), wherein the difference between urban and rural areas is insignificant [4, table 1.5].

Percentage of households with broadband access to the Internet

Rosstat has been measuring this indicator since 2013, and during this time its value increased from 56.5% to 72.6% in 2017 [2, item 2.6.12]. In the EU in 2017, 85% of households had broadband Internet access, and in leading European countries the value of this indicator is close to 100% (Netherlands – 98%, Luxembourg – 97%) [5].

Inequality between urban and rural areas in the proportion of households with broadband Internet, is fairly high: 76.8% vs. 59.6% [4, table 1.1].

Percentage of households with a computer

According to Rosstat [2, item 2.6.2] between 2010-2017, there was a steady increase in the proportion of households with access to a computer at home, of the total number of households, from 54.5% to 74.4%, or almost 20 percentage points. According to the ITU in 2016 [1, p. 138-141], Russia (74.3%), was more or less on the same level with Romania (74.0%) and lower than Republic of Korea (75.3%), but significantly inferior to the leaders: 98.5% in Iceland; 97.6% in Norway; 95.9% in Luxembourg.

As on other access parameters, here in Russia is also characterized by a marked disparity between urban and rural areas: 78,3% and 62,6% [4, table 1.1].

6.2 Use of digital technologies

Percentage of individuals using the Internet

Among the total population aged 15-74 years, the share of the population that has ever used the Internet is 76.4%, among which 74,1% are so-called active users, i.e. those who use the Internet at least once a week. According to Rosstat, it grew 1,2 times in the last five years (from 61.4% in 2013) [2, items 2.6.7-2.6.8]. According to ITU [1, p. 142-145] Russia with its 76,4% in this indicator is approximately at the level of Lebanon (76.1%), Czech Republic (76.7%) and Kazakhstan(76,8%) and significantly behind the world leaders of Bahrain (98.0%) and Iceland (98.2%). Rosstat shows a uniform annual increase in the value of this indicator by 3 percentage points starting from 2013.

The dynamics of the growth in the share of Internet users among household members is also of interest: from 38.0% in 2010 to 76.0% in 2017, where the peak of growth (6-8 percentage points per year) occurred in 2011-2014 [2, items 2.6.7, 2.6.9]. Among the main factors that motivate people to use the Internet are the use of social networking services, downloading content, and purchasing goods and services.

The gap between urban and rural areas in the share of Internet users is quite large: 79.0% versus 66.0%, and among active users it is 77.4% vs. 64.0%, while no gap exists between men and women independent of living in urban and rural areas [4, table 3.1b].

The share of the population which has never used the Internet in the total Russian population in 2017 was 16,3% (against 19% in 2016). Since 2010 the value of this indicator has decreased by 34.7 percentage points, and the speed of decrease peaked in 2011-2012 when the situation improved 8-9 percentage points per year [3, p. 247; own calculations based on Rosstat data of 2018].

Activities carried out over the Internet

The indicators of goals of internet usage are calculated by Rosstat since 2017, as a share of three-month audience (population aged 15-74 years who used the internet in

the last three months), that performed various activities via Internet. The similar figure for EU and OECD is calculated from age group 16-74. In all cases we use data for 2017.

According to data received by Rosstat in 2017 [4, table 3.11], the most popular (78,1% of users) way of using the Internet in Russia is to participate in social networks (for example, VKontakte, Odnoklassniki, Facebook). In this, Russia is ahead of the EU, where the average value in 2017 is 65%, and slightly inferior to the European leading countries in this indicator (Malta 87% and Iceland 91%) [5].

On the use of the Internet for phone calls or video conversations over the Internet (Skype and other applications), Russia with its 48.8% of users [4, table 3.11] is a little above the EU average (46%), but significantly lower than the leader on this indicator, Bulgaria (85%) [5].

In terms of sale / purchase of goods and services via the Internet (including via online auctions) by the population, Russia with its 18.9% [4, table 3.11b] is a little lower than the average level of online purchasing of goods and services in EU countries (22%) and two time lower that the champions – the Netherlands (38%), Croatia (37%) and Malta (36%)[5; 6]. To search for and sell goods and services, Russians used sites such as "Tiu.ru", "Avito.ru", "From Hand to Hand", "Yula", "Masters' Fair" and numerous special pages on social networks.

The value of the Russian indicator for user-generated content (books, articles, magazines, photos, music, videos, programs, etc.) to sites, social networks, or cloud storage for public access is 32.3% [4, table 3.11b]. The OECD average is 40%, while the leading countries are much more successful: 70% in Iceland, 67% in Cyprus [5].

Vvalues of the indicator of seeking information about health or health services in EU varies from t46% (Italy) to the 79% in Croatia. In Russia the value of this indicator is 's 33.9% [4, table 3.11b].

Lower is the value of the indicator of the search for information on education, training courses, trainings, etc., which was 11.7% in Russia in 2017 (the EU average in 2015[16] was 41%).

Also we should mark the significant difference in values of the indicator, which designates the usage of distance learning (online courses) – 3.6% for Russia (in the EU in 2017 it constituteds 8% [5]). Meanwhile this form of education (online courses) was chosen by 20% of internet users in Iceland (which is the leader by this indicator) and 18% – in Sweden.

30.9% of Russian Internet users were making financial transactions via the Internet during 2017 [4, table 3.11b]. Although the value of this indicator is growing rapidly (in 2016 it was 22.5%), this is still considerably lower than average for EU countries (in 2017 the share of individuals doing the Internet banking was 61%) and quite far from the leaders of Norway and Iceland (95%) [5].

The value of the indicator associated with the online search for vacancies, in Russia, according to Rosstat, is only 10.4% [4, table 3.11b], which is twice lower than the average for EU countries (20%), where Sweden is leading with a value of 36% [5, 6]. At the same time, according to expert estimates, in the Russian private sector today almost 70% of vacancies are closed thanks to Internet services for recruiting and personnel search (HeadHunter etc.). To find vacancies and jobseekers, as well as jobs for people

16 *The latest available data.*

with disabilities and vacancies for public and temporary work, the Rostrud website "Work in Russia" has been created and is being used.

Political activity by Russian citizens using the Internet, through participation in online polls or consultations on social and political issues (e.g., urban planning), signing petitions and appeals, publication of opinions on social and political issues via websites, participation in forums, etc., can be estimated as low [4, table 3.11b] at the level of 3% (EU average of 10% in 2017, 33% for Luxembourg, 26% for Iceland [5]).

Participation in professional networks, such as LinkedIn, Professionaly.Ru, Xing, E-xcutive.ru etc, makes 2.5% whereas EU average is 15% and the best are the Netherlands with their 36% and Denmark with almost 31% [5]).

Use of government services by citizens

In terms of "the proportion of the population using the Internet to receive state and municipal services in electronic form in the total population aged 15-72 years" [2, item 2.6.10] the value increased in the period from 2013 from 10.7% to 42.3%, with the peak of growth in 2016-2017, when the annual increase was 13.5 percentage points. The highest values of this indicator were registered in 2017 in Yamalo-Nenets Autonomous Area (83.2%), Republic of Tatarstan (73.4%) and Moscow Region (74.3%).

The proportion of the population who used the Internet to obtain state and municipal services in the total population that received state and municipal services has also risen substantially – since 2013 when this monitoring was started the value has more than doubled from 30.8% to 64.3%, with the peak of growth in the period 2015-2017, when the annual increase was 12-13 percentage points, indicating an increase in interest and trust of the Russian people in electronic/digital government. Champions on this indicator in 2017 were Moscow Region (86.2%), Yamalo-Nenets Autonomous Area (86.1%), and Republic of Tyva (78.8%) [2, item 2.6.11].

The most active service area at the end of 2016[17] was the receipt of healthcare related services (Make, review or cancel an appointment with a practitioner) with 32% of tthose who received state and municipal services in the last 12 months, taxes and fees (know your Individual Taxpayer Number, an appointment to the tax office, checking tax debts, etc.) of 27.7%, services of the Ministry of Internal Affairs / State Traffic Inspection (check fines, the issuance/replacement of a driver's license, vehicle registration) – 25.5%, services related to housing and utilities (extract from the house/household books, a certificate from the BTI, provision of meter readings, obtaining payment for housing subsidies) of 21.3% [4, таблица 5.9].

The value of such an important international indicator as "sending completed forms and other necessary documents in electronic form" when receiving state and municipal services in Russia was 12.1% of the population aged 15-72 in 2016 [calculated from 4, tables 5.1 and 5.11], which is lower than average European level (28% in 2016, 30% in 2017), and noticeably behind the best values in the EU (70% in Estonia, 71% in Denmark and 72% in Sweden) [5]. The gap between urban and rural areas in the level of population use of the Internet for public and municipal services in electronic form remained significant, but a gradual reduction of this gap was observed: in 2013 the gap in the share of those who used electronic governmental service from people, who appealed to the government was 25%, in 2017 it was 15% [3, p. 236, 4].

17 The latest available data.

The age groups that most intensively used the Internet in 2017 for state and municipal services were 30-34 years (56.7% of the population in this age group), 35-39 years (56.1%) and 25-29 (54,1%) [4, table 5.4].

The main reason given for the refusal of the Russian population to use the Internet for public and municipal services is a preference for a personal visit and personal contacts – this reason was pointed by 61% of the total population aged 15-72 years which did not use the Internet for state and municipal services [table 5.19].

Remote work activity

The term "distant working" was fixed in the Labor Code in 2013 [13]. The proportion of employed persons who have access to the internet and remote working by agreement with an employer in Russia is very low: according to expert estimates, it amounts to 1-3% of the EU average value of 5% people working from home daily or almost every day in 2018 and 10% of those who work from home at least one a week [5]. According to J'son & Partners Consulting the share of "virtual" workplacesr in Russia can grow up to 20% by 2021 [9].

The most common forms of distance employment are in programming, web design, consulting, analytical work, and others. The specialists (especially in the first two cases) often work with foreign customers.

Obstacles to the dissemination of remote work in Russia are: corporate culture features (directive management style, lack of confidence in the employee) and the mentality (socialization through presence at work and communication in a team), as well as low awareness of the positive economic effect of the remote work and its tools.

Use of payment cards

The vast majority of Russians (79.44%) have payment bank cards and their penetration is growing [10, item 2.61]. This is largely due to the implementation of salary and pension projects that, in particular, promoted active development of this means of payment not only to urban but also to rural residents.

According to the Central Bank of Russia, as of October 1, 2017, 88.3% of the total volume of the issue of cards consisted of debit (settlement) cards, 11.7% accounted for credit products [11].

Most household members carry and regularly use only one card. Two or more cards are more likely to be held by citizens with higher education, as well as middle-aged respondents from 25 to 44 years.

Use of digital technologies by citizens and security issues

The share of persons, that do not buy things on-line, because they don't trust this type of purchasing, according to Rosstat data, gathered during 2017, makes 17,8% [4], whereas for EU this figure is 16% [5]. The unwillingness to disclose the information about payment card was marked as a reason to decline online purchasing by 4,7% (in EU – 7% for close indicator), 4,9% of respondents, who have not ever buy anything via Internet, act in a such way because they don't want to uncover their personal data in the Web. If we mention distrust as a reason to refuse purchasing on-line, we should also bear in mind the general incredulity to Internet, which is connected to the safety considerations.

In 2017, according to Rosstat, the proportion of the population aged 15-74 years who did not use the Internet for security reasons was 3.2%, including because of the

intention to restrict children's access to undesirable information – 0.5% and because of the intention to protect the computer against viruses and virus-bearing programs – 0.2% [4, table 3.16b]. 2,7% did not use the Internet because of the unwillingness to uncover their personal data in the Internet. The difference between the city and the village is insignificant, but women, regardless of their place of residence, are a little more cautious, especially in terms of children's access to the Internet.

Data as of 2017 show that 28,8% Internet users (12-month audience, during last year have faced threats connected with information security, including 18,5% – with unsolicited advertising messages (spam), 13% – with infection by viruses, 1,8% – with unauthorized access to the computer. The values of indicators characterizing other threats (visiting unwanted websites by children, stealing money and personal data, the use of a mobile phone and e-mail by unknown persons) were very low, less than 1%. Statistics show a perceptible decrease in the number of clashes between the population and threats to information security in the last three years [3, p. 254].

Shopping online

Rosstat data show that the proportion of the general population aged 15-72 years who used the internet in the past 12 months to order goods and services from 2013 to 2017 gradually increased from 15.3% to 29.1% [2, item 2.6.13]. In this case, the EU average is 57% for 2017. European leaders here are the United Kingdom and Sweden (82% and 81%). Of this index, Russia is between Serbia (31%) and Croatia (29%) [5].

The Internet was most actively used for this purpose by those aged 25-29 years (47,7%); the least active age group was 70-79 years (1,7%) and older than 80 years (0,9%). The inequality between the city and the village in this indicator is very significant: 30,3% and 16,8% respectively [4, table 4.4].

About two-thirds of respondents of Yandex.Market and GfK Rus (survey of 2823 russian online shoppers aged 16-55, residents of towns with 100 thousand inhabitants and more [12]) bought goods abroad in the last 12 months – this indicator remained almost unchanged compared to year 2016. The audience of foreign online stores continues to reorient to China. This is especially noticeable in cities with a population of 500,000 to 800,000 people. Here the share of those who make purchases on Chinese sites has grown over the year from 58% to 66% (from total number of online buyers). In general, the smaller the city, the more popular there are Chinese shops and the less its inhabitants make purchases in other countries. This is proven also by answers of customers: they choose foreign internet-shops, primarily, because of low prices (76%, the most common answer), wider range (33%) and the opportunite to find products, that are not available in Russia (32%). The main reasons why one refuses to buy goods in foreign online shops are long periods of delivery (39%) and fear of becoming a victim of fraud (27%).

The list of top products has not changed in recent years: in Russian and foreign online stores, most respondents order clothes and shoes, small household appliances, cosmetic, smartphones and products for children .

According to Rosstat, payment is made in most cases by a credit card (75% of the total population aged 15-74 years who purchased goods and services via the Internet), followed by cash (33,9%), and payment through terminal/ATM (14,2%) [4, table 4,8b]. Comparing to 2016, we may observe a remarkable rise of popularity of 1st method (it

had risen by 7%) and a little decline of 2nd (3%). Payment through e-money (WebMoney, Yandex.Money etc.) and payment through mobile phone remain less popular (8% and 10,2% correspondingly) [4, table 4.8b].

Projected increased competition between domestic players of e-commerce market and international companies, mainly Chinese, that are actively expanding presence on the Russian market.

The use of household "smart home" technology

According the results of survey, conducted by J'son & Partners Consulting, "smart home" systems by the end of 2017 were used by 0.6% households. The predicted amount for 2022 is 6,7% [14]. The most popular "smart home" system, according to J'son & Partners Consulting, are:

- smart thermostats;
- connected security systems;
- smart lights;
- connected speaker systems;

The volume of global market of machinery, systems and "smart home" services in 2017 reached $84 billion, which is 11,3% more than the corresponding figure was in 2016. In 2018 "smart home" systems market had increased in volume by 14,3% which made $96 billion. According to calculations made by DISCOVERY Research Group, the volume of "smart home" services market in 2017 amounted to 8 billion RUR, in 2018 – 9 billion RUR (the increase was 12,5%). Within the structure of "smart home" services market one can distinguish three basic segments: devices themselves, services (software etc.), installation and connection provided. The main share of "smart home" systems market is formed by devices[15].

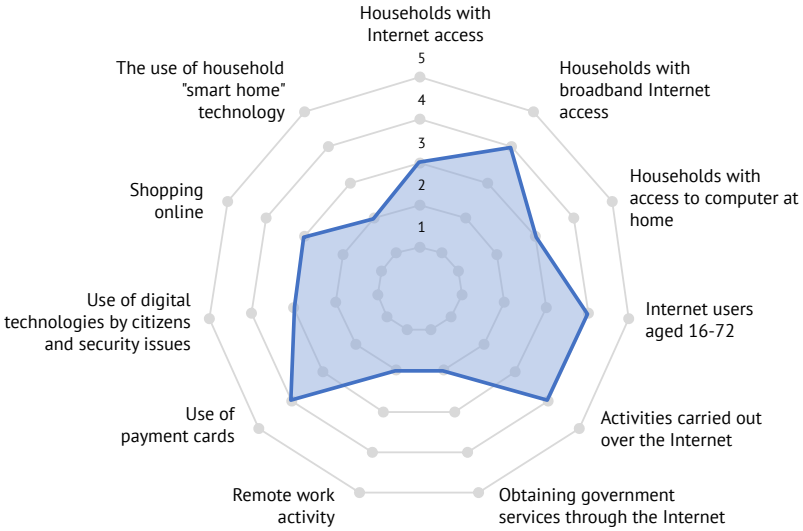
The complex solutions on the smart home" systems market are offered a vide range of companies, including cellular operators (Beeline, Megafon). The demand on such systems is yet limited by high price – the price of a set for one-room apartment can start from 410 thousands roubles[16].

According to J'son & Partners Consulting, government initiatives (development of digital economy, including the "smart city" project) and the initiatives of hardware and solution suppliers, which are actively searching ways for market entry and highly appreciate its perspectives, in recent times are becoming drivers of the russian market development, inter alia drivers of the changing the vision of "smart home" from what is called symbol of prestige or electronic toy to a product of mass consumption. There is a chance for market players to overstep the stages of development passed by global market using the experience of the leading countries and the support of the government [14].

6.3 Assessment of the current status and findings

Indicators for the whole section is presented in the diagram below. Specific values are contained in the table in Annex 1.

In Russia, due to the intensive development of information infrastructure and various ICT applications in socially important sectors (trade, health, education, public administration, culture and others) there is a dynamic entry of the population and households



into the digital economy. This occurs in the first place and at the fastest rate in large cities, while remote and rural areas are lagging far behind in almost all indicators of access to digital technologies and their use. However, due to historical continuity with the Soviet Union in Russia there is practically no gender difference in the development of new technologies and services, and in rural areas, women outnumber men in most areas of Internet use [4, table 3.11].

In household access indicators, Russia still lags behind the leading countries, but there is a positive trend in terms of broadband access to the Internet, especially on mobile devices. The values of Russia's indicators related to the use of the Internet for communication and participating in social media interactions exceed the average European ones. The usage of other services and possibilities is yet less developed. So far the desired indicator values of the Russian population in using Internet for implementation of financial transactions (two times less) and the search for work via the Internet are modest. Online political activity of Russian citizens is low, but in large cities, voting online, petitions and other forms of political activity have already become widespread. Statistics and expert assessments indicate the growing interest and confidence of the Russian population in digital government, the use of payment cards, and online purchases.

It takes a lot of work to develop digital and logistics infrastructure in remote areas and rural areas, to raise public awareness about the availability and benefits of digital technologies and services, and to develop the skills of the population in their use.

In general, the situation with the access of Russian households to digital technologies and their use by the population can be assessed as ***moderate***.

References

1. Measuring the Information Society Report. Vol. 1. Geneva: International Telecommunication Union, 2017. 154 p.
2. Росстат: Мониторинг развития информационного общества в Российской Федерации, 13.04.2018. URL: http://www.gks.ru/free_doc/new_site/business/it/monitor_rf.xls

3. Индикаторы цифровой экономики: 2017: статистический сборник / Г.И. Абдрахманова, Л.М. Гохберг, М.А. Кевеш и др.; Нац. исслед. ун-т «Высшая школа экономики». – М.: НИУ ВШЭ, 2017. – 320 с. URL: https://www.hse.ru/data/2017/08/03/1173504122/ICE2017.pdf

4. Росстат: Итоги федерального статистического наблюдения по вопросам использования населением информационных технологий и информационно-телекоммуникационных сетей (28.03.2018), URL: http://www.gks.ru/free_doc/new_site/business/it/fed_nabl-croc/index.html

5. Eurostat. Digital economy and society. Data. Main tables. URL: http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/main-tables

6. OECD.Stat: ICT Access and Usage by Households and Individuals. 2017. URL: http://stats.oecd.org/

7. Цифровая Россия: Новая реальность. – М.: Мак-Кинзи и Компания СиАйЭс, 2017. – 132 с. URL: http://www.mckinsey.com/~/media/McKinsey/Locations/Europe%20and%20Middle%20East/Russia/Our%20Insights/Digital%20Russia/Digital-Russia-report.ashx

8. Мартынова О.В. Удаленная занятость в России и перспективы ее развития // Молодой ученый. 2016. № 2. С. 542-545.

9. J'son & Partners Consulting. Итоги первого российского исследования рынка дистанционной занятости (2015).

10. Индикаторы финансовой доступности за 2014-2016 года (по результатам замера 2015-2017 годов и по состоянию на 24.10.2017.

11. Электронные платежные системы в России // TADVISER, 2018/01/25. URL: http://www.tadviser.ru/index.php/Статья:Электронные_платежные_системы_в_России

12. Развитие розничной онлайн-торговли в России. URL: https://yandex.ru/company/researches/2017/market_gfk

13. MIX Research. 44% россиян покупают товары через Интернет. URL: http://mix-research.com/novosti/44-rossiyan-pokupayut-tovary-cherez-internet/

14. Основные тенденции развития рынка систем Smart Home. J'son & Partners Consulting. 2018. URL: http://json.tv/ict_telecom_analytics_view/osnovnye-tendentsii-razvitiya-rynka-sistem-smart-home-20180614050852 Анализ рынка систем «умный дом» в России. DISCOVERY Research Group. 2019.
URL: https://marketing.rbc.ru/research/39016/
URL: https://umnyj-doms.ru/index/komplekt_quot_umnyj_dom_quot_dlja_1_komnatnoj_kvartiry/0-129

15. Основные тенденции развития рынка систем Smart Home.J'son & Partners Consulting. 2018. URL: http://json.tv/ict_telecom_analytics_view/osnovnye-tendentsii-razvitiya-rynka-sistem-smart-home-20180614050852

16. Анализ рынка систем «умный дом» в России. DISCOVERY Research Group. 2019.
URL: https://marketing.rbc.ru/research/39016/
URL: https://umnyj-doms.ru/index/komplekt_quot_umnyj_dom_quot_dlja_1_komnatnoj_kvartiry/0-129

7. Social and economic impact

With the development of the digital economy around the world, high expectations are associated. In the World Development Report "Digital Dividends" of the World Bank [1] three groups of expected economic and social effects of digital transformation (economic growth, jobs, and accessibility and quality of services) were alloted.

Economic effects are associated with the multifaceted impact of digital technologies that can reduce costs and increase labor productivity (by optimizing production and logistics processes, increasing equipment productivity, and reducing resource consumption and production losses), expanding markets and the scale of trade, increasing competition, increasing market efficiency of labor, as well as the effectiveness of R&D and the development of new products.

The social effect of digital transformation — improving the quality of life through the use of digital technologies — is associated with an increase in the availability and quality of educational and health services, new employment opportunities, increased participation, convenient digital services and government services, comfortable life with "smart" cities and houses, and increased public security.

However, as it was pointed out in the World Bank report, economic and social effects do not occur automatically. Digital potential for socio-economic development can only be realized if there is a favorable business climate, stimulating the growth of government regulation, effective innovation systems and the development of digital infrastructure. Without these conditions, opportunities can turn into risks, such as the concentration and strengthening of monopolies, increased inequality, and increased control.

The section below gives an assessment (mostly expert) of how the use of digital technologies currently affects the socio-economic development of Russia.

7.1 General Effects

Impact of digital technology on socio-economic development

To assess the impact of digital technologies on the social and economic impact of ICT, a composite sub-index of impact from the WEF Network Readiness Index [2] was used, according to which Russia ranks 41st in the world, behind China and Kazakhstan (39th and 40th).

The lowest rankings for Russia are on the impact of ICT on new business models, goods and services (97th place), on accessibility of basic services (88th), on new organizational forms (75th), and on government effectiveness (61st).

Indicators of social and economic effects from the use of ICT in national digital strategies and programs

Indicators of social and economic effects of ICT are practically absent from Russian strategic planning documents, with the exception of an index of consumer satisfaction with the quality of public and municipal electronic services. The lack of measurable indicators of goals related to the economic and social impact of ICT, as well as a built-in hierarchical system of indicators that allows assessing the contribution of individual initiatives and projects to the achievement of goals, reduces the effectiveness of digital transformation management and increases the risks of non-receipt of expected dividends.

7.2 Economic impact

Impact of digital technologies on new business models, services and products

In assessing the impact of ICT on new business models by business managers in the WEF Network Readiness Index [2], Russia ranks 97th, behind El Salvador, Greece and the Gambia. Finland and Great Britain are at the lead in this indicator.

In Russia, the situation with new business models is not uniform. In some areas of the platform economy, for example, national companies have been established that successfully compete with international ones: taxi ordering (Yandex.Taxi), trading platforms (Avito, Ozon, Yandex.Market), social networks (VKontakte).

The sharing economy actively developing in recent years is also growing rapidly in Russia, but is at the initial stage. Today, the most popular areas in it are car sharing and private rental services.

New forms of financial services related to digital technology (FinTech) developed in Russia, mainly due to two widely used products in the country: online payments and transfers of funds [4]. In this area, Russia has strong local platforms like Yandex.Money, QIWI Wallet, Unistream, Crown, Robokassa and others.

Impact of digital technologies on the organizational models

The impact of digital technology on the emergence of new organizational models (remote work, virtual teams, etc.) in Russia was ranked by the WEF experts [2] at 4 points out of 7. According to this indicator Russia ranks 75th place conceding Ukraine, Poland and Hungary.

In Russia, distant work has not yet become a mass phenomenon, according to experts and analytical agencies, and in 2016 did not exceed 1-3% of those employed, compared with one third employed in the leading countries on this indicator. This is due to the mentality of managers and employees, and the conservatism of organizational forms of business activity in Russia, but the economic effects of remote employment and successful examples are encouraging the expansion of this practice. According to the joint research of the Bitrix24 service and the J'son & Partners Consulting agency in Russia, 51% of programmers work primarily in remote employment mode, followed by employees of customer support services (38%), designers (27%), analysts 15%) and employees of the financial department (15%) [5].

Impact of the digital transformation on the economic growth and job creation

The impact of ICT on economic growth, including in Russia, has been studied in the last decade by many analysts.

In 2011, McKinsey published a study of Internet impact on GDP growth in 13 countries – Canada, France, Germany, Italy, Japan, Russia, UK, USA, Brazil, China, India, South Korea, Sweden, [6]. In these countries, an average of 7% GDP growth from 1995 to 2009 was due to the internet, and in the period from 2004 to 2009. its contribution to GDP was 11%. Against this background, Russia's performance looked more modest: the contribution of the Internet to economic growth, McKinsey estimated, was only about 1% (the worst figure among the BRIC countries). In general, in countries with rapidly developing economies, the contribution of the Internet to GDP growth was significantly less than in countries with developed economies.

A study of the impact of the Internet on the economic growth of G20 countries in 2012 was conducted by the Boston Consulting Group (BCG). For these countries, a macroeconomic assessment was made of the contribution of the use of the Internet to GDP growth (from 1.3% to 8.3%). The contribution of the Internet to the growth of the Russian economy was only 1.9% according to the Boston Consulting Group's estimate, being one of the lowest indicators of the G20 countries and giving way to the corresponding contribution for the BRIC countries [7].

In 2015, McKinsey estimated that the share of the digital economy in Russia's GDP rose to 3.9 percent (8 percent to 8.2 percent in the EU, 10 percent in China and 10.9 percent in the US). BCG, calculating the volume of the digital economy in its methodology, gives lower estimates. According to the recent (October 2017) BCG report "Russia Online: Four Priorities for a Breakthrough in the Digital Economy," the share of the digital economy in GDP in 2016 has returned to growth after a decline in 2015 and today is 2% (which is 10% higher than the value of 2015). The contribution of the digital economy to GDP grew from 1.5 trillion rubles in 2015 to 1.7 trillion rubles in 2016. Average annual dollar growth in 2010-2016 amounted to 4.8%, which is below the average annual growth rate of the digital economy in the leading countries (Scandinavia – 6-7%, the United States and Great Britain – 8-9%) [9].

Nevertheless, international analytical companies see in the long term great opportunities for economic growth in Russia through the use of digital technologies. In 2017, the report "Digital Russia: The New Reality" by McKinsey [8] states that the digitalization of the economy in 2025 may give the country economic impact estimated at 4.1-8.9 trillion rubles, which will be from 19 to 34% % of total GDP growth, as well as improving the quality of life.

A possible explanation of the smaller influence of digital technologies at earlier stages of their use in the Russian economy can be found in the studies of the Economist Intelligence Unit, which, based on the results of an empirical statistical study, substantiated the hypothesis of a "threshold effect" whereby the use of ICT starts to positively influence economic growth after reaching a certain level of penetration of ICT into the economy and/or after a certain period of time [10]. The bad business climate also makes a further contribution: on this parameter Russia occupies less than one hundredth place among the countries estimated in the ratings of the WEF.

According to Russian experts, the trend of job losses associated with the use of digital technology, which is projected in a recent report by the World Economic Forum

[11], at present and in the short term, affected Russia to a lesser extent due to several factors [12]:

- cheap labor, which after the devaluation of the ruble has become less expensive than in China, so enterprises have less incentive to invest in technological renewal of production and get rid of manual labor;
- a reduction in the availability of capital and investment, which leads to a slow-down in the introduction of new technologies (for example, sales of industrial robots in Russia in 2016 decreased by 40% from 550 to 316 units [13]);
- peculiar properties of the corporate culture and management settings: the decision to fire an employee is made in a pinch, the palliatives are prederred such as part-time etc.; in state corporations, for example, the ongoing automation processes do not lead to a reduction in jobs.

At the same time, Russia will not avoid global trends. For example, even now the demand for highly skilled specialists in new technologies is growing, but there is a shortage of such specialists. Companies are forced to invest in the formation of such competencies (the mobile operator VimpelCom, for example, opened its own corporate data school "Beeline "[12]).

7.3 Social impact

Impact of digital technologies on access to basic services

In assessing the impact of ICT on access to basic services (medical, educational, financial, etc.), Russia ranked 88th out of 139 countries (3.9 points) in the WEF Networked Readiness Index [2], behind Moldova, Poland and Mali. Singapore, the Netherlands and Switzerland rank first in this respect.

In health care, the potential for improving the availability of high-quality services by means of digital technologies is large, but in Russia its implementation has until recently been constrained by regulatory restrictions (on telemedicine interaction between physician and patient), and financial and technical barriers (in the case, for example, remote patient monitoring or the use of intelligent systems support of medical activity).

In the education system, the situation is better: almost 43% of higher education institutions and more than 23% of secondary professional education institutions provide distance education services [14], which, in particular, provided educational services for students with disabilities.

In the field of digital financial services, the proposal is formed, but they are used much less than in developed countries. All the major banks of the country working with deposits of individuals (Sberbank of Russia, VTB-24, Alfa-bank, etc.), provide Internet banking services for managing accounts via the Internet, but Internet banking in Russia in 2016 was used by only 16.4% of the country's population [15], while the EU average for this indicator was 49% in 2016, and in countries such as Finland, Sweden and the Netherlands it exceeded 80% [16]. At the same time, the share of Russia's adult population having a payment (debit and / or credit) card is 79,44% (at the beginning of 2017 [17]).

Use of digital technologies and the efficiency of the government

In the impact of digital technologies on improving the quality of public services (shorter time to receipt, reducing the number of errors, the introduction of new online services, increasing transparency), the WEF Networked Readiness index gave Russia 4.1 points out of 7 [2]. For this indicator, Russia occupies 61th place after Uruguay.

At the same time, it should be noted that, according to Rosstat, citizens' satisfaction with the quality of state and municipal services provided in electronic form is growing and reached 70,5 % in 2017 (in 2016 it was 66.1% and in 2015 – 57.5%), and together with those partially satisfied – 98.9% [18]. There is an increase in overall satisfaction with the quality of state and municipal services from their recipients (regardless of the receiving channel).

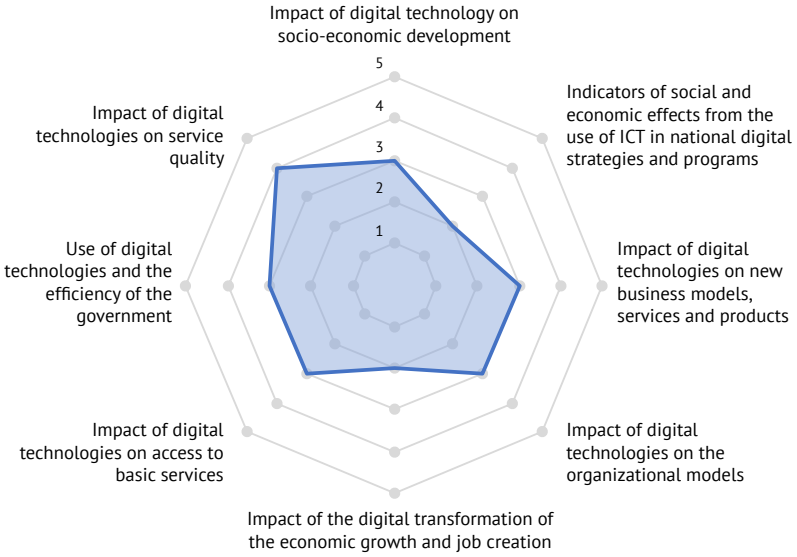
Impact of digital technologies on service quality

The use of digital technologies adds new qualities and conveniences to obtaining traditional services (remote access, additional services, shorter delivery times, a variety of choices, etc.). Users of basic services in electronic form are mostly satisfied with their quality. Thus, according to the monitoring of the availability of financial services conducted by the Central Bank, in May 2017, they positively assessed (by 4 and 5 out of a maximum of 5) their satisfaction with the services of 95% of Internet banking users from a stationary PC or laptop and 97% of mobile banking users applications (calculated by the indicators of financial accessibility [19]).

The public sector as a whole lags behind business in terms of improving the quality of services based on digital technology. Among enterprises in 2016 only 35% were fully satisfied with the quality of public services provided in electronic form [20].

7.4 Assessment of the current status and findings

Indicators for the whole section are presented in the diagram below. Specific values are contained in the table in Annex 1.



Russia has great potential to achieve digital dividends: to accelerate economic growth and improve the quality of services. But for the time being the digital transformation is only partially implemented and constrained by insufficiently wide use of new digital services by the population, inhibition of investments in digital technologies to update the activities of organizations, regulatory constraints and shortcomings in the business climate.

In general, the situation with the social and economic effects of the process of digital transformation in Russia can be assessed as ***moderate.***

References

1. World Development Report 2016: Digital Dividends. Washington, DC: World Bank. – 330 p. doi:10.1596/978-1-4648-0671-1. URL: http://www.worldbank.org/en/publication/wdr2016
2. The Global Information Technology Report 2016. Innovating in the Digital Economy. – Geneva, 2016. World Economic Forum and INSEAD. – 290 p. URL: https://www.weforum.org/reports/the-global-information-technology-report-2016
3. Одним автомобилем каршеринга пользуются до восьми раз в день. Официальный сайт Мэра Москвы. URL: https://www.mos.ru/news/item/25159073/
4. Fintech Adoption Index Russia: Key Trends. – Ernst & Young Valuation and Advisory Services LLC., 2016. – 8 p. URL: http://www.ey.com/Publication/vwLUAssets/EY-fintech-index-russia-rus/%24FILE/EY-fintech-index-russia-rus.pdf
5. Светлана Водянова. Итоги первого российского исследования рынка дистанционной занятости. J'son & Partners Consulting. Битрикс 24. URL: https://www.slideshare.net/bitrixcms1/02-json-1?next_slideshow=1
6. Internet matters: The Net's sweeping impact on growth, jobs, and prosperity. McKinsey Global Institute, 2011. – 56 p. URL: http://www.mckinsey.com/industries/high-tech/our-insights/internet-matters
7. The Internet Economy in the G-20: The $4,2 Trillion Opportunity. Boston Consulting Group, 2012. – 53 p. URL: https://www.bcg.com/documents/file100409.pdf
8. Цифровая Россия: Новая реальность. М.: Мак-Кинзи и Компания СиАйЭс, 2017. – 132 с. URL: http://www.mckinsey.com/~/media/McKinsey/Locations/Europe%20and%20Middle%20East/Russia/Our%20Insights/Digital%20Russia/Digital-Russia-report.ashx
9. Россия онлайн: четыре приоритета для прорыва в цифровой экономике. Октябрь 2017. The Boston Consulting Group. – 28 с. URL: http://image-src.bcg.com/Images/Russia-Online_tcm27-178074.pdf
10. Reaping the benefits of ICT: Europe's productivity challenge. The Economist Intelligence Unit, 2004. – 44 p. URL: http://graphics.eiu.com/files/ad_pdfs/microsoft_final.pdf
11. The Future of Jobs Employment. Skills and Workforce Strategy for the Fourth Industrial Revolution. WEF. 2016. URL: http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf.
12. Мария Подцероб. Технологии изменят труд // Ведомости № 4002 от 27.01.2016. URL: https://www.vedomosti.ru/management/articles/2016/01/27/625618-ischeznut-rabochih-mest
13. Далия Мухамедзянова. Россия установила антирекорд роботизации // Хайтек. 11 апреля 2017. URL: https://hightech.fm/2017/04/11/robosector

14. Мониторинг развития информационного общества в Российской Федерации. Росстат. URL: http://www.gks.ru/free_doc/new_site/business/it/monitor_rf.xls

15. Итоги федерального статистического наблюдения за использованием информационных технологий населением за 2016 год. Росстат (рассчитано на основе данных таблиц 3.11 и 3.2). URL: http://www.gks.ru/free_doc/new_site/business/it/fed_nabl-croc/index.html

16. Eurostat, Digital Economy and Society, 2016. URL: http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

17. Обзор состояния финансовой доступности в Российской Федерации в 2016 году. Центральный банк Российской Федерации. М. 2017. URL: https://www.cbr.ru/Content/Document/File/27576/rev_fin_2016_171024.pdf

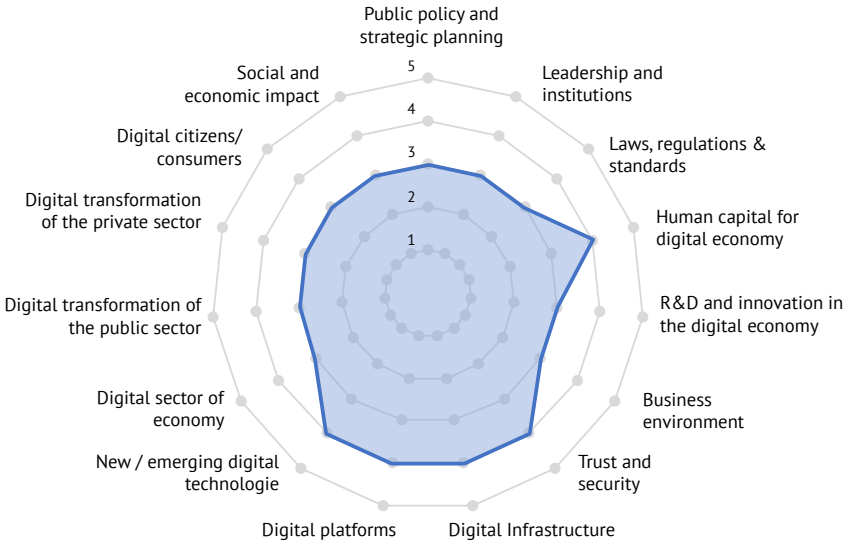
18. Итоги федерального статистического наблюдения за использованием информационных технологий населением за 2017 год (таблица 5.18). Росстат. URL: http://www.gks.ru/free_doc/new_site/business/it/fed_nabl-croc/index.html

19. Центральный Банк. Индикаторы финансовой доступности за 2014-2016 года (по результатам замера 2015-2017 годов). URL: http://www.cbr.ru/finmarket/development/development_affor/

20. Итоги федерального статистического наблюдения по ф. № 3-информ «Сведения об использовании информационных и коммуникационных технологий и производстве вычислительной техники, программного обеспечения и оказании услуг в этих сферах» за 2016 год (рассчитано на основе таблицы t40). URL: http://www.gks.ru/free_doc/new_site/business/it/3-inf/3-inf_2016.rar

Conclusion

In conclusion, we present an integrated set of estimates for the main directions of the analysis of the level of development of digital economy of the Russian Federation.



The analysis shows that for non-digital (analog) factors affecting the development of the digital economy, the situation in Russia is moderate, and in some such as regulation, human capital, trust and security the current status can be considered developed.

Digital foundations for the development of the digital economy in Russia have also been formed moderate, and the development of individual digital platforms, and the use of digital technologies and e-commerce well developed.

However, the digital transformation of the public sector (government, education, health, culture) and, especially, the transformation of business under the impact of digital technologies is lagging behind.

The level of use of digital technologies by citizens in the households of the Russian Federation is likewise scarce, which explains the generally low level of social and economic effects from the impact of digital technologies.

Annex 1. Areas of the analysis and indicators for digital economy in Russia

Legend for the digital economy development indicators for the country assessment

Level	Value
Excellent	5
Developed	4
Moderate	3
Emerging	2
Initial	1

No.	Areas of the analysis and indicators	Level
1.	Non-digital foundations for digital economy development	**Moderate**
1.1.	**Public policy and strategic planning**	**Moderate**
1.1.1.	Strategy for development of the digital economy	**Moderate**
1.1.1.1.	Current strategy for socio-economic development	**Developed**
1.1.1.2.	Current digital economy strategy	**Moderate**
1.1.2.	Implementation of the digital economy strategy	**Moderate**
1.1.2.1.	Implementation of strategy for socio-economic development	**Moderate**
1.1.2.2.	Implementation of the digital economy strategy	**Moderate**
1.1.3.	Digital transformation measuring, monitoring and evaluation	**Moderate**
1.1.3.1.	Monitoring and evaluation of digital transformation	**Moderate**
1.2.	**Leadership and institutions**	**Moderate**

1.2.1.	Managing the development of the digital economy	**Moderate**
1.2.1.1.	Availability and effectiveness of digital economy management system	**Moderate**
1.2.2.	Stakeholder participation	**Moderate**
1.2.2.1.	Stakeholder participation in management of the digital economy development	**Moderate**
1.2.3.	Digital leadership	**Developed**
1.2.3.1.	Senior leaders publicly taken personal ownership and accountability for any digital transformation initiatives	**Developed**
1.2.4.	Regulatory and financial institutions	**Moderate**
1.2.4.1.	Presence of an independent regulatory body in the telecommunications sector	**Initial**
1.2.4.2.	Presence of an institution responsible for regulating the use and protection of data	**Emerging**
1.2.4.3.	Provision of financing for the digital economy development	**Developed**
1.2.4.4.	Public-private partnerships for the digital economy development	**Moderate**
1.2.5.	International cooperation	**Moderate**
1.2.5.1.	Cooperation with other countries for the digital economy development	**Moderate**
1.3.	**Laws, regulations & standards**	**Developed**
1.3.1.	Regulating digital infrastructure	**Developed**
1.3.1.1.	Regulations and policy to support the deployment of broadband and overcoming the digital divide	**Developed**

1.3.1.2.	Obligation to provide mobile broadband services in sparsely populated and remote areas, assigned to operator in the provision of radio frequency.	**Developed**
1.3.1.3.	Regulations ensuring non-discriminatory access and shared usage of passive and active telecommunications infrastructure	**Developed**
1.3.1.4.	Regulations regarding use of cloud computing and data centers resources	**Emerging**
1.3.2.	Regulating the use of data	**Developed**
1.3.2.1.	Regulations regarding data protection	**Developed**
1.3.2.2.	Regulations allowing government data reuse	**Moderate**
1.3.3.	Regulation of digital interactions	**Moderate**
1.3.3.1.	Regulations on equal or predominant digital transactions, notifications and documents to physical one	**Moderate**
1.3.4.	Regulation of digital payments	**Excellent**
1.3.4.1.	Regulations on digital payment systems and e-payments	**Excellent**
1.3.5.	Incentive mechanisms for digital goods and services	**Moderate**
1.3.5.1.	Incentive mechanisms for the use of digital goods, services, rights to use them	**Moderate**
1.3.6.	Cybersecurity regulations	**Developed**
1.3.6.1.	Cybersecurity legislation and policies	**Excellent**
1.3.6.2.	Legal protection for confidential data	**Developed**
1.3.6.3.	Legal protection for online users	**Emerging**

1.3.7.	Standards	**Moderate**
1.3.7.1.	Relevance and effectiveness of the national system of standards for the digital economy development	**Moderate**
1.4.	**Human capital for digital economy**	**Moderate**
1.4.1.	Digital competencies	**Moderate**
1.4.1.1.	ICT specialists in employment	**Emerging**
1.4.1.2.	Secondary and tertiary education enrolment rate	**Excellent**
1.4.1.3.	Digital competencies requirements in professional standards	**Moderate**
1.4.2.	Efficient use of talent	**Moderate**
1.4.2.1.	Country capacity to retain talent	**Moderate**
1.4.2.2.	Country capacity to attract talent	**Moderate**
1.4.3.	Training of personnel for the digital economy	**Moderate**
1.4.3.1.	Compliance of educational programs of all levels with the requirements of the digital economy	**Emerging**
1.4.3.2.	Training of specialists in digital technology	**Moderate**
1.4.3.3.	Quality of math and science education	**Developed**
1.5.	**R&D and innovation in the digital economy**	**Moderate**
1.5.1.	Research and development	**Emerging**

1.5.1.1.	Researchers in R&D	**Emerging**
1.5.1.2.	Gross expenditure on R&D	**Moderate**
1.5.1.3.	Gross expenditure on R&D financed by business enterprise	**Emerging**
1.5.1.4.	R&D expenditure in ICT as a share of all domestic expenditures on research and development	**Emerging**
1.5.1.5.	Cooperation between universities and businesses in R&D	**Emerging**
1.5.2.	Innovation Infrastructure	**Moderate**
1.5.2.1.	The share of innovative enterprises	**Initial**
1.5.2.2.	Maturity of the national innovation infrastructure	**Developed**
1.5.2.3.	ICT-related patents applications filed under the Patent Cooperation Treaty	**Emerging**
1.6.	**Business environment**	**Moderate**
1.6.1.	Economic factors	**Moderate**
1.6.1.1.	Doing Business overall ranking	**Developed**
1.6.1.2.	Intensity of local competition	**Moderate**
1.6.1.3.	The total tax rate	**Moderate**
1.6.1.4.	Availability of financial services	**Moderate**
1.6.1.5.	Affordability of financial services	**Emerging**

1.6.1.6.	Ease of access to loans	**Moderate**
1.6.2.	Rule of law	**Emerging**
1.6.2.1.	Intellectual property protection	**Emerging**
1.6.2.2.	Software piracy rate	**Moderate**
1.6.2.3.	Judicial independence	**Emerging**
1.6.2.4.	Efficiency of legal framework in challenging regulations	**Moderate**
1.6.3.	Institutional factors and support for entrepreneurs	**Moderate**
1.6.3.1.	Availability of the latest technology	**Emerging**
1.6.3.2.	High status to successful entrepreneurs	**Moderate**
1.6.3.3.	Irregular payments and bribes	**Emerging**
1.6.3.4.	Efficiency of customs clearance process	**Developed**
1.6.3.5.	Urban population	**Emerging**
1.7.	**Trust and security in the digital economy**	**Developed**
1.7.1.	Public policy and regulation	**Developed**
1.7.1.1.	National policy on cybersecurity	**Excellent**
1.7.1.2.	Raising the awareness of citizens and organizations to ensure information security in the use of digital technologies	**Moderate**

1.7.2.	Organizational measures to ensure information security	**Moderate**
1.7.2.1.	Emergency response teams for cybersecurity	**Moderate**
1.7.2.2.	Public-private partnerships and coordination of cybersecurity issues	**Moderate**
2.	Digital foundations of the digital economy	**Developed**
2.1.	**Digital Infrastructure**	**Developed**
2.1.1.	Broadband access to the Internet	**Moderate**
2.1.1.1.	Fixed-broadband Internet subscriptions	**Emerging**
2.1.1.2.	Active wireless-broadband subscriptions	**Moderate**
2.1.1.3.	International Internet bandwidth per Internet user	**Emerging**
2.1.1.4.	Percentage of the population covered by at least a 3G mobile network	**Moderate**
2.1.1.5.	Percentage of the population covered by at least a 4G mobile network	**Emerging**
2.1.1.6.	Average speed of Internet connection	**Moderate**
2.1.2.	Mobile networks	**Developed**
2.1.2.1.	Mobile cellular telephone subscriptions per 100 inhabitants	**Developed**
2.1.2.2.	Mobile network coverage – percentage of population	**Developed**
2.1.3.	Affordability of broadband access	**Excellent**

2.1.3.1.	Fixed broadband service basket as a percentage of GNI per capita	**Excellent**
2.1.3.2.	Mobile-broadband prices, prepaid handset-based	**Excellent**
2.1.3.3.	Mobile-broadband prices, postpaid computer-based	**Excellent**
2.1.4.	Data centers and cloud computing services	**Moderate**
2.1.4.1.	Maturity and competitiveness of the cloud computing market	**Moderate**
2.1.5.	Data analytics	**Moderate**
2.1.5.1.	Maturity and competitiveness in the data analytics market	**Moderate**
2.1.6.	Cybersecurity	**Excellent**
2.1.6.1.	Maturity and competitiveness in cybersecurity services market	**Excellent**
2.2.	**Shared digital platforms**	**Developed**
2.2.1.1.	Global digital platforms	**Developed**
2.2.1.2.	Localization of global digital platforms	**Developed**
2.2.1.3.	National digital platforms	**Developed**
2.3.	**New / emerging digital technology**	**Moderate**
2.3.1.	Awareness and motivation for the use of new technologies	**Moderate**
2.3.1.1.	Awareness, motivation and plans for the use the new and emerging technologies	**Moderate**

2.3.2.	Domestic producers of new digital technologies	**Moderate**
2.3.2.1.	Presence of companies producing new / emerging technologies in the country	**Moderate**
3.	Digital sector of economy	**Moderate**
3.1.	**Enabling environment for the digital sector**	**Developed**
3.1.1.	Strategic objectives and indicators of the digital sector development	**Developed**
3.1.2.	Implementation of strategy of the digital sector development	**Developed**
3.1.3.	Public procurement policies, which provides an opportunity for small / medium enterprises to easily compete for the provision of ICT products and services to the state	**Developed**
3.1.4.	Provisions or rules establishing preference for local ICT providers or limiting the ability of public institutions to procure ICT products and services from foreign enterprises	**Developed**
3.1.5.	Tax benefits for the digital sector	**Developed**
3.2.	**ICT sector**	**Emerging**
3.2.1.	ICT sector share in the gross value added	**Moderate**
3.2.2.	Proportion of total business sector workforce involved in the ICT sector	**Moderate**
3.2.3.	ICT goods and services imports as a percentage of total imports	**Emerging**
3.2.4.	ICT goods and services exports as a percentage of total exports	**Emerging**
3.2.5.	Ratio of exports and imports of ICT goods and services	**Emerging**
3.2.6.	Share in the total volume of world exports of ICT goods and services	**Initial**

3.2.7.	BERD in the ICT sector	**Moderate**
3.2.8.	Innovative activity of enterprises in the ICT sector	**Emerging**
3.3.	**Content and media sector**	**Emerging**
3.3.1.	Share of the content and media sector in gross value added	**Emerging**
3.3.2.	Proportion of total business sector workforce involved in the content and media sector	**Emerging**
3.3.3.	Share of imports of products and services of the content and media sector from total imports	**Emerging**
3.3.4.	Share of exports of products and services of the content and media sector from total exports	**Emerging**
4.	The digital transformation of the public sector	**Moderate**
4.1.	**Digital Government**	**Moderate**
4.1.1.	Public policy and regulation	**Moderate**
4.1.1.1.	Strategic goals and indicators of the digital government development	**Developed**
4.1.1.2.	Action plan for the digital government development	**Moderate**
4.1.1.3.	Architectural approach used in designing and managing the digital government development	**Emerging**
4.1.1.4.	Regulations on equivalence of or priority to digital transactions, notifications and documents in relation to non-digital forms	**Emerging**
4.1.2.	Human capital for government	**Developed**
4.1.2.1.	Digital competences included in the qualification requirements for civil servants	**Developed**

4.1.2.2.	Civil servants training and retraining in use of digital technologies	**Moderate**
4.1.2.3.	Share of civil servants in central government organizations who regularly use computers and the Internet	**Developed**
4.1.3.	Digital infrastructure for government	**Moderate**
4.1.3.1.	Share of central government organizations with broadband access	**Moderate**
4.1.3.2.	Share of regional governments and municipalities with broadband access	**Moderate**
4.1.3.3.	National government cloud and data center infrastructure	**Moderate**
4.1.3.4.	Interoperability Framework with mandatory standards for government information systems	**Moderate**
4.1.3.5.	National databases and their mandatory use in public administration	**Moderate**
4.1.3.6.	Provision of open application programming interfaces to government data and digital services	**Moderate**
4.1.3.7.	New/emerging technologies used for the digital government development	**Moderate**
4.1.4.	Digital government services	**Developed**
4.1.4.1.	e-Government Online Service Index	**Developed**
4.1.4.2.	Priority sectors for improving the quality of state and municipal services delivery	**Excellent**
4.1.4.3.	Unified entry point (portal) for provision of state and municipal services	**Developed**
4.1.4.4.	Complex services for life and business events	**Emerging**
4.1.4.5.	Automatic provision of services without human intervention in real time	**Moderate**

4.1.4.6.	Proactive approach to the provision of services	**Initial**
4.1.4.7.	Mobile applications for state and municipal services	**Excellent**
4.1.4.8.	Continuity of state and municipal services provision across different channels	**Moderate**
4.1.5.	Open government	**Developed**
4.1.5.1.	UN E-Participation Index	**Developed**
4.1.5.2.	National open data portal	**Developed**
4.1.6.	Digital government platforms	**Emerging**
4.1.6.1.	Use of government digital tools and services by civil society and business to support their own activities	**Emerging**
4.1.7.	Impact of government digital services	**Developed**
4.1.7.1.	Share of citizens satisfied with the government digital services	**Developed**
4.1.7.2.	Share of businesses satisfied with the government digital services	**Developed**
4.2.	The digital transformation of the social sector	**Moderate**
4.2.1.	Digital healthcare	**Emerging**
4.2.1.1.	Public policy and regulation of digital healthcare	**Emerging**
4.2.1.1.1.	Strategic goals and indicators for the digital healthcare development	**Emerging**
4.2.1.1.2.	Action plan for the digital healthcare development	**Emerging**

4.2.1.1.3.	Harmonization with international standards and reference data for the digital healthcare development	**Emerging**
4.2.1.1.4.	Mandatory requirements for interoperability of healthcare information systems	**Emerging**
4.2.1.2.	Human capital for digital healthcare	**Emerging**
4.2.1.2.1.	Inclusion of digital competences in the qualification requirements for healthcare workers	**Emerging**
4.2.1.2.2.	Training and retraining of health professionals in digital technologies	**Emerging**
4.2.1.2.3.	Percentage of employees of healthcare organizations who regularly use computers and the Internet	**Moderate**
4.2.1.3.	Digital healthcare infrastructure	**Moderate**
4.2.1.3.1.	Proportion of healthcare organizations with broadband access	**Moderate**
4.2.1.3.2.	Proportion of medical equipment (devices) with an interface for data transfer	**Moderate**
4.2.1.3.3.	Mandatory use of national databases within healthcare	**Moderate**
4.2.1.3.4.	Presence of domestic producers of digital medical technologies and equipment	**Emerging**
4.2.1.4.	Using digital technology for healthcare	**Emerging**
4.2.1.4.1.	National integrated electronic health records	**Emerging**
4.2.1.4.2.	Telemedicine consultations between healthcare providers, and between doctors and patients	**Emerging**
4.2.1.4.3.	Availability of information systems for healthcare system management	**Moderate**
4.2.1.4.4.	Use of digital technologies for the healthcare	**Emerging**

4.2.1.4.5.	Telemedicine services exports as a percentage of total exports of medical services	**Initial**
4.2.1.5.	Impact of digital technologies on healthcare	**Emerging**
4.2.1.5.1.	Impact on access to healthcare services through the use of digital technology	**Emerging**
4.2.1.5.2.	Impact on quality of healthcare through the use of digital technology	**Emerging**
4.2.2.	Digital education	**Moderate**
4.2.2.1.	Public policy and regulation for digital education	**Emerging**
4.2.2.1.1.	Strategic objectives and indicators of the digital education development	**Moderate**
4.2.2.1.2.	Action plan for the digital education development	**Emerging**
4.2.2.1.3.	Harmonization with international standards, normative and reference information necessary for the development of digital education	**Emerging**
4.2.2.1.4.	Mandatory requirements for interoperability of information systems in education	**Emerging**
4.2.2.2.	Human capital for digital education	**Emerging**
4.2.2.2.1.	Inclusion of digital competencies in the qualification requirements for educators	**Emerging**
4.2.2.2.2.	Teacher training and retraining in the use of digital technologies	**Emerging**
4.2.2.2.3.	Proportion of teachers with ICT skills in schools	**Moderate**
4.2.2.3.	Digital education infrastructure	**Moderate**
4.2.2.3.1.	Proportion of secondary educational institutions with broadband	**Moderate**

4.2.2.3.2.	Proportion of higher education institutions with free broadband wireless internet access	**Moderate**
4.2.2.3.3.	Number of students per computer used for educational purposes	**Emerging**
4.2.2.3.4.	Mandatory use of national databases in education	**Emerging**
4.2.2.3.5.	Digital library of educational resources for different levels of education	**Emerging**
4.2.2.3.6.	Digital learning platform	**Moderate**
4.2.2.3.7.	Percentage of educational institutions with a website	**Excellent**
4.2.2.4.	Use of digital technologies for education	**Emerging**
4.2.2.4.1.	Proliferation of digital teaching methods	**Emerging**
4.2.2.4.2.	Use of digital technologies in the exams and certification	**Emerging**
4.2.2.4.3.	Proportion of educational institutions providing distance learning services	**Emerging**
4.2.2.4.4.	Proportion of students in higher education programs mastering at least 50% of the content in a massive open online course (MOOC) format	**Initial**
4.2.2.4.5.	Proportion of educational organizations in which paperwork is done electronically	**Moderate**
4.2.2.4.6.	Use of new/emerging digital technologies for education	**Emerging**
4.2.2.4.7.	Share of exports of distance digital educational services in total distance educational services	**Initial**
4.2.2.5.	Impact of digital technologies on education	**Moderate**
4.2.2.5.1.	Impact of the use of digital technologies in the availability of educational services	**Moderate**

4.2.2.5.2.	Impact of the use of digital technologies on the quality of educational services	**Emerging**
4.2.2.5.3.	Impact of digital technologies on students' opportunity to choose personalized routes of development of key competencies	**Moderate**
4.2.3.	Digital culture	**Moderate**
4.2.3.1.	Public policy and regulation	**Moderate**
4.2.3.1.1.	Strategic objectives and indicators of the digital culture development	**Emerging**
4.2.3.1.2.	Action plan for the digital culture development	**Moderate**
4.2.3.1.3.	Harmonization with international standards, normative and reference information necessary for the digital culture development	**Developed**
4.2.3.1.4.	Mandatory requirements for interoperability of information systems	**Moderate**
4.2.3.2.	Human capital for digital culture	**Developed**
4.2.3.2.1.	Inclusion of digital competencies in the qualification requirements for employees of cultural institutions	**Developed**
4.2.3.2.2.	Training and retraining in use of digital technology	**Developed**
4.2.3.3.	Digital culture infrastructure	**Developed**
4.2.3.3.1.	Proportion of cultural institutions with access to the Internet	**Developed**
4.2.3.3.2.	Proportion of cultural institutions with broadband access	**Developed**
4.2.3.3.3.	Mandatory use of national databases in cultural institutions	**Developed**
4.2.3.3.4.	Digital platforms in culture	**Emerging**

4.2.3.3.5.	Share of cultural institutions having a website	**Emerging**
4.2.3.4.	Use of digital technologies in culture	**Moderate**
4.2.3.4.1.	Proportion of cultural holdings with an electronic catalog	**Moderate**
4.2.3.4.2.	Proportion of electronic catalogs accessible via the Internet	**Moderate**
4.2.3.4.3.	Proportion of digitized collections available via the Internet	**Initial**
4.2.3.4.4.	Number of museums with virtual exhibitions	**Emerging**
4.2.3.4.5.	Use of new/emerging technologies for the digital culture development	**Developed**
4.2.3.5.	Impact of digital technologies on culture	**Moderate**
4.2.3.5.1.	Impact of the use of digital technologies on the availability of cultural services	**Moderate**
4.2.3.5.2.	Impact of the use of digital technologies on quality of cultural services	**Emerging**
5.	The digital transformation of the private sector	**Moderate**
5.1.	**National policy and regulation of digital transformation of the private sector**	**Moderate**
5.1.1.	Strategic goals and programs for digital transformation of the private sector	**Moderate**
5.1.1.1.	Strategic goals and indicators for digital transformation of private sector	**Developed**
5.1.1.2.	Implementation of strategy for digital transformation of private sector	**Emerging**
5.1.2.	Regulation of digital transformation of the private sector	**Moderate**

5.1.2.1.	Laws relating to ICT	**Moderate**
5.2.	**Human capital for business**	**Moderate**
5.2.1.	Digital leadership and entrepreneurship	**Emerging**
5.2.1.1.	Entrepreneurship innovation Motivation of business leaders to execute digital transformation	**Emerging**
5.2.1.2.	The share of enterprises in which there are decision makers responsible for digital transformation	**Moderate**
5.2.1.3.	The status and powers of the enterprise decision-makers responsible for digital transformation,	**Moderate**
5.2.1.4.	Quality of management schools	**Emerging**
5.2.1.5.	Availability and maturity of the training system for masters of business administration for digital transformation	**Emerging**
5.2.2.	Digital competences of business personnel	**Moderate**
5.2.2.1.	Digital competences requirements for employers	**Moderate**
5.2.2.2.	The share of ICT professionals in the private sector	**Moderate**
5.2.2.3.	Share of enterprises provided training to their personnel to develop/ upgrade their digital skills	**Emerging**
5.3.	Other non-digital factors affecting digital transformation of the private sector	**Moderate**
5.3.1.	R&D and innovations for digital transformation of the private sector	**Emerging**
5.3.1.1.	Accessibility of financial resources for private sector to innovation activities related to digital transformation	**Emerging**
5.3.1.2.	Enterprises, engaged in acquisition of machinery, equipment and software	**Emerging**

5.3.2.	Business environment for digital transformation of the private sector	**Emerging**
5.3.2.1.	Favorability of tax regime for the development and use of digital technologies by business	**Emerging**
5.3.3.	Trust and security for doing business digitally	**Developed**
5.3.3.1.	Presence of industry actors responding to information security emergencies	**Developed**
5.3.3.2.	Share of enterprises from the private sector had a formally defined ICT security policy	**Developed**
5.3.3.3.	Share of enterprises from the private sector using information protection instruments	**Developed**
5.4.	Digital foundations for digital transformation of private sector	**Moderate**
5.4.1.	Broadband access to the Internet	**Moderate**
5.4.1.1.	Share of enterprises with broadband access	**Moderate**
5.4.2.	Data centers and cloud computing services	**Emerging**
5.4.2.1.	Businesses purchasing cloud computing services	**Emerging**
5.4.3.	Data analytics	**Emerging**
5.4.3.1.	Share of enterprises using data analytics	**Emerging**
5.4.4.	Shared digital platforms for business	**Moderate**
5.4.4.1.	Enterprises which sold via a website or apps – via an e-commerce marketplace	**Moderate**
5.4.5.	New / emerging digital technologies in business	**Moderate**

5.4.5.1.	Awareness of enterprises about new / emerging technologies and their impact on the industry	**Moderate**
5.4.5.2.	Extent of new / emerging technologies use by enterprises	**Moderate**
5.4.5.3.	National enterprises-leaders in the implementation of new / emerging digital technologies	**Moderate**
5.5.	Use of digital technologies by business	**Developed**
5.5.1.	Use of traditional ICT by business	**Developed**
5.5.1.1.	Share of enterprises using traditional ICT	**Developed**
5.5.1.2.	Share of enterprises using ERP-systems for doing business	**Developed**
5.5.1.3.	Share of enterprises using CRM-systems for doing business	**Developed**
5.5.1.4.	Share of enterprises using SCM-systems for doing business	**Developed**
5.5.1.5.	Share of enterprises using EDI-systems for doing business	**Developed**
5.5.1.6.	Share of enterprises with a website	**Developed**
5.5.1.7.	Share of enterprises that perform electronic data exchange between their own and external information systems in standard formats	**Developed**
5.5.1.8.	Use of government services by business	**Developed**
5.5.2.	Digital Commerce	**Developed**
5.5.2.1.	B2C eCommerce Index	**Moderate**
5.5.2.2.	Share of e-commerce in GDP	**Developed**

5.5.2.3.	The ratio of online sales by geography	**Moderate**
5.5.2.4.	Share of revenue generated by online advertising	**Developed**
5.5.2.5.	Share of enterprises receiving orders over the Internet	**Developed**
5.5.2.6.	Proportion of businesses placing orders over the Internet	**Developed**
5.5.2.7.	Value of e-commerce sales (percentage of turnover)	**Developed**
5.5.3.	The emerging phenomena of the digital economy	**Moderate**
5.5.3.1.	Using digital platforms for crowdfunding	**Moderate**
5.5.3.2.	Using digital platforms for crowd-investing	**Moderate**
5.5.3.3.	Digital peer lending instruments	**Moderate**
5.5.3.4.	Prevalence of equitable money exchange and the use of crypto currency	**Moderate**
5.5.3.5.	Share of the financial technology industry in the total market volume	**Moderate**
5.5.3.6.	Using of digital payment systems	**Moderate**
5.5.3.7.	Using of digital sharing platforms	**Moderate**
5.5.4.	Digital transformation of different sectors of the economy	**Moderate**
5.5.4.1.	Assessment of the level of digital transformation of different sectors of the economy	**Moderate**
6.	Digital citizens/consumers	**Moderate**

6.1.	Access to digital technology	**Moderate**
6.1.1.	Percentage of households with access to the Internet	**Moderate**
6.1.2.	Percentage of households with broadband access to the Internet	**Developed**
6.1.3.	Percentage of households with a computer	**Moderate**
6.2.	Use of digital technologies	**Moderate**
6.2.1.	Percentage of individuals using the Internet	**Developed**
6.2.2.	Activities carried out over the Internet	**Developed**
6.2.3.	Use of government services by citizens	**Emerging**
6.2.4.	Remote work activity	**Emerging**
6.2.5.	Use of payment cards	**Developed**
6.2.6.	Use of digital technologies by citizens and security issues	**Moderate**
6.2.7.	Shopping online	**Moderate**
6.2.8.	Use of smart home technologies by households	**Moderate**
7.	Social and economic impact	**Moderate**
7.1.	General Effects	**Moderate**
7.1.1.	Impact of digital technology on socio-economic development	**Moderate**

7.1.2.	Indicators of social and economic effects from the use of ICT in national digital strategies and programs	**Emerging**
7.2.	Economic impact	**Moderate**
7.2.1.	Impact of digital technologies on new business models, services and products	**Moderate**
7.2.2.	Impact of digital technologies on the organizational models	**Moderate**
7.2.3.	Impact of the digital transformation of the economic growth and job creation	**Emerging**
7.3.	Social impact	**Moderate**
7.3.1.	Impact of digital technologies on access to basic services	**Moderate**
7.3.2.	Use of digital technologies and the efficiency of the government	**Moderate**
7.3.3.	Impact of digital technologies on service quality	**Developed**

9 785901 907474