

Development trends of the education in Russia under digital economy

Tendencias de desarrollo de la educación en Rusia en economía digital

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ABSTRACT:

The relevance is in the problem of reforming Russian education system in ensuring that its content and technologies are consistent with the task of building a digital economy. The purpose is to propose directions for improving the Russian education system in a digital economy that meets modern international trends in its development. The main methods were the analysis of statistical data, index, and rating. The materials can be useful for educational organizations of all levels, forms, and directions of training.

Keywords: digital economy, world trends of digital development, digital education

RESUMEN:

La relevancia está en el problema de reformar el sistema educativo ruso para asegurar que su contenido y tecnologías sean consistentes con la tarea de construir una economía digital. El propósito es proponer instrucciones para mejorar el sistema educativo ruso en una economía digital que cumpla con las tendencias internacionales modernas en su desarrollo. Los principales métodos fueron el análisis de datos estadísticos, índice y calificación. Los materiales pueden ser útiles para organizaciones educativas de todos los niveles, formas y direcciones de capacitación.

Palabras clave: economía digital, tendencias mundiales del desarrollo digital, educación digital

1. Introduction

More than half the world's population now actively uses the Internet in their daily lives (Internet World Statistics, Usage and Population Statistics, 2017).

In national economies there is a radical reform of their structure: a growing proportion of high-tech and knowledge-intensive industries based on the "figure" (O.I. Klimenko and E. V. Maymina); new trends of digital economic development are formed (V.P. Kupriyanovskiy et. al., 2016; S. Stelmakh, 2017); is translated into the "number" system of public administration (Ranger, 2018).

Traditional requirements of the international labor market - economic and technical knowledge, knowledge of foreign languages, competent oral and written speech, ability to use basic software, sales skills, presentations, analysis - have new requirements added in the ability to use neural networks, artificial intelligence, virtual reality, digital platforms.

In addition, a special category of labor market requirements was formed - over professional ones, such as system thinking, creativity, teamwork, client-oriented programming, and project management.

As a logical consequence of structural changes in the economy, the professional structure of society is being modified: Many professions that are not in demand in the digital economy are "dying off".

It is, first, about those areas of employment where human labor can be mostly replaced by machines, for example, an operator in banks. Already, one does not have to stand in lines to pay bills; one can pay all through an online banking systems. Another example is the profession of a security guard, since there are cameras or an operator in a taxi, since the population is increasingly using mobile taxi ordering services (Maymina and Puzynya, 2017).

It is expected that in the age of the digital economy the most promising areas of professional activity for men will be programming (cybersecurity), design, engineering, cyber-prosthetics, city farming (the organization of production of farm products in a megacity), the space industry (spacecraft piloting, cosmogeology and galactic architecture). In turn, among the women, the most popular professions are the profession of journalist, editor, nanomedic, cosmotourism manager, game teacher (a specialist in teaching children in game form), mind-fitness coach (brain training) (Butenko et al., 2017).

According to the World Economic Forum, 65% of children entering primary school will find themselves in professions that do not exist today. It is predicted that by 2020, 1.5 million new digitized jobs will appear in the world. At the same time, 90% of organizations are currently experiencing a shortage of IT professionals, while 75% of teachers and students feel that there is a gap in their ability to meet the needs of IT staff (Frezzo, 2017).

The aforementioned actualizes the problem of education reform, in particular, the use of digital educational platforms, the change of technologies and teaching methods, and the formation of a new educational ideology.

The hypothesis of this research was because the goal setting is fundamental for educational reforms in the field of digitalization.

The goals and objectives of the reform of education should fully comply with the state policy for the development of the digital economy. Otherwise, graduates of educational organizations will be unclaimed in the labor market.

Ensuring the conformity of Russian education with the requirements of the digital economy must take into account the world trends in the development of education, adapt the educational technologies used in other countries to Russian practice.

The purpose of this research was to specify goals, principles, and promising directions for improving the Russian education system in a digital economy that meets modern international trends in its development.

The objectives of the research were as follows:

- Highlighting the main trends in the development of the digital economy in the world and assess the position of Russia in the ranking of countries on the global connection index;
- Analyzing the legal framework and practice of state regulation of the digital economy in Russia, clarify the state's tools and functions in the digital economy;
- Specifying the strategic goals of the development of Russian education and key indicators of its evaluation in the concept of the state program of the digital economy;
- Defining tasks, principles, and perspective directions of improving the Russian education system in the digital economy.

2. Literature review

The global trend of digitalization of the economy naturally caused the growth of scientific research of its problems. For this research, those works that provide analytical confirmation of the prospective demand for specialists with digital knowledge, skills and skills, on which the need to reform the education system, are of particular value.

All researchers recognize the thesis that in the conditions of the development of the digital economy, not only the large-scale introduction of digital technologies in the education system is necessary, but also the presence of direct interaction with employers.

For example, the research "Enhancing the competitiveness and efficiency of business with the help of ICT" business school INSEAD shows that firms working in the ICT sector should combine direct investments in ICT with the creative potential of students that will strengthen the key factors of the organization's competitiveness. Today, the European Union offers an online practical skills training platform, as well as open online courses for teachers themselves. SAP, the company that develops Microsoft training programs, has increased the number of trainees and the number of internships by 50% in three years, and Hewlett-Packard plans to train more than 500,000 IT specialists around the world (Frezzo, 2017).

Digital technologies and platforms radically change the model of the education process, increasing its effectiveness by eliminating intermediaries and optimizing. As the World Bank experts found, increasing the number of high-speed Internet users by 10% can provide an annual increase in gross domestic product from 0.4 to 1.4% (Milgrom & Roberts, 1990).

Recognition of the importance of the role of the digital economy in the field of education can also become the annual increase in its share in the gross domestic product of the states by almost 20%, in the developed countries, this figure averages to 7%. In 2010, Boston Consulting Group estimated the digitalization size of 2.3 trillion for a group of 20 countries, or about 4.1% of their gross domestic product. With the continued growth rate, the share of such an economy in the world gross domestic product will reach in 10-15 years, according to various forecasts, 30-40%. In developing countries, the ICT sector accounts for about 1% of the workforce. It creates a comparatively small number of jobs, but due to the technological conjugation of the economic branches, the number of employees in other sectors will increase, the development of which is promoted by high technologies (4.9 jobs per job in the ICT sphere) (Stelmakh, 2017).

In the gross domestic product of the US in 2015, the share of the digital economy was 6%, in the gross domestic product of European countries - on average more than 5%, in particular, in the UK - 8.4%. In Russia, the share of the digital economy in the gross domestic product is 2.1%, which is 1.3 times more than 5 years ago.

In various studies, Russia's position in the international rating of the level of development of the digital economy is assessed in different ways, which is connected with the choice of the assessment indicator. For example, according to the digital evolution index (DEI), Russia ranks 39th in the rating (2.44 points).

In the author's opinion, a more accurate indicator of the development of the digital economy of different countries is the Global Connectivity Index (GCI), the research and evaluation of which is made by the Chinese communications company Huawei Technologies Co. Ltd. The research is conducted in 50 countries around the world, and 40 indicators are used for evaluation in two groups of parameters: productivity parameters and technological parameters of maintenance of transformation in digital economy. "Top-30" countries on the GCI index (Global Connectivity Index, 2016) are presented in the table, and shows that Russia is on the 26th place.

Table 1
Top-30 countries on the Global Connection Index (GCI)

Place in the rating	Country	GCI (2016)	GDP per capita (nominal), IMF data (2016), USD The USA
1	The USA	74	57,220

2	Singapore	72	52,755
3	Sweden	70	51,136
4	Switzerland	68	78,179
5	United Kingdom	65	42,105
6	Denmark	64	53,104
7	South Korea	63	25,989
8	The Netherlands	63	44,827
9	Japan	62	34,870
10	Norway	61	69,711
11	Australia	59	49,144
12	Germany	59	41,895
13	France	58	38,172
14	New Zealand	58	36,253
15	Canada	57	40,409
16	Belgium	57	40,688
17	Spain	51	26,823
18	Portugal	50	19,684
19	UAE	50	32,988
20	Czech Republic	48	17,543
21	Qatar	47	66,265
22	Italy	46	30,231
23	China	44	8,239
24	Chile	44	12,938
25	Malaysia	44	9,810
26	Russian Federation	43	7,742
27	Poland	43	12,459

28	Saudi Arabia	43	19,312
29	Romania	42	9,157
30	Brazil	39	7,447

The prospects for Russia in the development of the digital economy are proved by the following. In 2015, the share of vacancies in information technology, the Internet, and telecommunications was second only to the share of vacancies in sales. In 2016, according to polls, companies working in information technology minimally reduced the cost of maintaining staff by reducing the number, reducing the social package, reducing wages, etc. At the same time, there were significant staff reductions in the automotive business, extraction, and processing of natural resources, as well as retail trade. Benefits package decreased in banking, finance, logistics, and wages decreased in media business, marketing, and construction. If the existing trends continue, it is expected that Russia will have more than 500 thousand ICT-related vacancies by 2020 (Timofeev and Lebedinskaya, 2016).

It should be recognized that the deficit of professional competencies for working in the digital economy is recognized not only by the demand for labor, but also by its supply.

Thus, the research of Youth Business International and the Global Entrepreneurship Monitor shows that people aged 18-34 in the countries of the European Union do not engage in business much more often than anywhere else does in the world because of fear of failure. More than 40% of young people in Europe, when participating in the poll, referred to the fear of failure as an obstacle to business organization, compared with 24% in Africa and 27.7% in Latin America (Global Entrepreneurship Monitor, Global Report, 2016/2017).

The hypothesis that the low entrepreneurial activity of the population of European countries is connected with the influx of migrants, is not confirmed in practice. Thus, according to The Economist, more than 40% of the 500 US Fortune list companies were created by immigrants or their descendants. While non-Russians make up only 1/8 of the population of the United States of America, and annually the country accepts only 225,000 immigrants with special skills, a quarter of the technological start-ups there were founded by immigrants (The Economist, 2013).

The authors believe that this convincingly proves the need to research for the best practices of leading countries, in particular, the United States in the areas of introducing IT technologies into the educational process, and the formation of "digital" education as an advanced distance learning form. For Russian practice, this experience will be useful in the formation of a new educational policy, updating educational standards in order to harmonize them with the requirements and regulations of the countries, which are leading in the IT technology market.

3. Materials and methods

The main method of research was the analysis of statistical data characterizing the level of development of the digital economy in different countries of the world, the actual and potential demand for IT specialists in national labor markets.

The index method and the rating assessment method are implemented in international comparisons of countries by the digital evolution index and the Global Connection Index.

The method of analyzing legal regulations was used in researching the regulatory and legal framework for the development of the digital economy in Russia.

The benchmarking method of international practice for introducing digital technologies into education is applied to establish educational technologies that are promising for Russian practice.

The goal-setting method was the basis for defining the tasks, principles, and directions for improving the Russian education system in the digital economy.

4. Results

International practice usually unifies digital economy with the concept of "smart working". In this regard, the British Standardization Institute (BSI) issued in 2005 a special standard with codes for different industries (PAS 3000: 2015 Smart working. Code of Practice, BSI, 2015).

Due to the novelty of the digital economy phenomenon, both for foreign and domestic practices, its structure is at the initial stage of formation.

The main sectors of digital economy are as follows:

- Interaction of market counter-parties (producers, business intermediaries, suppliers, buyers);
- Information technologies (public administration, management of economic entities, electronic commerce, communications);
- Information security (in terms of providing complete and reliable information, as well as protection from unauthorized access to it, "hacker attacks");
- Training of personnel for digital economy (primary education, including professional, retraining, advanced training) (Egozaryan and Maymina, 2017).

Obviously, the sectoral composition of digital economy can be presented more widely.

To some extent, the incompleteness of the structural formation of the digital economy is due to the degree of development and implementation of legal regulations governing its development. So far, Russia has adopted three basic legal regulations:

- The federal target program "Digital Economy of the Russian Federation", approved by the Decree of the Government of the Russian Federation as of July 28, 2017, No. 1632-r (Digital Economy of the Russian Federation: federal target program, 2017);
- The Strategy of the Information Society Development in the Russian Federation for 2017-2030, approved by the Decree of the President of the Russian Federation as of May 09, 2017, No. 203 "On the Strategy for the Information Society Development in the Russian Federation for 2017-2030";
- The Doctrine of Information Security of the Russian Federation, approved by the Decree of the President of the Russian Federation as of December 05, 2016, No. 646 "On Approving the Doctrine of Information Security of the Russian Federation".

Each of these documents focuses on the problems of staffing the digital economy. For example, the program "Digital Economy of the Russian Federation" indicates the inadequacy of the use of digital tools for educational activities, a fragmented rather than integral inclusion of the learning process in the digital information environment.

The main directions to solve this issue are the following:

- Creation of institutional and infrastructural conditions for education of digital economy personnel;
- Improvement of the education system based on competence and practice-oriented approaches;
- Structural changes in the labor market, bringing it in line with the requirements and trends in development of digital economy;
- Creation of a motivation system for students to develop the necessary competencies and their participation in development of digital economy of Russia.

Effective implementation of these areas will require the state to adjust "digitally" its inherent functions, in particular:

- Methodological, involving regulation of methods of planning, coordination, monitoring, and reporting of economic and social subjects through information technologies;
- Legislative, consisting in the development of regulatory and legal acts on the development of the digital economy, the mechanisms for introducing information technologies in the production process in all areas of the economy;

- Controlling, assuming systematic control over the process of creation, implementation, and use in practice of information technologies through state annual monitoring;
- Regulatory, involving development and implementation of state professional standards in information technology, quality evaluation of educational services and digitalization degree of education.

Digital public policy focuses on creating a large data system, accounting for and analyzing artificial intelligence, detailing the quantum technology system, introducing robotics, microelectronics and sensors into production, developing a system for recording and analyzing virtual reality (Ranger, 2018).

These tasks are of a strategic nature. Currently, their solution is difficult due to objective reasons. In author's opinion, the main of them shall be considered:

- Lack of state standards for quality assessment and processing of digital information;
- Insufficient funding of scientific developments in the implementation of information technology in the production process;
- Continued dependence of the country's socio-economic development on the export of natural raw materials to international markets;
- Lack of trust on the part of citizens and the business community for the safety and completeness of data placed in the information space;
- Insufficient protection of human rights in the information society, the vulnerability of its rights and freedoms.
- Low level of knowledge about information systems, cloud data stores, and possibilities of modern software, etc.

The imperfection of the monitoring system of the digital economy development is also a problem in the implementation of the digital state policy, which, as applied to the educational sphere, requires supplementing with forms of statistical reporting reflecting the results of introducing information technologies into the educational process, the development of digital education, including distance learning.

The program "Digital Economy of the Russian Federation" has only three indicators related to the sphere of education, with the establishment of target values:

- The number of graduates of educational institutions of higher education in the areas of training related to information and telecommunication technologies - 120 thousand people per year;
- The number of graduates of higher and secondary vocational education, possessing competences in the field of information technology at the world average level - 800 thousand people per year;
- The share of population with digital skills is 40 percent (Digital Economy of the Russian Federation: federal target program, 2017);

The authors believe that in the future, as the digitalization of education develops, the composition of its evaluation indicators will expand. Prerequisites for this are the results of the work done on the introduction of digital technologies in the system of Russian education.

Currently, the requirements for the formation of the basic competences of the digital economy for all graduates and learning systems of general, professional, and additional education for all specialties and training areas have been developed. Federal state educational standards are updated taking into account the requirements for the formation of competences of the digital economy for all levels of education. Considering the requirements to the competences of the digital economy, educational programs of all levels of education have been updated with the aim of using general and professional digital tools in educational activities, including the state final attestation. In educational organizations, for each trainee, an individual profile of competencies with an information support system is created, a personal development trajectory is fixed in accordance with the rules determined by the organization authorized at the federal level. In many educational organizations, the practice of using e-learning technologies is expanding.

At the same time, it should be recognized that despite the results of digitalization of education, its prospects in the educational sphere are practically unlimited and are determined by the peculiarities of the digital economy in the field of education, namely:

- Educational activities are concentrated in the Internet, which helps to save money, both to educational organizations and to the learner.
- Virtual educational environment makes it possible to satisfy as much as possible any educational needs of each student regardless of gender and age.

The foregoing gives us grounds for singling out the tasks of education in the conditions of the development of the digital economy:

- Implementation of information tools and digital technologies in the educational environment;
- Creation of conditions for professional retraining and advanced training of personnel adequate to the requirements and pace of the dynamics of the digital economy;
- Development of motivational policies to accelerate the process of introducing digital technologies into the educational environment and the production process of all spheres of the economy;
- Offer of educational professional standards, including competence in the use of information technology at the stages of the production cycle of all sectors of the economy.

It does not require proof that solving new tasks facing education in the context of its digitization will require the same new principles for improving the entire educational system. Recognizing the alternatives of their formation, the authors consider it possible to propose the following principles:

- Large-scale implementation of IT technologies in the educational process;
- Development of new forms and methods of teaching, including hybrid, distance learning, etc.;
- Creation of innovative centers for attracting venture capital to educational organizations;
- Implementation of a practical approach to education through activation of interaction between educational organizations and employers;
- Constant expansion of the range of digital educational services in accordance with changes in the market environment, including through the active participation of students in the educational service.

Here are some practical examples that confirm the implementation of the new principles of digital improvement of the educational system. For example, in the company "Daimler Trucks North America" ("Sensor data acts as virtual mechanic for Daimler Trucks, 2014") an active service "virtual mechanic" was developed. The Cabinet of Ministers of Great Britain has transferred to work the inter-branch program TW3 (Way We Work), which is an integral part of the government program on the digital economy. The goal of the TW3 interdisciplinary program is to create acceptable conditions for all employees in the form of modern workplaces providing quick adjustment to new tasks and including the required information and telecommunication tools, labor protection, etc., ensuring the reduction of various encumbrances of personnel (Kupriyanovskiy et al. 2016).

There are also successful examples of introducing IT technologies into the entrepreneurial sphere in Russia. One of the leaders in terms of investments in the development of digital technologies is Sberbank, which organized their work on a one-stop-shop system. The essence of this system is not only the performance of a variety of banking operations for the client, but also the provision of various government and commercial services: from the doctor's appointment to registering the passport. Thus, clients do not need to apply to different instances, they can make all transactions and make inquiries in one branch of the bank.

It is IT technology that provides an increase in profitability: according to MIT research, companies with 50% of the revenues from digital systems have generally higher incomes and higher profits, than conventional companies in the same industries.

These examples show that the formation of new business models in the context of the introduction of IT technologies makes it necessary to rethink not only educational but also professional standards in the context of the introduction of artificial intelligence and robotics. This means that the education system shall create conditions and become attractive not only for venture capital, but for talented specialists.

The introduction of information and communication technologies in the education process inevitably causes the growth of the society's expenses for education, but the cost input for students on educational programs will decrease as the education is online, which does not require the direct presence of the student in a classroom. Consequently, the costs for maintaining the material and technical base of the educational organization, purchase of supplies, remuneration for teachers, etc. will also tend to decrease, and as a result, the amount of tuition fees will decrease.

In the age of digital technologies, online education will become a priority form of education (Yu.A. Makarina, 2017; A. Makeeva, 2017; E. Sakharova, 2017; S. Stelten, 2013; S.K. Callaway, 2012), as its provision requires only a computer, Internet connection and the basic skills in IT. The availability of online learning can be expected to increase for the majority of the population.

So far, researchers have demonstrated that the features of e-learning enable the following:

- Educating in various forms, including synchronous and asynchronous, as well as mixed typed;
- Implementing different ways of communication of participants in e-learning;
- Using modern information and communication teaching aids (simulators, tests, simulations, imitation modelling, etc.);
- Provision of necessary access to systematized electronic libraries;
- Organizing joint work of students of distance learning in the mode of web-seminars and videoconferences (Peculiarities of the e-Learning system, 2017).

Network communication with the professional and expert community, for example, through the LinkedIn web-site, opens great prospects for education. By referring to this site, tutors can implement a demonstration of their abilities through a digital portfolio or resume. In future, active interaction of educational organizations with social networks will allow "closing" the currently vacant niche of social networks managers. Social networks management is one of the most popular areas of labor market development, in particular, online identity management in social networks.

In the scientific component of the educational process, the digital platform Networking Academy realizing the idea of "learning scientific DNA" is promising for Russian practice. The researches based on the Cisco design (D. Frezzo, 2017), are used to create a variety of teaching tools, courses, boot cameras and academic programs and large data.

Recognizing the prospects for the education development in virtual environment, the society, at the same time, does not diminish the possibility of hybrid learning combining electronic and traditional (classroom) forms of learning. Speaking about this direction, the "makerpace" technology, i.e. the organization of a joint working space within an educational organization that maximizes opportunities for creativity and the introduction of innovations in the educational system, seems to be useful for the Russian educational practice. This ensures the development of practical skills necessary for future graduates in the digital economy. Active use of multimedia technologies in education allows students taking notes directly online on the monitor of their computer or smartphone.

The value of hybrid education technology is also determined by the fact that the tutor retains a leading role in the learning process: having the ability to assess the progress of each student, and demonstrating personal competence, it is the teacher who can motivate students to expand constantly knowledge, skills, and habits. At the same time, no, even the most modern educational technology, can provide such a motivation, without the participation of the "teacher factor".

5. Discussion

The research materials were based on the analysis of international experience and Russian practice of building a digital economy, acting as a catalyst for reforming the educational system at all levels of its hierarchy, in all areas and forms of education.

The concept of the developed legal regulation for developing digital economy in Russia defines the strategic goals and indicators of the development of education, its tasks, principles, and directions for improvement.

Further perspectives of the scientific development of the problem lie in the field of research into the practical implementation of the e-learning concept, for example, in the implementation of the idea of a "digital city", "smart" and environmentally friendly home, using 3D-printers, including producing innovative products, popularization of electronic outsourcing with the participation of educational organizations.

6. Conclusion

The rapid penetration of digital technologies into all spheres of societal life sets fundamentally new tasks for the education, and the solution to the tasks requires the full correspondence of the content of education with the requirements of digital economy.

This manuscript investigates the main trends of its development in international and Russian practice. The regulatory and legal framework for state regulation of digital economy in Russia is analyzed; the framework forms the conceptual basis for the reformation of education and defines the vector of the ongoing reforms. The strategic goals of digital development of education and indicators of its evaluation are specified; tasks, principles, and directions of improvement are defined.

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