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Reducing global risks in the process of transition to the digital economy

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Abstract. In the context of starting period of implementation of a grand-scale comprehensive program for the development of a new technological generation economy, a detailed consideration of the possible scenarios of the digital economy transformation and study of various approaches to its implementation become fundamentally important. Presently a group of authors of Peter the Great St. Petersburg Polytechnic University have undertaken a comprehensive study dedicated to this issue. More than two hundred primary sources of reference have been analyzed. Several main groups of risks associated with the shift to global digitalization have been defined and classified with reference to the results of the research undertaken. In order to specify the ways of adaptation to the circumstances and facts of the digital economy, the researchers have analyzed the experience of several leading enterprises which use digital technologies in their work. The research results described in this article provide the basis for draft recommendations on reducing the likelihood of the occurrence of the risks revealed.

1. Introduction

The concept of the Fourth Industrial Revolution was defined in 2011 at Hannover Fair. The world's largest economies (China, Germany, South Korea and the USA) are already engaged in the development of new business standards and the introduction of the Internet infrastructure in key industries. Russia introduces new technologies along with other countries.

Global changes in the organization of scientific, research, technology and innovation activity lead to the emergence of the following factors that are significant for the development of any country: innovation cycle compression; blurring of discipline-specific and industry-specific boundaries in research and development; sharp increase in the volume of scientific and technological information, the emergence of crucially new ways of processing this information.

One can observe change in the forms of organization, hardware and software tools involved in research and development process; there has been an increase in international competition in attracting talented and highly qualified personnel; the role of international standards is growing more important; a particular group of countries which occupy a dominant position in the sphere of research and development can be distinguished. These conditions necessarily imply emergence of some new groups of risks in the course of the digital economy transformation.

It is known that even the original author of the concept of the Fourth Industrial Revolution, Klaus Schwab, the founder and permanent President of the World Economic Forum in Davos, noted that “...



the change is so profound, that, from the perspective of human history, there has never been a time of greater promise or peril.” [1].

L.A. Chaldayeva and A.A. Kilyachkov, the representatives of the Financial University under the Government of the Russian Federation, state that the reason for this is that “... the digital economy at the first stage of its implementation and development will create more problems than it can solve. Nevertheless, it is impossible to back out of it..., otherwise intellectual and technical progress will not “open the way” to movement towards perfection. Consequently, risks are to be foreseen, prepared for, minimized, and avoided as far as feasible.” [2].

The report prepared for the conference held on January 12, 2017 by the OECD (Organization for Economic Cooperation and Development) in Germany points out a number of problems arising from the reduction in the cost of collecting, storing and processing data, increasing computational capability, more and more typical penetration of social and economic activities in the Internet. It is argued that technology, smart applications and other innovations in the digital economy can improve service and help to solve policy problems in a wide range of areas, including health, agriculture, government, taxation, transport, education and environmental resources management. Information and communication technologies contribute not only to incremental innovations in products, but also to innovations in processes and organizational development.

Digital technologies as growth accelerator can be disruptive, which has a far-reaching influence on productivity, employment and well-being. While new technologies provide an avenue for businesses, employees and citizens to get involved in economic activities, these same technologies can outcompete the workers who are assigned specific tasks and can further increase the existing deficiency in access to digital technologies and use of them, which, in its turn, will contribute to further rise of inequality. The report presents an assessment of the effectiveness of the G-20 economies in terms of digitalization and covers some of the most pressing policy issues in the areas ranging from access to digital infrastructures to digital security. It provides 11 key policy recommendations that can form the basis for the comprehensive G20 digital agenda. In general, the purpose of the report is to specify the areas of activity that will enable the G-20 countries to maximize the benefits of an increasingly digitized global economy [3].

Carl Bildt, the former Minister for Foreign Affairs of Sweden, in his article “Securing a Digital Transition”, published in January 2018, notes the growing significance of ensuring cyber security. In his opinion, without creating new state-owned cyber-threat management infrastructures, the opportunities which are afforded by digital technologies could be squandered. He also dwells on the broader problem of a significant lag in actions to ensure global stability in relation to the speed with which the world is entering the digital age. What is more, the Westphalian model of international relations is becoming even more outdated in the context of the digital transition [4].

The materials of the United Nations Conference on Trade and Development, held in April 2018, describe the impact of e-commerce on business, entrepreneurs and consumers. It is argued that many well-established practices will be disrupted. The requirements for employee skills will be subject to change, many jobs will become redundant and some new ones will be created due to automation. The benefits of will be enormous, like they were during the periods of previous large-scale economic transformations, but they will not be the result of a smooth, low-cost transition. As a rule, the outcome will depend on the policy pursued at the national and international levels. Maximization of the benefits of these transformations and ensuring their equitable distribution will depend on the capabilities of the countries in the wide range of policy areas. It is an integrated political approach to digitalization and trade that provides for making a step in the proper direction towards recognizing the right of developing countries population to join the new world of technological progress and benefits [5].

For example, in China digitalization is already recognized as one of the priorities for the development of the country's economy. Andrew Sheng, Distinguished Fellow of Asia Global Institute, University of Hong-Kong, in his report at the International Financial Symposium, held in Tokyo on February 22, 2018, cites the data obtained from the analysis of Chinese economy beginning from 2008 and presents a description of China's transformation to the digital economy alongside with a forecast of the country's

advanced development up to 2030. Furthermore, covering the issues of the development of digitalization, he specifies three forces of digitalization, which by 2030 will have managed to shift (or create) industry revenue pools by 10-45%: disintermediation (automation), disaggregation (provision of individual services) and dematerialization (3D modeling and virtual reality) [6].

2. Classification of the risks involved in the digital economy implementation

There is a group of factors which are a source of concern for modern scientists and which are associated with the fact that people who shape a strategy for social and economic development may lack innovative thinking. It causes a number of risks at the level of states governance.

a) non-conjugacy of the rate of technical changes and the evolution of the mentality of managers;

The digital revolution is creating paradigm-changing approaches that bring dramatic change to interaction and collaboration strategies used by individuals and institutions.

In this context, for Klaus Schwab “decision makers are too often caught in traditional, linear (and non-disruptive) thinking or too absorbed by immediate concerns to think strategically about the forces of disruption and innovation shaping of our future.” [1].

According to Sergey Glaz'yev, Advisor to the President of the Russian Federation “in the process of technological paradigm shift, the structure of demand for scientific discoveries and inventions is changing. There has been no call for many of them for a long time since they do not “fit” into the production and technological systems of the prevailing technological paradigm. It is only when all the avenues of its growth get exhausted the need arises for conceptually new technologies; the competitive procedure of their selection establishes the baseline for technological paths.” [7].

b) the withdrawal of international trade and finance beyond national jurisdictions;

Advancement of a new technological paradigm fundamentally changes the entire system of management of global socio-economic processes.

This group of risks can be related to the emergence of specific cross-border management systems of economic, social and political processes which have impact on the national interests of states and their associations.

The basis for such systems is provided by global social information and trade information networks and digital currencies, the Internet of things and other pooled information transaction tools that take international trade and finance beyond national jurisdictions.

The state government and regulatory system appears to be failing to keep pace with the challenges issued by new technology options. Consumers may disengage themselves from state provided systems that protect their interests; they may rely upon network security systems and use blockchain technology and smart contract system [7].

Legal uncertainty, ethical problems, increased fraud, quality and responsibility reduction, “robotization” of people, increased social alienation — all these aspects were covered in a number of foreign publications and in the report by N. Kasperskaya [8, 9].

c) constantly mounting level of cybercrime and the need for ensuring greater cyber security of the entire digital space;

The third group of problems is related to ensuring security in cyberspace. Cyber-violations are a serious threat to business today. According to some evaluations, businesses annually spend 400 billion US dollars to cover damage from cybercrime [8].

The most troubling issue in terms of the Internet of Things is that cybercriminals find practically no difficulty in hacking supposedly secure systems characterized by several levels of protection. Overcoming the problem of ensuring security of the Internet of Things devices is an area which is subject to improvement. Security issues associated with the Internet of Things technology devices become particularly topical in the framework of provisions for the emergence of the Internet of Things ecosystem, where billions of objects will be connected to the Internet and interconnected.

There emerged a new type of crime – organized cybercrime. The use of new digital technologies and fast analysis of big data amounts allow us to prepare realistic economic projections, which means that there comes an era of prognostic economy which is based on the most customized consumption model.

Customization results in orienting development of competition between manufacturers towards the struggle for the information about the preferences and dreams of the customer, for the databases reflecting the lifestyle, the health condition, the hobbies, which increases the risk of unauthorized access to personal data and its theft.

International competition for political and economic influence in the framework conditions of the digital economy development contributes to the emergence of new threats to economic security. Preventing and eliminating digital economy threats and risks, ensuring security of information environment has today formed the basis for the competitiveness of man, business and the state [10].

Development of a modern economy based on the use of the advanced digital technologies, creation of new materials, analysis of large data sets, development of new control systems, leads to a change in the principles of competitive relations. Competition takes place not only for the existing markets redistribution, but also for building new markets for goods, services, and technologies; competition of management systems based on new digital platforms. In this context, the digital economy changes the fundamental nature and awareness of the economic security of the state, business, household, individuals, poses new threats and risks for the participants of economic processes and relations [11].

d) social consequences of broad-scale digitalization of production sphere associated with the release of employees and job cuts;

This group of problems reveals itself in the course of production digitalization. Innovations in information and other breakthrough technologies often contribute to increasing productiveness by replacing the existing workers, rather than by creating new products that require additional labor for production. According to American scientists from the Oxford Martin School, only 0.5% of the US workforce is engaged in industries that did not exist at the beginning of the century; less than 8% of new jobs were created in the eighties of the last century and 4.5% of new jobs in the nineties. This is confirmed by the latest US Economic Census, which provides interesting information about the relationships between technology and unemployment [12].

In order to make the advantages of digital technology of organizations in the real sector of the economy to be fully manifested, their balanced development is necessary. If one of the segments of real production will work to the highest standard and at a growing rate, using digital technologies and the other one will perform slowly and poorly, using outmoded equipment, it will result in their collective slow and unsatisfactory performance [13].

General public is getting more and more concerned about the risks resulting from the implications of automation which is gaining pace. Loss of jobs, unemployment, social tension, emergence of a work-shy population group – these are just a part of the list of the possible consequences.

The risk of decline in professional skills can be attributed to the same group. The changing nature of industrial markets, broader options for production and implementation of new technologies mean that a skilled and flexible workforce will play a vital role for the future productivity and competitiveness of the real economy sectors. Changes in the requirements for the qualifications of workers also cause an increase in demand for a higher level of qualification for managerial personnel as well; therefore, both managerial and professional skills are essential for the effective functioning of industries [14].

At the same time, at the stage of introducing the digital economy, it will be psychologically “unprofitable” for workers to be a professional in their field of activity, since old professions will die off and during the active working life a person will often be forced to change profession several times. This situation encourages indifference to the need to take effort to train professional skills, for after 5–7 years of professional career one has to train again, spending time and money.

e) risks of de-professionalization and the need to create a sustainable system of continuous retraining and new knowledge acquisition;

In the context of the digital economy development there arises a need for reorganization in the education system. New professions replace the old ones. Consequently, it is necessary to revise the existing educational programs and develop some new ones, which will entail reconsideration of educational standards in all countries. The requirements for training teachers will be subject to change in many instances. When implementing the principle of lifelong education much work will be assigned

to the system of advanced training and professional retraining. There is also a need to train new engineering elite — the highly qualified personnel [15].

The starting period of the implementation of a large-scale comprehensive program for the development of the economy of a new technological generation, the so-called digital economy, sets new challenges for the engineering education system of Russia. Presently, 158 federal state educational standards in the field of education “Engineering, Technology and Technical Sciences” have been developed on the basis of the revised professional standards. Analysis of this data file provided a basis for structuring a collective competence model of an engineer corresponding to the needs of global digitization of education [16, 17].

f) the risks and benefits of a new sharing economy;

Change in the nature of market competition can also pose a number of new risks. Entrepreneurs who intend to develop pivotal production industries in the conditions of the digital economy formation period will have to take a new look at the spheres other than the production sphere and somehow related to the life of society, ranging from modernization of health care and education systems to the issues concerning food safety and ease of transport traffic. Conventional scenarios of development, characteristic of the twentieth century, will turn out to be inoperative. Industrialists will have to build new relationships between the economy sectors which haven’t overlapped before; they will also have to grow awareness of the political situation aspects they have traditionally been neglecting. Otherwise, all the leading sectors of the global economy will be put at risk of disruption [18]. Natalya Kasperskaya notes that there is an emerging risk of rapid seizure of new markets by transnational companies [9].

One more group of problems is associated with the anthropological shift and is described in detail in the works of Ye.S. Larina [19]. The essence of the anthropological transition is to divide humanity not even into new castes, but into species. Along with the familiar algorithmized humanity, a new type of people is expected to emerge, qualitatively different from today in their intellectual potential, health, longevity, adaptability to different environments, etc. The new anthropological shift is based on three distinctive technological packages: these are various types of interfaces and ways of establishing connection between computing devices and the human psyche and brain; designing and miniaturization of gadgets that allow people to exist in holographic augmented reality; a variety of engineering applications of synthetic biology and bioengineering in their most advanced forms.

3. Discussion

When we consider the possibility of reducing the risks associated with a lack of innovative thinking that may be characteristic of the key decision makers at the state level, it becomes evident that no quick decisions can be made. The matters in question are the development of flexibility of thinking, analytical skills and use of a systematic approach.

Many surveys aimed at eliminating risks at the level of state government have already been carried out, a number of proposals have been made, and several projects are being executed for their implementation. This refers to organization of management using big data technology, analytics and forecasting. There has been a significant increase in the redistribution of the share of value added in favor of information-intensive industries, such as finance, media and telecommunications. This increases the risk of information leaks, which results in the requirement to increase the level of protection. New development activities are constantly being carried out on this sphere by the companies which occupy leading position in the market for systems which analyze the level of security and compliance with the standards, as well as protect web applications. In many countries, special standards are being developed that establish information security requirements for financial organizations and operators of payment systems.

The main tasks of ensuring cyber security have already been highlighted: they are protection of personal data of an individual; security of commercial information systems; security of information systems of state structures; protection of the working environment, technology and tools.

Prevention of the risk of corruption can be achieved by organizing permanent and continuous monitoring of the actions of a potential lawbreaker and the identification of personal expenses incurred by the person.

Risk prevention in production sector can be achieved by implementation of innovative projects with high commercial potential provided that their interaction has been thoroughly planned and they have been coordinated with the real economy.

The risks associated with digitalization that are characteristic of the education system can be prevented by use of an integrated approach which implies establishing partnership between educational institutions, employing organizations and ministries involved in the development of science and education.

By no means all the contemporary studies favor the scenario of the possible anthropological shift. It is commonly treated as some surreal forecast concerning the development of society in the context of scientific and technological advance acceleration. Providing that the above listed groups of threats are prevented, the risks of this group tend to vanish. There is also a path oppositional to the fourth industrial revolution transformation: the search for technologies that will be both economically significant and not related to digitalization.

4. Conclusions

To present the result of the research undertaken the authors of the article propose the following list of recommendations for reducing risks which refer to the groups specified:

a) the rate of policy-makers' frame of mind development is not in congruence with technical innovation pace;

It also concerns changing the existing approaches to shaping the future managerial elite; forming the relevant qualities in governmental officials; developing a new universal request to the international education system. It is necessary that digital technologies should become the subject of national and supranational regulation during the period of the next 3 to 5 years.

b) withdrawal of international trade and finance beyond national jurisdictions;

Securing closer international cooperation aimed at improving the procedure for information sharing, providing mutual assistance and taking joint measures to achieve digital economy transformation.

c) constantly mounting level of cybercrime and the need for ensuring greater cyber security of the entire digital space.

Systematic exchange of data on information incidents and protection technologies between companies and public organizations at the international level; increasing the competence in information security of IT professionals, all services of companies and government agencies, the organization of the interaction of business units; organization of security measures and protection not only of the main objects of the economy, but also of security-critical infrastructure; increasing the security of banking and payment systems; constant media coverage of the results of the fight against cybercrime; popularization of information security in the framework of school education; stronger technical support of information security of automated control systems; legislative regulation of cyberspace, development of programs which detect cybercriminals and taking other measures to prohibit the use of cyber-weapons at the international level.

d) social consequences of broad-scale digitalization of production sphere associated with the release of employees and job cuts;

Designing computational tools that in terms of usability should stand well above those that are presently involved in actual production. Development and implementation of advanced training programs in production sphere. Building career management systems at manufacturing enterprises.

e) risks of de-professionalization and the need to create a sustainable system of continuous retraining and new knowledge acquisition;

Formation of new competence profiles of educational institutions graduates in compliance with the requirements of the digital economy development.

f) the risks and benefits of a new sharing economy;

Companies should begin to implement the technologies of the Internet of Things, aligning to the already developed marketing strategies that take into account the array of risks involved in the use of digital technologies.

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