

Quality of Digital Transformation Management on the Way of Formation of Innovative Economy of Russia

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Abstract

The article actualizes the problem on transition of the Russian economy to the path of technological development that can provide a fundamentally different quality of economic growth. The state innovation policy is uncovered from the standpoint of stimulation of advanced development of essentially new hi-tech economy sectors and markets, carrying out deep technological modernization of traditional industry branches and productions. The management quality of digital transformation of business is considered as a reasonable necessity in the conditions of large-scale and deep technification of society. The article reveals contemporary concepts and peculiarities of the Russia's approach to the implementation of technological breakthrough, as well as provides description of the program documents at the national and regional levels targeted on the development of the digital economy. The authors outline the range of tasks in the field of digital transformation, specifying the timing of their implementation and expected results, as well as offer the model of digital maturity of business and present the evidence of existing interrelations between corporate financial indicators of the company and the level of its digital maturity. The conclusion is made about the necessity and inevitability of Russia's transition to a new development model, which will be found on knowledge-based and innovation-driven high-tech industries. It is emphasized that the digital transformation should become a national idea, the practical embodiment of which in each national company and the entire Russian economy will allow rapidly transiting to the correct path of sustainable development and restoring technological leadership in the global space.

Keywords: management quality; Industry 4.0; digital economy; digital transformation; Russian economy; innovation policy.

1. Introduction

The objective of the present article is analyzing the state of the Russian economy at the stage of digital transformation, its compliance with global technological trends and economic transformations, as well as assessing the country's ability to restore its technological leadership.

The relevance of the research becomes apparent in the conditions of Russia's technological lagging behind against the backdrop of digital breakthrough by world powers (Shwab K., 2016). The complexity of Russia's situation is explained by a number of circumstances. First of all, by the strong dependence of the national economy on commodity markets, making it more difficult for a country to remain competitive in the international market. The transition to the innovative development model of (Leydesdorff 2012) requires the presence and continuous improvement of its participants' core competence, which is the ability to continuous learning, readiness to continuously acquire new knowledge in emerging technologies. This is a key factor for successful professional growth in the modern digital world.

Changing mentality should be considered the second important factor in the progressive development of the country. In Russia there are still companies that believe that information technology is a threat to the traditional way of running business.

Even for companies which understand the need for integrating into digital reality, it is difficult to realign. The most difficult change for Russian companies is the restructuring of the corporate culture and business processes of organization.

Thirdly, in the country there is a serious shortage in qualified personnel in the field of information and communication technologies. This problem, as the best world practices show (Ansell and Gash 2008), must be solved at the level of both educational organizations (appropriate educational programs) and through the implementation of corporate training programs in companies, as well as in the form of state support to implement the state program on the development of education in the field of information and communication technologies.

Finally, the unfavorable economic situation affects companies' investments in fixed assets (Leuz, et. al. 2003), including investment in the acquisition and implementation of new technologies. The venture capital market as an important element of the digital economy, also suffers from this circumstance. Thus, in 2015, due to the deterioration of the macroeconomic situation, the Russian venture market decreased by 2 times compared to 2014. Although Russia has created a relatively effective mechanism to support business projects at the early stages, at the subsequent stages these projects are mostly not supported by Russian business. As a result, companies grown by the local venture

market are entering the markets of other countries due to limited access to further financing in Russia.

2. Methods

The authors' studies are based on a comprehensive approach to the choice of methodological tools, which include methods of statistical, comparative and abstract-logical analysis, simulation, formalization, inductive-deductive method, and general logical methods that are applied to the analysis of economic development indicators of Russia and foreign countries. This approach allowed conducting analysis of the digital economy development trends, assessing the state of the Russian economy at the stage of the digital economy formation, and offering digital business transformation models. The use of strategic documents and official data of authoritative Russian and international organizations allows asserting the validity of the obtained results.

3. Results

3.1. Modern approaches to the new management quality of digital economy business models

The cross-cutting penetration of technologies into all sectors of the economy (Westerman, et. al. 2014) as digital (intangible) assets, as well as in the form of new business models and the industrial Internet of things determines the formation of large amounts of economically significant sectoral and cross-sectoral data. At the same time, the technological coverage of the social sphere in the form of communication technologies and the Internet of things, where almost every household item and the world around is connected to the global digital space, forms the preconditions for the use of relevant data to assess and predict economic development. Thus, as people, business, and equipment are becoming more closely linked in a single digital space, digitalization offers broad opportunities for new decision-making models, becoming the basis for the current global economic and social transformations, which change business and consumer models, as well as models of social service provision and economic activity of the population.

The potential for digitalization to provide data for informed decision-making creates the preconditions for the emergence of competitive advantages of states, as well as businesses at the national and global levels (Moskowitz 2014). However, in order for data to gain value and become a new productive force, giving a competitive advantage, systems for processing data need to be analyzed, tying up into the systems (networks) and building predictive models. The development of such technologies should go ahead of schedule that becomes possible with the use of new approaches to the management of the economy digitalization.

At the same time, at the first stage, for a qualitative leap in economic growth, it would be enough such amounts of digitized data, at which each subsequent set of new data will lead to exponential growth of effects. The primary and basic task of digitizing the economy is the formation of the necessary infrastructure, incorporating a set of necessary elements (Program for the development of the digital economy of Russia until 2015).

The basic element of the digital infrastructure is providing universal accessible connectivity to high-performance broadband Internet networks. Universal access to the Internet will help developing the benefits of the "Internet of things" both in industry, business, and everyday life. According to the most modest estimates, more than 100 billion devices around the world will be connected to the Internet by 2045. These things will be mobile and portable devices, instruments, medical devices, industrial sensors, security cameras, automobiles, clothing and other high-tech things. All these devices will produce amounts of information that will revolutionize the operation technologies and dramatically change the quality of life. People will use infor-

mation obtained through the Internet of things to make smarter decisions and gain a better understanding of their own lives and the world around them. At the same time, devices connected to the Internet also automate many tasks of monitoring, management and repair, which currently require human labor. The integration of the Internet of things, analytics and artificial intelligence will create a global network of smart machines which would conduct a huge number of critical business operations without human intervention. Although the Internet of things will improve many aspects of economic efficiency, public safety and labor productivity, it will also require additional measures to ensure cyber security and protect privacy.

A second essential element of the digital infrastructure is the use of digital platforms (Chaudari, et. al. 2017). Currently, there are many digital platforms that provide markets for goods, services and information, rendered both physically and digitally. State digital platforms represent a digital ecosystem, a technological environment with an application programming interface (API) that provides services and software for managing citizens' life situations, as well as a platform, where contracts are formed between the state and various categories of stakeholders interested in obtaining public services. Public platforms can provide also free services, based on the processing of open big data for both business and people. Platforms-offering companies are becoming one of the basic elements of the new economy.

Investments in national digital platforms should be increased. The digital technologies development should be incorporated in all programs and plans for socio-economic development. Private companies involved in the development of digital platforms should be provided with most easy access to loans, subsidies, tax and other financial benefits. In order to unlock the potential of digital platforms for business development, the following should be taken into account.

1) State policies should aim at simultaneously promoting and facilitating the creation and use of digital platforms in the business environment, including the small and medium-sized enterprise sector, as well as informing the society concerning the multiple benefits that the platforms offer to businesses across the global market;

2) Both business and government, intentionally or unintentionally, can reduce the benefits of platforms by imposing restrictions and barriers. It is necessary to encourage businesses to manage digital platforms in terms of maintaining interoperability and competition at the expense of engineering solutions. It is necessary to avoid conservative regulation which conflicts with the specified objectives. Achieving noted goals will require more effective coordination between business and the state. The digital platforms created by civil society are extremely important as a source of open data, significant for building state economic policy and feedback with the population. Digital platforms offer opportunities for sharing data among different stakeholders, thereby creating favorable conditions for analytics, forecasting, and multifunctional services.

Creation of appropriate structures for storing information is very important element for unimpaired operation of the digital infrastructure. Taking into account the volume of devices connected to the digital space and the general digitalization of the economy, the amount of data is growing exponentially (Digital transformation and the high-performance enterprise). In this regard, the role of high-tech solutions for safe, reliable, long-term storage of "big data" is growing continuously.

The technologies of processing "big data" are the fourth element of the digital infrastructure. To simplify the large-scale transition of business to digital platforms, it is necessary reducing the cost of computing power. Solutions in this area will determine competitive advantages and will reduce the threshold for micro business to enter into the information services market (Westerman, et. al., n.d.).

Finally, the creation of a trusted digital space for storing and processing of "big data", as well as for the authentication and

identification of the actors involved in digital economy in the digital space will increase the level of involvement of business and the population into the digital economy and provide high-quality digital services.

One cannot but agree that in a digital economy, data become a form of capital. The formation, accumulation and use of such kind of capital require close cooperation between the state and business, the state and civil society, as well as business and civil society. However, economic benefits are given to those states and economic entities which have not only access to data, but also effective technologies for data processing.

High-quality economic growth is possible through the implementation of technologies that allow assessing the most accurately the current condition of markets and industries, as well as predicting effectively their development, and responding quickly to changes in the national and world market condition.

Modern approaches to the new quality of management at the level of industrial enterprises and the state should be based on the following basic management principles:

- ❑ real-time data acquisition;
- ❑ economic process management based on automated processing and analysis of big data;
- ❑ high-speed in decision-making, real-time change of rules, the instant response to changes, and interactivity of the environment;
- ❑ tailoring to specific user, the life situation of customers as a business process;
- ❑ one-touch solutions;
- ❑ the digital ecosystem is understood as a center of synergy between the state, business, and citizens.

The key to success in the digital economy, highly competitive and transboundary, is not technology, but new models of technology and data management that enable rapid response and simulating future challenges and problems for states, businesses, and civil society.

3.2. Global experience in solving the problems of breakthrough development of the digital economy: foreign and Russian practices

To build strategic guidelines for the state innovation policy in Russia and to plan the tactics of its implementation, companies consider it important to study the best practices of digitalization of the economies of a number of countries, among which the Asian region primarily attracts attention (Fedorova 2017a; Knyaginina 2017). Thus, in 2010, China announced the priority development of technologies called "Internet of things", and began working on supporting initiatives. "Made in China 2025" and "Internet+" strategies were implemented, which defined a new vector of the country's economic development, in which digital technologies play a special role as the main driver of the qualitative transformation of each economy sector. China implements systematic tools of the state support directed on technology development of the Internet of things in areas such as tax regulation, public funding, development of uniform standards, and implementation of pilot projects. For example, high-tech industry enterprises are taxed on profits at a reduced rate (15% against the standard 25%), while software developers are exempt from income tax for two years and pay 50% of tax liabilities in the next three years. The state has established the R&D support fund to promote as well as develop applications and services through grants and loans: the volume of investments in 2015 amounted to \$1.6 bln. In addition, China has taken a leading role in the development of common standards of the Internet of things and supports the establishment of an International Association on these standards (Made in China 2025: Global Ambitions Built on Local Protections, 2017).

In the context of infocommunication development index, South Korea in 2016 became a leader among "digital powers" and together with Japan and China occupies a leading position

in the testing and development of mobile technologies, ahead of the countries of North America and Europe. In South Korea, with the active support of the state, leading companies begin to invest independently in breakthrough digital technologies. Thus, one of the largest telecom operators in the country namely SKT indicated its intention to invest more than \$4 bln in artificial intelligence technology and the Internet of things. By the 2020 the country plans to abandon the minting of coins and replace the paper money circulation by digital payment systems.

High transactions rates and trust in online payments is typical for the whole South-East Asia. Thus, WeChat, Chinese competitor of Facebook messenger, with a user audience of 600 million people has sent 32 bln mobile money transfers in just 6 days that is more than PayPal services for the whole year. The Indian mobile payments market is growing rapidly: in 2 years the volume of transactions has grown by 289.3%. In Viet Nam and Singapore, this indicator is kept at the level of 17%.

Singapore, which aims at becoming the first smart nation in the world, is actively implementing personnel development program in the field of data analytics, smart robotics, big data and cloud computing, thereby demonstrating the desire for technological education of the population in order to support industrial development and business interests (Fedorova 2017b).

Thus, the countries of the Asian region, using the tools of operational management of digital modernization, show the world a grandiose "digital leap" not only in the sphere of innovative developments in the sector of information and communication technologies, but also in the digital economy, which includes information and communications technologies (ICT). According to experts' forecasts, it is exactly this region that will set new trends in the development of the digital economy in the coming years. For Russia, as a strategic partner of the countries situated in this region, it is fundamentally important to meet the set trends, increase its technological potential, including the use of the latest ICT in the development of the digital economy, in order to be within the mainstream of technological development.

In Russia, a key element of state policy in the scientific and technological sphere was the adoption of a range of legislative acts. First of all, this is Federal laws No. 127-FZ "On science and state scientific and technical policy" of 23.08.1996, No. 172-FZ "On strategic planning in the Russian Federation" of 28.06.2014, and No. 488-FZ "On industrial policy in the Russian Federation" of 31.12.2014, as well as by-laws implementing their provisions. They became the basis for the preparation of a wide range of sectoral (inter-sectoral) and regional strategic planning documents, similar documents of state corporations, large companies with state participation, as well as development institutions. These documents contain the most important elements of scientific, technological and sectoral policies. However, they neither contain integrative vector, nor are focused on the priorities of the technological revolution and the transition to the digital economy model.

The issues related to digital economy development in Russia started since December 2016 in accordance with the program "Digital economy of the Russian Federation" approved based on instructions of the President of the Russian Federation and the Government of the Russian Federation No. 1632-R of 28.07.2017). To ensure digitalization of the country's most important infrastructures, the Federal law has also been adopted on 26.07.2017 No. 187-FZ "On Security of Critical Russian Federation Information Infrastructure". In addition, the strategic documents adopted in Russia by 2017 (Strategy for Innovative Development of the Russian Federation for 2020, 2011; Scientific and Technological Development Strategy of the Russian Federation, 2016) include the implementation of measures to stimulate economic actors in the development of digital technologies and their active implementation in all sectors of economy. These documents include, first of all, Strategy for the development of the information society in the Russian Federation for 2017-2030, as well as the Forecast of the social and economic development of the Russian Federation for 2017 and

the planning period 2018-2019.

The regions actively support the plan of the Russian Federation Government. Thus, Tatarstan has started developing a draft of the regional state program on economy digitalization. The program will consist of nine areas, which include public administration, information infrastructure, public services, and digital public health service. Earlier, the Government of the Republic announced its intention to implement blockchain technology in public administration. In August 2017, the Ryazan Region presented its draft program "Digital economy", according to which the regulatory framework will be adapted, personnel will be trained, appropriate infrastructure will be created, and information security will be provided.

Particular attention in the ICT development in the country is paid to telecommunications and information technologies (Figs. 1 and 2).

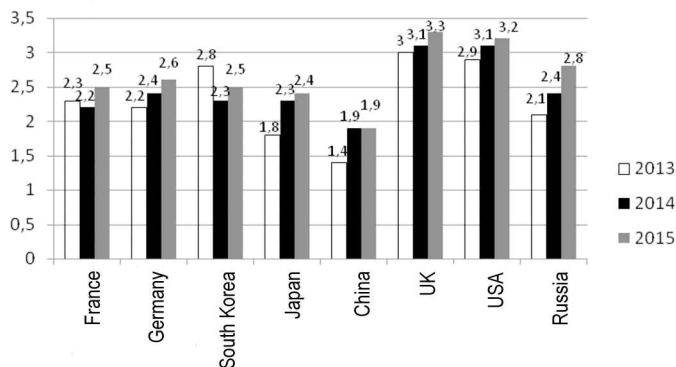


Figure 1. The average number of devices connected to the Internet in some countries, units per person (New technological revolution: challenges and opportunities for Russia, 2017)

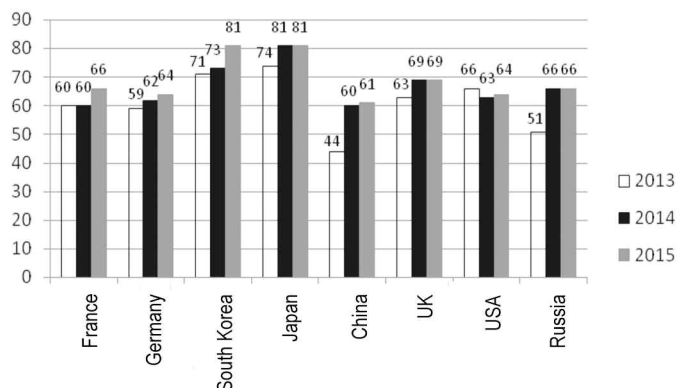


Figure 2. Proportion of people accessing the Internet daily in selected countries, % (New technological revolution: challenges and opportunities for Russia, 2017)

According to the global competitiveness index in 2016-2017, Russia ranked 39th among 138 countries by the number of Internet users (in the previous rating Russia was on 40th position out of 140), which was 73.4% of the population. At the same time, Russia holds the 83rd position among the countries in terms of accessibility of the latest technologies for the population (in comparison with the index of 2015-2016 Russia has rose to 40th position) (Report on the business climate condition in Russia in 2016).

In recent years, in the field of information technology, there have been events that have seriously affected the development rate of this sphere. Thus, import substitution when using software and hardware takes place not only in the public sector, but also in the corporate sector with state participation. Moreover, the Register of Russian software has been created and launched, giving companies the right to participate in public procurement of software. The model of state cooperation on the

basis of special investment contracts with commercial organizations is working effectively in order to ensure the localization of companies' products and the provision of state preferences.

Almost all industries – from the financial sector to commodity corporations – have come to grips for business efficiency and have begun to develop digital technologies. Russian companies do not lag behind the global trends in the implementation of digitalization, and in some aspects seek to set the bar of leadership. Despite the stimulating measures of the Government of the Russian Federation and the adopted package of documents on the creation of the digital economy in Russia, the country does not see the explosive pace of creating digital products and services. The market, which was growing by 30-40% annually a few years ago, decreased its growth rate to 5-10%. The rating of top 20 high-tech companies in Russia has not been updated by ambitious newcomers for a long time. One of the reasons for this situation is the growth crisis. In the Russian high-tech sector it got unique features. Companies, which today could joint global markets, continue feeling themselves like startups; this deprives them of the necessary management flexibility. What is good for starting a business is not suitable for its development in global competition conditions. National digital product developers continue focusing too much on technology. Nor does the product quality fetishization, as the major and often the only factor of success traditional for this market sector, improve the situation. This leads to a very important conclusion about the need for rapid transition of business processes in Russian companies to a digital basis.

3.3. Simulation of digital business transformation management

Global experience shows that the digital transformation of business is a stable global trend, embracing all companies seeking to improve their productivity, services and products quality, and willing to reduce bureaucratic costs (Schuh, Potente, et. al. 2014). Government officials, scientists, economists and other economic agents are puzzled by the question of how the digital transformation affects the productivity of business. Let us turn to the studies devoted to the structural analysis of the digital maturity model (Westerman, et. al. 2014) where an attempt was made to establish the relationship of the company's corporate financial performance with the level of its digital maturity. In the proposed model, the digital maturity of the company is presented in the form of a combination of two separate but interrelated parameters.

The first parameter is digital activity, which is characterized by the volume of investment in technological projects. The purpose of this investment is developing new methods of the company operation, including searching for new ways of interaction with customers, organization of internal processes, and building business models (Solow 2005). Despite the fact that companies, regardless of their industry sector affiliation, choose for investments digital projects that are suitable to them, when analyzing company's investment activity, it is often possible to detect uncoordinated investments or even their duplication.

The second parameter is the activity related to transformation management. This parameter lies in the field of searching for management opportunities to stimulate changes. It includes the presence of a clearly defined desired result, options for selecting the most optimal models of digital transformation management and involvement of users in this process, well-established procedures for interaction of the IT-Department with all structural units of the company aimed at implementing technological innovations. Transformational activity needs to be continuous, and this becomes possible by rational combination of management exercised from the top down, and innovations coming from bottom-up (Schuh, Potente, et. al., 2014). Practice shows that these elements are often implemented quite slowly, and sometimes are characterized by a very high conservatism. As a result, they deprive the company of the opportunity to

invest the necessary amount of funds in the proper innovations.

Various combinations of the analyzed parameters, namely digital activity and transformation management activity, allow speaking about four types of digital maturity (Fig. 3).

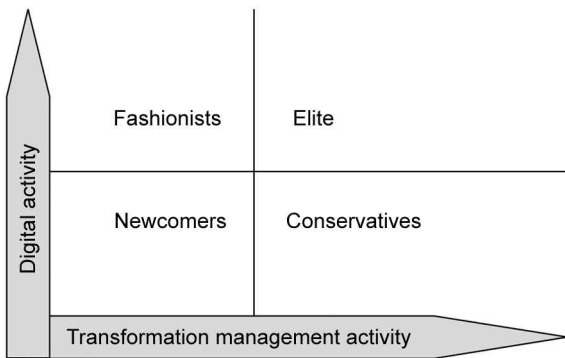


Figure 3. Types of digital maturity (Westerman, et. al. 2014)

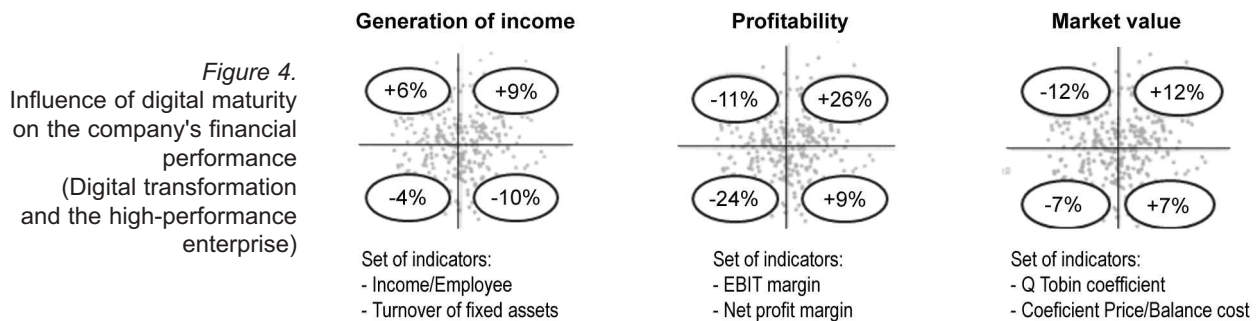
The lower left quadrant of Fig. 3 hosts companies that do not use the latest digital technologies in their practice, i.e. "Newcomers" of the digital world. At the same time this category of companies may aggressively enough implement the traditional tools such as ERP system and e-Commerce. The positioning of the company as a Newcomer may result due to two reasons: conscious and voluntary choice or accidental entry into this quadrant. The unifying attribute of all Newcomers is the lack of knowledge about the existing capabilities of their own company or a small amount of investment into the creation of new technologies that requires the creation of effective management system of transformation processes.

"Fashionists" are situated in the upper left quadrant. They have experience in implementing or experimenting with the latest digital applications, a number of projects have brought them some benefit, while the others brought zero outcomes. Implementation of the projects was carried out without the developed concept, which would have contributed to the synergic effect; therefore, the problems of this group of companies

come from misunderstanding of how to maximize business benefits on the basis of a well-thought-out strategy of digital transformation. However, it is necessary to highlight the strong side of "Fashionists" that is availability of motivation to implement changes into the company activities on the basis of digital technologies. The quadrant of the "Fashionists" is open to companies that require work at the corporate level to improve the transformation management system. At the same time, in some structural subdivisions of the company, specific digital projects may correspond to more serious stages of maturity.

The lower right quadrant hosts "Conservatives", whose distinctive feature is the prudence, repeatedly surpassing the value of any innovative solutions. Conservatives are characterized by a certain dualistic position: on the one hand, they recognize the inevitability of development believing that it is necessary to create a single concept of innovative development, a management system, and a strong corporate culture as means to obtain high returns from investments in the recent technology developments, though on the other hand, these companies perceive modern trends in the field of digital technologies with great distrust and sometimes to the detriment of themselves. Conservatives see a way out of this situation in cautious decisions and reasonable spending in the field of new developments that forces them to abandon emerging opportunities and significantly reduces their competitive strength.

Finally, digital "Elite" is presented in the upper right quadrant. These companies are among the first to realize what benefits exactly can be derived from the digital transformation of their business, and how (Moskowitz 2014). In addition, a clear outline of the transformation is coordinated with a carefully thought-out management system, a verified mechanism for involving users into the transformation processes, and significant resource investments in the opening opportunities. All this together allows "Elite" companies to form a special digital culture, which is a success factor in all future changes in the company. Coordination of ongoing digital projects and investment of new technologies are determinants of increasing the competitive advantages of "Elite" companies in the field of digital transformation (Fig. 4).



Thus, based on the data in Fig. 4, we can draw the following conclusions: firstly, companies with higher digital activity are able to derive much greater profit from real assets as compared to companies that are passive in terms of the implementation of digital policy; secondly, companies showing a more active management of transformation processes, have much more income and achieve greater market value.

4. Discussion

This work makes a certain contribution to the solution of the problem concerning innovative development of Russia, which requires new approaches and solutions (National scientific and technological policy of "rapid response": Recommendations for Russia, 2014) in the context of globalization based transformation (Marsh 2015; Kurakova, et. al. 2015) and technification of society (Hermann, et. al. 2016), as well as in the context of

permanent disturbances of the economic environment, unstable geopolitical situation, and continuing restrictions imposed by sanctions. The obtained results correlate with the conclusions made by scientists at earlier stages of research, namely with the fact that the innovative activity of Russian companies is extremely low, less than 50% of residents carry out their activities in the field of information technologies, while only 22% are engaged in the implementation of high technologies (in instrumentation, nano- and biotechnology, laser technology, etc.) (Labor Productivity. Results of the survey of 500 executives of industrial enterprises, 2017). Besides, Russian companies are most acutely aware of the weakness of the state regulation mechanism with respect of their activities, that is a barrier to innovative development (Shelomentsev, et al., 2016); the problem of innovative entrepreneurship financing on the basis of its performance indicators is still unsolved; there is the vagueness of the innovation strategic guidelines, including the innovative enterprises commercialization management (Gorokhova

and Sekerin, 2016).

5. Conclusion

The solution to the problem of Russia's technological breakthrough seems important not only from the economic standpoint. The formation of a modern technological platform with the use of latest digital technologies will ensure preservation of country's national sovereignty and security. Otherwise, in the context of the growing technological gap between Russia and the technological powers, the country may face a number of various risks. The first category of risks includes those associated with the structural characteristics of Russia's current economic system. The second category of risks involves a set of challenges in the field of human capital and labor market modernization. Finally, the third category is a combination of risks associated with the inability to build an effective management system for the modernization of the national economy in the absence of a clear focus on participation in the new technological revolution.

The success of digital transformations (Chaudari, et. al. 2017) is largely determined by the awareness of all economic actors of the irreversibility of the transition to new technologies. The development pace and success of digital transformation as well as resulting positive effects depend on how quickly the country will come to understanding of the need to integrate modern technologies into day-to-day work and business processes.

Companies should become aware of this reality, change the format, start working, as well as implement new digital services, train the personnel to work with new technologies, the implementation of which is necessary for business development, and encourage employees who have mastered new technologies (Sawhney, et. al. 2006). Most of the company's business processes should be transferred to online mode. This concerns contract negotiation, accounting, logistics, transactions registration, procurement, personnel training, monitoring of relationships with partners and customers, technical support, and much more (Zeng, et. al. 2010). In addition to information systems, it is necessary to implement the appropriate corporate culture in the company. As a result, this set of measures will transform the company into a "digital" enterprise and ensure urgently needed competitive advantages such as efficiency and productivity, as well as will give the potential for further business growth.

Real measures taken by the Russian government to stimulate the development of the digital economy instill confidence that the digital transformation of Russian companies and the entire Russian economy will become a national idea which will embrace all parties interested in the technological breakthrough of the country.

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