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**Professional Culture of the Specialist of the Future**

**TRAINING OF SPECIALISTS FOR "DIGITAL" AND  
INNOVATIVE ECONOMIES**

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***Abstract***

The article is about the peculiarities of training specialists in the field of macro technologies, which form the future of new technological and economic structures, in particular the "digital" and innovative economies. The novelty of the article is the development of conditions for the creative development of specialists, the possibility of improving their qualifications, competencies and educational level, first of all in the sphere of high technologies and subsequent highly effective intellectual activity in new technological and economic structures. The article shows a direct relationship between the training of specialists for the "digital" and innovative economies and the increase in the effectiveness of their development. Conditions for the creative development of a specialist, the possibility of improving his qualifications, competencies and educational level are offered, especially in the sphere of high technologies and subsequent highly effective intellectual activity in future new dominant technological structures. The obtained results show that the "foresight" approach must become the most effective tool for training specialists for the technologies that form the future new technological and "digital" and innovative economy in Russia. In Russia, it is necessary to create conditions, and in Russian universities - a system of training specialists for the "digital" and innovative economies, based on the foresight of the development of critical technologies and research topics for future new technological structures.

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**Keywords:** Innovative economy, labor market, training of specialists.



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## 1. Introduction

"Strategies of the innovative development of the Russian Federation for the period until 2020"<sup>1</sup> (hereafter referred to as the Strategy), based on an assessment of the innovation potential and a long-term scientific and technological forecast, raise the problem of increasing the number of Russian universities that are among the world's top 200 universities according to the world rating of universities<sup>2</sup> up to 4, and the share of income for completed R & D in the structure of funds entering the leading universities at the expense of all sources of financing, up to 25%. For their implementation, the Strategy focuses, in particular, on: 1) adjusting educational standards and introducing new teaching technologies in order to develop the skills necessary for the "digital" and innovative economies; 2) building a system of searching and ensuring the disclosure of talented children's creative abilities (first of all, in the field of science and technology); 3) a significant increase in the quality and prestige of scientific, engineering and entrepreneurial activities, as well as engineering education, including the creation of a special program for the establishment and payment of scholarships for students of engineering specialties, closer integration of training and practice in leading industrial enterprises; 4) redistribution of financing in favor of active research teams by enhancing the role of competitive mechanisms for allocating funds for science and increasing the mobility of scientists in scientific organizations and universities; 5) the formation of a network of leading universities, the development of their research competencies, and the expansion of the implementation of R & D on their basis for the real sector of the economy. The strategy includes, in particular, measures to improve the efficiency of education and science; development of R & D in universities.

One of the basic aims of the "Concept of long-term social and economic development of the Russian Federation for the period until 2020"<sup>3</sup> is the building of human potential in science, education, technology and innovation, including the radical expansion of the "class" of innovative entrepreneurs, the formation of a system of continuous education, adapted to the formation students have the knowledge, competencies, skills and behavior patterns necessary for an innovative society and innovative economy. For an innovative economy, an "innovative person" is needed who can fully use the achievements of science and technology and is focused on creating innovations, introducing them into all spheres of public life.

In this regard, the main emphasis in the policy will be made in the areas of: 1) education and fundamental science will be made on the qualitative increase in their effectiveness within the existing funding, on redistribution from ineffective directions to promising ones and the renewal of managerial personnel; 2) generation of knowledge - the development of "competence centers" in national research universities (NIU) with the subsequent promoting them to the world level of competitiveness.

## 2. Problem Statement

The reform of Russian education has made it possible to increase the demand for young workers and engineering professions by 40%. The number of Russian universities in Top-QS has increased over the period 2006-2016. from 5 to 22<sup>4</sup>. In Russia, since 2015, there have been published about 100 thousand

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<sup>1</sup> Approved by The Government of the Russian Federation on 8.12.2011.

<sup>2</sup> Quacquarelli Symonds World University Rankings.

<sup>3</sup> The concept of long-term socio-economic development of the Russian Federation for the period up to 2020 (approved by the order of the Government of the Russian Federation of November 17, 2008 No. 1662-r).

<sup>4</sup> Results of the last 17 years in Russia: education. 12/19/2017. URL: <https://vz.ru/infographics/2017/12/19/900573.html>

scientific works in the most authoritative scientific journals<sup>5</sup>. However, according to the research "Russia 2025: from cadres to talents" in Russia at present, highly skilled work, where it is required to apply knowledge, perform creative and non-standard tasks, employs 17% of workers (for comparison<sup>6</sup>, in Great Britain their share is 2.6 times, in Singapore - 2, Germany - 1.7, and in the US and Japan - 1.5 times more). For the development of the Russian economy, according to the scenario of outrunning modernization by the year 2025, 4.7 million workers in the category "Knowledge" (this is one of the key indicators of the country's competitiveness) will be required, while it is assumed that in Russia there will be 10.5 million jobs for workers of the highest qualifications. As a result, according to the results of the study of the Russian labor market and human capital "Russia 2025: from talent to talent" by 2025, Russia may face a deficit (> 10 million) of highly qualified personnel (medical workers, analysts, engineers, agronomists, etc.) as one of the main driving forces for the development of its economy, at enterprises of high-technology activities (Plutenko, Leif, Kozyr, & Khaletskaya, 2018), who do not only have a diploma of higher education and possess real knowledge and competence and ability to correctly apply them, to engage in creative and analytical activities, but capable of autonomous adoption of non-standard solutions.

At present, there is a gap between the skills that future specialists receive in universities and the real needs of modern and, especially, future "digital" and innovative economies. According to this study, 80% of the working population due to the current educational system, including the low level of digitalization of education (Machekhina, 2017), the principles of pay and their personal qualities are not prepared for effective work in modern digital labor markets<sup>7</sup>. In particular, according to the service for finding vacancies "Indeed", the number of questionnaires, in which the name indicates the term "blockchain", has increased sixfold since 2015, and the number of vacancies - by 10 times. On the recruiting portal "HeadHunter" as of the beginning of 2018, there were found about 190 vacancies in the field of blockchain, these are the developers of such systems; copywriters, lawyers and marketers for ICO; managers of blockchain-projects<sup>8</sup>; financial analysts at crypto-currencies, etc. Most of all experts on blockchain-books and crypto-currencies are needed by banks and other financial organizations. Applicants, especially developers, in Russian companies are most often offered a salary of 100 to 200 thousand rubles, technical directors for the blockchain - from 400 thousand rubles; in Western companies - a beginner blockchain-developer earns about 15-20 dollars / hour (2500-3500 dollars / month), a developer with experience in the blockchain - 60-100 dollars per hour, (> 15 000 dollars / months). At the same time, despite the high salary, there is a significant deficit of blockchain specialists, including mining engineers, which, according to experts' forecasts, will not close for another 3-4 years<sup>9</sup>. That is, Russia needs to form a new labor market for the "digital" and innovative economies.

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5 Denisov A. Ogorodova: scientific research of Russian universities is recognized in the world. RIA News. 19/09/2017. URL: [https://ria.ru/abitura\\_research/20170919/1505052114.html?inj=1](https://ria.ru/abitura_research/20170919/1505052114.html?inj=1)

6 Study: Russia is an incompetent resource colony. 10/31/2017. URL: <http://ktovkurse.com/rossiya/issledovanie-rossiya-nekompetentnaya-syrevaya-koloniya>

7 Stepanova A., Diatlikovich V. Talent management: where to get 10 million professionals for the new economy. 10.27.2017. URL: [http://tass.ru/ekonomika/4680191?utm\\_source=smi2.ru&utm\\_medium=referral&utm\\_campaign=smi2\\_exchange](http://tass.ru/ekonomika/4680191?utm_source=smi2.ru&utm_medium=referral&utm_campaign=smi2_exchange)

8 Starting in 2017, Russian institutions of higher education began to open educational programs for the training of managers of blockchain projects, in particular, in the Russian Academy of Economics. G.V. Plekhanov opened a master's program for their preparation.

9 Degotkova I. Profession of non-traditional orientation: whom will be fired by the blockchain / Moskovsky Komsomolets, No. 27590. 15.01.2018.

December 23, 2017 at the congress of "United Russia". President of the Russian Federation V.V. Putin said<sup>10</sup>: "The Russian school must be among the best in the world in terms of quality and breadth of education, and our colleges, technical schools, universities must create the leading standards in the training of workers, engineers, scientists, researchers of the new technological order". "Today (a network of educational institutions for gifted people and finding talent<sup>11</sup>) is still too small. This is the successful future of the country, which will provide a strong creative, talented young generation of Russia. "In his opinion, a more flexible, modern system of professional education should be created: young people should have equal opportunities for self-fulfillment regardless of place of residence<sup>12</sup>.

At the present time, more and more frequent "breakthrough" innovations are being introduced, rendering, at times, unnecessary widely sought-after specialties: robotic cash registers and cars with autopilots will leave jobless cashiers and taxi drivers. In part, the functions of the initial interview of staff, legal assistants, air traffic controllers, bank employees, call center operators, insurers, information entry operators, translators, as well as professions related to documents and reporting (entry-level bookkeepers, secretaries, notaries, estate agents)<sup>13</sup> are done by robots. In the United States robot servers, began to work in which dishes in accordance with the menu are prepared by kitchen robots in front of visitors (the process of cooking of one dish takes about 3 minutes<sup>14</sup>), in China a robotic dentist was developed which is able to carry out operations with the team of assistant operators on real patients<sup>15</sup>, goods can be placed on store shelves by robots, etc. According to a study (McKinsey Global Institute, 2017), 400 million to 800 million people may lose their jobs due to the introduction of automated systems<sup>16</sup>.

On the other hand, the main problem with the accelerated transition of the Russian economy to the model of the leading modernization and the transition to the 6th TS under the condition of the formation of the postindustrial economic structure due to the introduction of "breakthrough" innovations can be the ever growing shortage of specialists in the "Knowledge" category in the spheres science, art, innovation, especially in the field of critical technologies, as well as managers who provide the process of creativity, intellectual activity, primarily to commercialization its results (Pystyl'nik & Vlasova, 2018).

During the transition from the industrial economy to the "digital" and innovative one, the individual's attention to the development of his personality and, above all, his creativity will be increased, but not all those who have the opportunity to become acquainted with the existing knowledge in the relevant production process will want and / or will be able to use these opportunities (Aladyshkin, Kulik, Michurin & Anosova, 2017; Gashkova, Berezovskaya & Shipunova, 2017). With the innovative development of enterprises and the information society (Bell, 1988), overall professional activity will require an increasingly creative approach, and individual professions will become increasingly specific and the number of such professions will only increase. This may lead to a reduction in the ability to simply replace

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10 "The Russian school should be among the best in the world," Putin said. 12/23/2017. URL: <http://rusvesna.su/news/1514039308>

11 Note. aut.

12 Oganova V. Putin said about the need to create a new labor market. URL: [https://rueconomics.ru/297648-putin-prizval-sozdat-v-rossii-novyj-rynok-truda?utm\\_campaign=transit&utm\\_source=mirtesen&utm\\_medium=news&from=mirtesen](https://rueconomics.ru/297648-putin-prizval-sozdat-v-rossii-novyj-rynok-truda?utm_campaign=transit&utm_source=mirtesen&utm_medium=news&from=mirtesen)

13 Degotkova I. Profession of non-traditional orientation: whom will be fired by the blockchain / Moskovsky Komsomolets, No. 27590. 15.01.2018

14 In America, they opened a restaurant where food is prepared by robots. 05/13/2018. URL: <https://hi-tech.mail.ru/news/v-amerike-otkryli-restoran-gde-edu-gotovyat-roboty/?from=hitech>

15 Digital economy and mass unemployment. URL: <https://ria.ru/analytics/20170922/1505297429.html?injj=1>

16 Caste of the unemployed. Robots will deprive the poor of the last money. 05.23.2018. Forbes. URL: <https://news.mail.ru/society/33561411/?frommail=1>

the "Knowledge" category in the labor market due to their individual, unencumbered knowledge, abilities and experience, and also because the choice of such specialists in the labor market is limited by the emergence of surplus labor, on the one hand, does not possess the necessary fundamental scientific knowledge and innovative worldview, consciousness and thinking (Filin & Yakushev, 2018), and on the other hand, leads to an increase in frictional unemployment for those who possess these qualities. Solving this problem requires radical socio-economic and organizational and managerial innovations, in particular, the need for scientifically based specialization (Poldin, Valeeva, & Yudkevich, 2015), the choice of specialties for the "digital" and innovative economies and the training of employees in the category "Knowledge" both at the state level and at the enterprise level.

### **3. Research Questions**

Due to the fact that the current cycle of technological re-equipment of production is  $\leq 5$  years, and the dynamics of technology development requires additional education and further training, the need for the education and self-education of a specialist throughout his life increases dramatically (Eichhorst, Rodríguez-Planas, Schmidl, & Zimmermann, 2015). The inflow of the high-skilled, professional scientific and engineering and professionally competent of specialists, engineers and managers for management in "digital" and innovation to high-tech sectors 4.0 and 5.0<sup>17</sup> of the real economy, and also planning (Firstov, Moiseeva, Akulov, Timofeev, & Fedorov, 2017) and monitoring human resources (Ivashchuk & Konstantinov, 2015) and human resources management (Noe, 2012) in general become crucial.

The solution of these tasks involves attracting and training the most qualified personnel and human resources (Eichhorst, Rodríguez-Planas, Schmidl, & Zimmermann, 2016) as a whole into promising high-tech sectors of the economy (Savchenkov, 2017). To effectively implement these tasks, it is necessary to conduct research through forecasting, including long-term (foresight) needs for specialists in labor markets, new technology markets and the business community (Yuan, Jin-Chang & Hao-Jie, 2017), which is performing its activities in the sphere of high technologies, according to the list of Russian critical technologies and macro technologies in Russia and abroad, as well as research in the field of general scientific training of specialists, training managers for "digit" and innovative economies.

### **4. Purpose of the Study**

The aim of the research is to offer recommendations on the effective training of specialists for the innovative economy and the conditions that ensure the creative development of the specialist, the opportunities for upgrading his skills, competencies and educational level, especially in the sphere of high technologies and subsequent highly effective intellectual activity in promising technological and economic structures.

### **5. Research Methods**

For achievement of a goal by authors methods of a logical research, forecasting, the analysis and synthesis on the basis of a private "foresight"-approach within the general system and cognitive approach are used.

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17 Rudskoy A. University, science, high-tech enterprises - this is one team. URL: <http://tass.ru/rusengineers/vik-tochka-zreniya/>

## 6. Findings

Taking into account the current trends in the labor markets of economically developed countries, namely: 1) the growing role of highly skilled labor with a significant drop in demand for professionals of medium qualification and 2) the reduction in the demand for labor with the growth of production under the influence of robotization (automation) of modern economies, the labor market in the "digital" and innovative economies will undergo significant changes - there will be a transition from a set of skills to a set of competencies, many functions will be performed by robots. As a result, the following recommendations for effective training of specialists for an innovative economy can be offered.

1. As it is known, in the last third of the XX century the long-term forecast assumed the dominance of space and nuclear technologies and, as a consequence, the demand for specialists of these specialties in the labor market in the XXI century. However, until now, the infocommunication technologies (ICT) are dominant and the demand for specialists in this sphere of the economy dominates the labor market. Therefore, to prepare students for the specialties that will be in demand in the sixth and seventh technological ways, it is expedient, on the one hand, to conduct a constant forecast (foresight) of the need for specialists in labor markets, in new technology markets and in the business community that conducts its activity in the sphere of high technologies, according to the list of Russian critical technologies and macro technologies in Russia and abroad. On the other hand, it is necessary to strengthen general scientific training of specialists, as well as to organize the training of managers: a) for management in "digital" and innovative economies experts and managers; b) on the commercialization of intellectual property (OIC) and innovation in general; c) on intellectual systems: cognitive, energy, transport, logistics, computing, management; e) on the development of the education system, applied and fundamental research in the field of ICT; f) on the organization of management of strategic technology platforms (STPs), innovative clusters, technology parks, techno-, technoeco- and futuro- and interaction between them, etc. Also, the designers and programmers creating and controlling the production on the basis of nanobiomaterials using a nanobiotechnologies and nano(bio)robots, experts in the sphere of critical, socio-humanistic and sociocultural technologies are necessary.

For this, perhaps, it is necessary to separate the general scientific training and the formation of innovative consciousness and thinking of specialists from their special preparation for the immediate performance of production and official duties. This contradicts the prevailing tendency of preparing a highly specialized qualified performer, who is very much in demand at the labor market, but the need for whom will decrease in the innovative economy.

2. In the case of revealing, as a result of the forecast (foresight), a tendency to increase the level of dominance of space technologies by the second half of the twenty-first century increase the number of specialists trained in the field of space research: geophysicists, geochemists, robotics specialists, biologists, specialists in the field of nanotechnologies and nuclear technologies, etc.

3. Create open partner systems, joint programs, a network of basic chairs at leading high-tech enterprises, in order to meet the challenges of accelerated high-tech and science-intensive development of Russian universities and enterprises, in order to train future multidisciplinary specialists according to their needs. The Sixth TU and post-industrial economy should be accompanied by the corresponding

infrastructure, at high-tech enterprises of which future specialists are trained in universities for the innovative economy, starting from the first years of training, should practice on real production, mastering the philosophy of innovative development of the enterprise. By the time the university graduation, the enterprise receives specialists<sup>18</sup> adapted to their highly technological conditions. In the future, the latter should have the opportunity to work in their specialty, so as not to lose the competencies of the "Knowledge" category acquired at the university when working at enterprises of a lower technological level.

4. Reform the systems of higher and secondary special education in terms of a) the formation of scientifically sound policy regarding strategy, structure and vocational guidance in the preparation of human resources for the "digital" and innovative economies (Mahmood, 2015); b) improvement in the light of current trends in the labor market, in the social sphere, technologies and economy; c) Formulating a policy for the younger generation to develop their creative and scientific potential as research scientists, including the preparation of educational programs focused on the development of meta-subject and personal competencies and providing an opportunity for highly qualified teachers (for which it is necessary to stimulate the influx of talents into education) to prepare experts of a category "Knowledge" by training of schoolchildren and students, the students capable to think creatively, including economic specialties: a) without external stimulation to generate the innovative ideas, on their basis — the business ideas, to create information packing of these ideas; b) theories of invention, including preparation and execution of the application for issue of patents for intellectual property items; c) to create new knowledge and innovations on the basis of special knowledge, to enable their technological realization and transformation into material products by means of new technologies; d) to organize living conditions and forms of consciousness.

5. To increase the number of trained specialists in the field of production, for which the training of engineers and technologists<sup>19</sup>, especially in critical technologies, requires, in particular, stimulating demand for engineering education programs (Firstov, Moiseeva, Akulov, Timofeev, & Fedorov, 2017); large-scale "technologization" of schools and higher professional technical education on the basis of training aimed at mastering advanced high technologies in Russia and abroad. The centers of technological training created by higher education institutions in cooperation with organizations that own high technologies, and the permanent revision of these programs in terms of forecasting (foresight) should be an institutional basis of programs, first of all short ones, of technological training (retraining) for professional activity.

6. Organize sites (competitions) for the exchange of engineering designs, research, knowledge and innovations as an integral part of the modern engineering education process. It is important that these sites accumulate current technological problems of corporations, and the latter use the results of such intellectual results taking into account the interests of their authors to create products that can successfully compete in the global market.

7. It is necessary to transform the system of corporate management in the direction of taking into account the need to manage talents, scientists, inventors, specialists who are able to generate ideas and efficiently work with high technologies. This, in turn, will require changes in corporate governance and in the training of highly qualified personnel for this field of activity. This task should be solved in general, at

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<sup>18</sup> Rudskoy A. University, science, high-tech enterprises - this is one team. URL: <http://tass.ru/rusengineers/vik-tochka-zreniya/>

<sup>19</sup> The Russian labor market needs engineers the most, the head of Rostrud believes. RIA News. 3.06.2017. URL: <https://news.mail.ru/economics/29966705/?frommail=1>

the state level, otherwise it will be impossible to form a relatively homogeneous institutional structure of the economy, as a necessary condition for its growth.

8. To develop and implement the concept of human capital development, including education, training and retraining specialists, based on the system-creative approach; stimulation of demand for personnel in the category "Knowledge"; the formation of an environment facilitating the creative development of the individual, the transition to the logic of talent management (rather than cadres).

9. Create conditions for interactive cooperation between the service sector, industry and the education system.

10. To increase the availability of knowledge in the process of raising the level of professional skill and the level of education of specialists.

## **7. Conclusion**

1. The restructuring in the activity of the university should include the creation of a system for training specialists for the "digital" and innovative economies on the basis of and taking into account the forecast of directions for the development of critical technologies, the topics of research on future new specifications and on their basis the labor market in future new dominant technical specifications, university laboratories and foresight departments. At the same time the task of the Russian pedagogical school and higher education institutions in the conditions of transition of the Russian enterprises and Russia in general on innovative type of development has to assume stimulation of interest of future experts in mastering first of all specialties of the sixth and seventh technological ways and understanding them that mastering these specialties is possible only on condition of formation at them innovative, including ecological, world outlooks, consciousness and thinking.

2. The main factors in the "digital" economy will be competence, knowledge and skills. If the specialist has them, especially in the field of ICT, he will undoubtedly "come up with" a job and create a workplace for himself. The problem is to adapt workers, whose functions can be performed by robots and infocommunication systems<sup>20</sup>, to the "digital" and innovative economy.

3. As a result of the accelerating process of forming of the labor market for future new dominant technical specifications, on the one hand the distance between skilled and unskilled labor will grow, on the other hand, this process will stimulate the redistribution of human capital from spheres with a low intellectual component to new "intellectually intensive" ones.

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<sup>20</sup> Gref does not expect a shortage of jobs in the "new economy". RIA News. 10/27/2017. URL: <https://news.mail.ru/economics/31459159/?frommail=1>



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