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HUMAN RESOURCES POTENTIAL AS A FACTOR OF INNOVATIVE ECONOMY DEVELOPMENT

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Abstract

Strategic documents on the socio-economic development of Russia indicate the need for a transition to an innovative economy. To ensure such a transition, it is necessary, first of all, to build an effective national innovation system in the country. Technological innovations, new technological processes and industries, which are rapidly changing society's way of life and economic structure, have come to the fore. In this regard, it is necessary to undertake a number of organizational, legal, financial, social measures to organize effective innovation activities of the institutional elements of the innovation system, namely the activities of educational, scientific and research institutes, financial institutions, the business community, etc.). The main factor of innovation is the research and personnel capability of the country, its human capital. As a result, the purpose of the article involves a study of the institutional elements of the national innovation system, in particular, human capital and factors, influencing its formation. The authors examined the basic concepts of the national innovation system, its structural components; it is shown that the staffing of innovation activities is of paramount importance for the innovation economy; the main factors, affecting the formation of human resources are identified.

Keywords: Innovation economy, personnel potential, science, innovations.

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1. Introduction

Innovation activities include scientific, technological, organizational, financial and commercial activities, which are aimed directly at the implementation and commercialization of innovations. Apparently, the unity and interconnection of the structural elements of the national innovation system ensures the organization of innovation with a focus on the needs of the economy, its regulation and stimulation with the help of certain conditions, new forms, methods and principles of organizing the interaction of its entities, the renewal and expansion of resource support for innovations (personnel, financial, material and technical and other resources).

The development of technological innovations will allow Russia to form a complex of high-tech industries, expand the production of high-tech products, enter the world market of high-tech products and intellectual services, which will ultimately increase the competitiveness of the country's economy and make it innovative.

Technological innovations have led to a change in the nature and content of human labor, the processes of organization and management of production. The structure of the population's employment is changing, the share of people employed in the sphere of material production is decreasing, while it is increasing in the sphere of nonmaterial production (the service sector prevails).

The activities aimed at creating the institutional component of the innovation system and the development of its infrastructure elements are designed to ensure the effective functioning of the national innovation system, including increasing the level of personnel potential for the development of innovations.

One of the most important areas of development of the national innovation system of Russia is training highly qualified personnel, taking into account the needs of the innovation economy and the labor market. Vocational education is viewed as an element of the national innovation system, as an important condition for its development is the availability of qualified personnel.

2. Problem Statement

In recent decades, Russia has been actively trying to create and operate an effective national innovation system. In the relevant regulatory documents (Decree of the President of the Russian Federation …, 2011). Key areas for the development of scientific and technological progress in Russia are identified that correspond to global trends in scientific and technological development: information and telecommunication technologies; life sciences; nanoindustry; transport and space industries; rational nature management; Energy Saving Technologies; nuclear energy.

Today, a number of high-tech industries are successfully developing in the country (aviation and rocket and space industry, shipbuilding, radio-electronic industry, nuclear energy complex, power engineering, information and communication technologies), where Russia has competitive advantages in the world market

Due to the increased level of innovation activity and knowledge-intensity, the innovation sector of the economy also includes education, healthcare, pharmaceuticals, communications and telecommunications. To develop the listed sectors and industries, state programs and strategies have been

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created and are being implemented (Decree of the President of the Russian Federation …, 2016; Order of the government of the Russian …, 2011; Resolution of the government of the Russian Federation …, 2014).

However, at the present stage, the national innovation system of Russia is characterized by a low level of demand for innovations in the real sector of the economy and innovative activity of enterprises. The subjects of innovation in both the private and public sectors of the economy do not show sufficient interest in the implementation of innovative technologies. The innovative activity of Russian enterprises is seriously inferior to the performance of most leading countries in this area. It is necessary to mention the lack of budget funding for the implementation of state measures to develop the innovative system.

In addition, to ensure the development of technological innovations, an appropriate research and personnel potential is required. Human capital today is the main factor in the socio-economic development of society.

3. Research Questions

The conceptual issues of building national innovation systems, starting in the late 1980s, were laid down by J. Schumpeter, the founder of the theory of innovations, who formulated its main provisions, having demonstrated the relation of scientific and technological progress to innovative processes, occurring in connection with the introduction of technological innovations in production. The concept of a national innovation system was introduced by Freeman (1987) to explain the differences in the level of technological development of national economies. On the example of Japan's economic policy, which secured this country a technological breakthrough in the post-war years, Freeman (1987) identified and demonstrated the main elements of its national innovation system.

The term "human capital" was introduced into economic theory by Shultz (1961), who meant by that the totality of qualifications and knowledge. Shultz (1961) noted the property of human capital to accumulate and reproduce. Investments in human capital, in his opinion, in the future give income to its owner. At the same time, he pointed out the importance of investing in human capital for the development of society as a whole. Following Shultz (1961) and Becker (1975) studied in more detail the nature of human capital, defining it as skills and knowledge, and pointed out the significant role of education in the acquisition of professional qualifications by an employee; it is the qualification of an employee that positively affects her productivity. Among the Russian scientists, developing the theory of human capital, one can note the works by (Dobrynin, Dyatlov, & Tsyrenova, 1999; Kapelyushnikov, 2012)

4. Purpose of the Study

In this regard, the purpose of the article involves a study of the institutional component of the national innovation system, in particular human capital and factors affecting its formation in modern conditions. When researching this issue, it is very important to identify problem areas and trends in the development of human capital that affect the innovative development of Russia.

5. Research Methods

Based on the purpose of the study, the main research method is a comparative analysis of statistical

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data. The information base was statistics, provided by the Federal State Statistics Service of Russia.

To obtain a general picture of the development of human capital in Russia, we analyzed statistical data on the age and number of the employed, and the structure of employment for the period from 2010 to 2018.

The personnel potential of the field of science and innovation was studied in detail with respect to such indicators as the number of people employed in this field, their qualification, age, the number of organizations performing research and development. Conclusions were made based on statistical data for the period from 2000 to 2017.

In order to determine the prospects for the development of human capital in Russia, we analyzed data on the number of graduates of educational institutions of secondary vocational and higher education, their employment, the relevance of their work to the specialty received in the educational organization, and the structure of employment, data used embrace the period from 2015 to 2017.

The methodological basis of the study is the concept of the national innovation system and the concept of human capital.

The conceptual foundations for building the national innovation system are based on the following principles and ideas that reflect the evolution of ideas about innovations and elements of innovative systems.

According to J. Schumpeter, the innovation process is based on the process of transforming scientific knowledge into applied developments (new, innovative products), which, when introduced into production, yield higher profits. He designated this phenomenon as diffusion of innovations (Schumpeter, 1982).

In the conception of Ch. Freeman, the national innovation system is a set of public and private institutions that contribute to the development and implementation of innovative technologies (Freeman, 1987). By institutions he meant any organizations (enterprises, research institutions, etc.), as well as forms, ways and methods of organizing and managing the process of introducing innovations. Innovations can be implemented both at the enterprise and at the national level. He made a special emphasis on the environment in which innovations are born – this is the field of science and technology.

In parallel with the emergence of the concept of national innovation systems, the concept of a knowledge economy began to take shape (period of the 80s–90s). The leading role in such an economy belongs to innovations (samples of high-tech products, information and communication technologies, new forms of organization and management of production processes, etc.), the introduction of which gives a significant increase in GDP and labor productivity and, as a result, the country's economy is growing steadily.

According to modern theoretical considerations, the national innovation system is a set of state, private and public organizations whose activities are aimed at creating, developing, preserving and disseminating new knowledge and innovative technologies (Golichenko, 2011; Nikitskaya, 2012).

The terms “mechanism of the national innovation system” are used in the literature to denote the structure of the national innovation system (Astapenko, 2014), “innovative mechanism” (Kolokolov, 2002), etc. However, in all cases, the structure of the national innovation system consists of two components – subjects and objects of innovative activity – making up a single mechanism for the interaction of its constituent elements in order to effectively implement innovation.

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The subjects of the national innovation system include the state, the entrepreneurial community, scientific and research institutions and organizations, and consumers. These can be such structures as state and private research laboratories, institutes, science cities, higher educational institutions and the technoparks, technopolises, business incubators created by them, etc. They carry out mainly reproduction, use, storage and dissemination of the new knowledge, ensure the conduct of research and development work, and introduction into production of the results of intellectual activity (inventions, industrial designs, utility models, etc.).

The objects of the national innovation system include innovations, as well as the institutional infrastructure that helps stimulate innovation activity. Innovation infrastructure is made up of organizations that support the implementation of innovations and their commercialization, which consists in the provision of managerial, logistical, financial, informational, staffing, consulting and organizational services. They carry out strategic management, budget financing, investment, regulatory, informational, methodological and social support of innovation activity (Khokhlova & Okladnikova, 2014; Khohlova, Kuznetsova, Kretova, & Tsaregorodtseva, 2017).

The emergence of the concept of human capital (the period of the 60s) was determined by the development of scientific and technological progress. The connection between science, technology and production became clearly visible. Science generates new technologies, the introduction of which into production leads to qualitative changes in social production and economic breakthroughs.

The analysis of the development of human capital in Russia revealed the following main trends and factors affecting innovative development.

Firstly, one of the most serious threats is the population decline in the country as a whole, including people of working age. The forecast for the long-term socio-economic development of the Russian Federation for the period until 2030 indicates that the number of economically active population will decrease from 72.6 million people in 2011 to 66.1 million people in 2030, or 9 %. Changes in the age structure of the population are caused by an increase in population of people older than working age, while the population of working age is decreasing every year.

Secondly, the level of staffing in the field of science and innovation is also declining. In the Russian statistical yearbook for 2018 (Russian statistical yearbook, 2018), The following data on the number of employees engaged in research and development are given, are shown in Table 1.

Table 01. Number of personnel engaged in research and development

	2000	2010	2015	2016	2017
Total	887729	736540	738857	722291	707887
Including:					
Researchers	425954	368915	379411	370379	359793
Technicians	75184	59276	62805	60441	59690
Support staff	240506	183713	174056	171915	170347
Other staff	146085	124636	122585	119556	118057

Table 1 shows that, compared with 2000, the number of researchers in 2017 decreased by 16 %.

Thirdly, data on the number of researchers by age groups (Table 2) demonstrate not only a general decrease in the number of researchers, but also, mainly, negative dynamics in terms of age.

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Table 02. Number of researchers by age group

	Total	Up to 29 years inclusive	30-39	40-49	50-59	60-69	70 and older
Number of researchers							
2010	368915	71194	59910	54113	88362	60997	34339
2017	359793	66376	91429	51149	59893	57414	33532
Of these, possessing academic degrees of:							
Doctor of sciences							
2010	26789	52	632	2394	7211	7743	8757
2017	26076	32	566	2473	5160	8484	9361
Candidate of sciences							
2010	78325	4354	15229	12157	18805	16001	11779
2017	77251	3153	20772	14906	13238	14351	10831

The share of young researchers under the age of 29 in the total number of researchers in 2017 decreased by 7 % compared to 2010. Of these, the share of doctors of sciences decreased – by 38 % and of candidates of sciences – by 28 %.

Fourth, the number of organizations performing research and development has decreased, from 4099 in 2000 to 3944 in 2017, or by 4 %. Despite the importance of developing the innovation system, direct budget expenditures on innovations in 2009 amounted to 1.5 % of GDP, they decreased by 1 % by 2013, and, from 2014 to 2020, the share of innovative expenditures remaines almost unchanged – about 1.3 % of GDP.

Fifth, the main factor in innovation is human capital. The education sector ensures the reproduction of human capital. American scientists have calculated the amount of GDP produced by employees of the enterprise, based on the duration of their education. Employees were grouped by the duration of education into three groups: 5 years, 10−12 years, 14 years or more. It turned out that these were the employees of the third group that accounted for more than half of the GDP. Similar conclusions were reached in Russia. According to the results of a study, it was revealed that a quarter of the employees of the enterprise, all of them having higher education, account for 56 % of the value of GDP. Thus, indicators of the development of the educational sphere meet the criteria for the effectiveness of human capital (Kochetkov, 2012).

Education expenditures in Russia as a percentage of GDP are 4.3 % (according to data of 2014), the country is in the 98th place in the ranking of leading countries, while in the USA, Canada, France, Great Britain and other similar expenditures account for 5.3–6.5 % of GDP. Russia's neighbors in the ranking of countries in terms of spending on education were Slovakia and Paraguay (UN data for 2012) (Human capital…, 2016).

Despite the above data, Russia still retains competitive advantages in the formation of human capital for further innovative development of the economy. E.g., the proportion of the population with higher and additional professional education is 22.8 % of the total population aged 25 to 64 years. With respect to this indicator, Russia is at the level of such leading foreign countries as Great Britain, Sweden and Japan, etc. A high level of higher education in natural sciences and engineering specialties persists, which is especially

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important for the effective national innovation system.

However, looking at the structure of employment according to state statistics for 2018, one can see that in the field of science and innovation only 5.6 % of the population is employed, while the largest percentage of employed is in the sphere of trade (15.9 %) and manufacturing (14.1 %).

Percentage of employed graduates in 2015–2017 in the total number of graduates of educational institutions of higher and secondary vocational education amounted to: with higher education – 76.4 %; with secondary vocational education – 71.6 %. With respect to the correspondence of the work performed by employed graduates with their specialty obtained in an educational organization, the following data are presented: with higher education – 71 %; with secondary vocational education – 60 %. The distribution of graduates of educational institutions of higher education in 2015–2017 by types of economic activity is as follows: the total number of graduates is 2627.5 thousand people, of which the largest number of graduates are involved in trade – 361.5 thousand people, state administration – 335.6 thousand people and education – 330.7 thousand people, manufacturing – 260.4 thousand people; for comparison – in the field of science and innovation 173 thousand people are employed.

Since 2018, Russia has adopted and is implementing national projects in the field of education, science and other most important areas of public life. The budget of national projects provides for 5.7 trillion roubles for the development of human capital. In particular, 784.5 billion roubles were allocated for the national project “Education”, and 636 billion rubles for the national project “Science”.

The changes taking place today in the system of vocational education in Russia are aimed at developing future specialists' competencies for effective interaction with the labor market in an ever-changing world of innovation and high technology (Ilyin, 2002). The demand for specialists is determined by their ability to put into practice the acquired knowledge in order to effectively solve professional problems (Tikhomirova, 2015).

6. Findings

At the present stage of building an innovative type of economy, the personal (human) factor of production comes to the fore, namely, the requirements for the qualification characteristics of workers are gradually changing, the level of educational qualification is increasing, the proportion of workers engaged in mental work is growing.

Summarizing the theoretical postulates in determining the essence of this economic category and its significance in the development of an innovative economy, several important points can be noted:

- human capital includes knowledge, skills, abilities, motivation, work experience, qualifications, health condition, culture level and other characteristics, which together constitute a person’s potential (capabilities) that determines the quality of her human capital.

- the quality of human capital determines the economic and social effects of its use for society – education is an important component of human capital.

The analysis of the level of human potential in Russia showed that it seems necessary first of all to increase the efficiency of the innovation generation sector (fundamental and applied sciences), since every year there is a reduction in the number of scientific workers, as well as scientific and research organizations performing research, and, as a result, there is a decrease in the volume of research and development. In

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addition, there is only a weak orientation to the needs of the economy in the innovation sphere of Russia.

At the moment, with the development of information technology, automation of processes and the formation of the digital age, the labor market and the world of professions are rapidly changing. The state in this situation should take a number of measures to organize the processes of redistribution of labor, which, ultimately, should ensure the progressive development of the country's economy.

Today, it is the quality of professional training that determines the competitiveness of an innovative economy. In this regard, the education system is tasked with meeting the needs of the labor market in highly-demanded high-skilled workers. The transition to an innovative economy will provoke an increase in demand for such personnel. To solve this problem, it is necessary to organize professional training of personnel taking into account state priorities for the development of the economy by reforming the vocational education system (secondary vocational education, higher education, additional professional education). Key changes aimed at improving the quality of professional education include the development of the personnel potential of education workers, updating the material and technical base of educational organizations, the introduction of modern educational technologies, innovative educational projects, the development of a system of continuing professional education and a number of other important measures.

7. Conclusion

In the strategic documents of Russia on the development of the sphere of science, education, technology and innovation, one of the most important tasks is the creation of conditions for the influx of the most qualified specialists, active entrepreneurs, creative youth into innovative sectors of the economy. It is recognized that for this purpose it is necessary to develop and put into practice a system of stimulating measures of a moral and material nature that contribute to increasing the motivation of subjects to perform innovative activities.

The spheres of education and science should play a decisive role in the development of the innovative economy, they are the ones who ensure the reproduction of human capital and determine its quality. The development of education and science, taking into account the priorities of the development of Russia, contributes to the formation of the competencies of innovation in the population, motivation for entrepreneurship, creative work, which, ultimately, will positively affect the national innovation system.

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