

Role of higher education institutions in developing hr potential in a forming innovation economy

Papel de las instituciones de educación superior en el desarrollo del potencial de recursos humanos en una economía de innovación en formación

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ABSTRACT:

The development of higher education is a basic premise for reaching the strategic goals of innovation changes in the Russian economy. The authors speak about the role of science and education in development of HR potential, necessary for a transfer to sustainable development of an innovation economy. The scientific and research sector, within the framework of which higher education institutions operate, is represented as a key element of the national innovation system. The authors systematize the modern problems of innovation development of Russian higher education institutions. Based on this work, the problems of innovation development in the sphere of science and education are separated into innovation threats and innovation barriers. Different models of integration of higher education institutions into the national innovation system are considered, which allows to distinguish the "triple helix" model as the most adequate to Russia's conditions. This study was financed by a grant from the Plekhanov Russian University of Economics.

Keywords: innovation economy, human capital, HR potential, national innovation system, innovation barriers, scientific and research sector, models of integration of higher education institutions, "Triple

RESUMEN:

El desarrollo de la educación superior es una premisa básica para alcanzar los objetivos estratégicos de los cambios de innovación en la economía rusa. Los autores hablan sobre el papel de la ciencia y la educación en el desarrollo del potencial de recursos humanos, necesario para una transferencia al desarrollo sostenible de una economía de innovación. El sector científico y de investigación, en el marco del cual operan las instituciones de educación superior, está representado como un elemento clave del sistema nacional de innovación. Los autores sistematizan los problemas modernos del desarrollo de la innovación en las instituciones de educación superior rusas. Con base en este trabajo, los problemas del desarrollo de la innovación en el ámbito de la ciencia y la educación se separan en amenazas a la innovación y barreras a la innovación. Se consideran diferentes modelos de integración de las instituciones de educación superior en el sistema nacional de innovación, lo que permite distinguir el modelo de "triple hélice" como el más adecuado a las condiciones de Rusia. Este estudio fue financiado por una beca de la Universidad rusa de economía Plekhanov.

Palabras clave: economía de la innovación, capital

1. Introduction

The activation of innovation processes is one of the top development priorities for the Russian economy. On a global scale, scientific-technical progress is recognized as the vital factor of transfer to a sustainable economic growth and is most often associated with creation of innovation mechanisms that combine science, technics, entrepreneurship and management. Russia belongs to a group of countries where the model of technical development is only being formed, and the main driver of innovation growth is the state, which is in line with the practice of economically developed countries. Technical transformation is possible only within the framework of a national innovation system that requires institutionalized growth aimed at controllability of innovation processes. Moreover, a significant aspect pointed out by the scientists is the formation of the corresponding socioeconomic environment as the basis for creation of an innovation system by the states interested in their development (Kleiner 2008).

Through regulatory impact, the state has now made a turn towards the innovation model of economic development. Today, the Russian economy is in a state of transfer from innovation stagnation to innovation "acceleration". The priorities of macro regulation of this process are:

- Stronger interaction within the framework of the national innovation system with regard to the best international practices;

- Measures aimed at going past the "return point";

- Creation of conditions for a large-scale support of "grassroots" innovations (demand, supply of industrial factors);

- Review of the system of stimulation of innovation activities of the market players on all levels and in all spheres of the economy, including science and education;

- Active co-financing of practical studies in state scientific and research institutions and in universities, with participation of the business sector and NGO's;

- Development of innovation infrastructure, etc.

The main problems of today's innovation development in Russia are, first, a broad range of views as to the causes of innovation stagnation; second, lack of a unified approach to overcoming this stagnation (National innovation systems in Russia and CIS countries. Series "Innovative development and commercialization of technologies in Russia and EU countries: experience, problems, prospects, 2006). The technological degradation of the Russian economy in the 1990's was accompanied by destructive tendencies and imbalances in the sphere of science and higher education. Scientific and research institutions and scientific production associations had to curb their activities, and often to shut them down altogether, due to low demand for science. Simultaneously, many higher education institutions began to commercialize their activities by offering professions that were in high demand at that moment, which resulted in a surplus of graduates in the spheres of economy, management and law, as well as to devaluation of professional education in these spheres. For a long time there was no innovation refocusing of higher education institutions, which were taking a hands-off approach due to lack of signals from the state.

The government's understanding of the need to align the economic course with the global technological trends has brought light to a number of setbacks in the higher professional education system. An acute deficit of human resources capable of participating in innovation production and management, absence of solutions for many socioeconomic problems have created the "psychological unpreparedness trap", which, according to Silvestrov, Rykova and others, includes "a whole spectrum of psychological problems, such as skepticism and

nihilism or, vice versa, satisfaction and calmness, aversion of risks, dislike for change, failure to understand the problems and the ways to resolve them" (Silvestrov and Rykova 2011; Sibirskaya, Khokhlova, Oveshnikova, and Tulinova 2017). As a consequence, today there is a need to elaborate a vision of Russia's modern and future innovation development, based on the consensus of all participants of this process – the state, the business, the science, the civil society – which will eventually influence the macroeconomic regulation.

2. Methods

The subject matter of this research is the analytical overview of methodology, modern international experience and Russian practice of forecasting the economy's demands for skilled labor from the standpoint of labor market development in conditions of development of innovation processes.

The authors aim to reveal the strong sides of forecasting and planning of skilled labor. The legislative acts related to education as the most fully reflections of historical processes in this area were used as the main sources for this work.

Methods of research include structural and system approaches, and the following methods have been used as a methodological basis of a research: economical and statistical data analysis, comparative analysis, expert estimates, observation, poll, analytical modeling. In addition, methods based on economic and mathematical modeling were applied at this research.

Besides the released statistical information, the conclusions are based on the results of the social and economic research conducted by the authors and under their guidance. This manifold and multi aspect research enabled us to draw new conclusions, and also to review some existing views.

The development of higher education is a basic premise for reaching the strategic goals of innovation changes in the Russian economy. The authors speak about the role of science and education in development of HR potential, necessary for a transfer to sustainable development of an innovation economy. The scientific and research sector, within the framework of which higher education institutions operate, is represented as a key element of the national innovation system. The authors systematize the modern problems of innovation development of Russian higher education institutions. Based on this work, the problems of innovation development in the sphere of science and education are separated into innovation threats and innovation barriers. Different models of integration of higher education institutions into the national innovation system are considered, which allows to distinguish the "triple helix" model as the most adequate to Russia's conditions.

3. Results

3.1. Human Capital Development through Satisfaction of HR Demands in Innovation Economy

Innovation economy creates new economic development factors, where the dominating position is occupied by nonmaterial industries: science, education, services, etc. The transfer to a new development stage puts knowledge and education on a special place in the modern economic mechanism, which is why knowledge-based and high-tech sectors gain priority, and high qualification, unique skills and abilities of a person, i.e. its human capital, become the dominating factor of competition and development.

Historically, the establishment and genesis of the notion of human capital developed along with the technical progress. Three groups of positions and directions can be defined. The first one is the classic one (W. Petty, A. Smith (2017), J. Mill (1967)), which laid the foundation for the "Economic Man", oriented at personal gain and rational actions. In the works of William Petty (1623-1687), who is considered to be the "founding father" of political economy and statistics, famously said that the first thing to do is to account. This approach was implemented in the first try to take account of the human capital in England.

In "Political Arithmetic" (1676), Petty established the "price" of England's population at 417 mln. pounds, and the material assets at almost half that sum – 250 mln. pounds. In his estimates, he tried to differentiate between the price of simple people, soldiers and sailors, and reached certain results in this enterprise. In accordance with Petty's accounting methods, the value of the principal mass of people, as well as of land, equals 20 times the annual income they produce (Petty 2007).

The second direction is the labor theories of value (K. Marx, C. Menger, E. von Bohm-Bawerk, V. von Wieser (2009)), in which a person's production capacities are regarded as production capital. These theories also develop the category of "value of labor power" and its role in production. In his fundamental work, Karl Marx (1818-1883) points out that the development of physical, intellectual and artistic creative powers is the true wealth and the main production force of the society (Marx, n. d.).

The third direction is the Austrian historical school with L. von Mises' theory of "human action" (Mises 1966) and F. Hayek's "dispersed knowledge" theory (Hayek 1989). These theories describe the basis of economic effectiveness, conditioned by non-material components of human labor.

The notion of "human capital" is itself relatively new. It appeared together with the studies of an American Nobel Laureate, Theodore Shultz (1902-1998). The modern theory of human capital was born in October 1962, when the "Journal of Political Economy" printed the "Investment in Man" issue (Schultz 1962). It was Schultz who made human capital recognized as the main driver during the transfer to a postindustrial economy.

Gary Becker, one of Shultz's followers and a professor of economics and sociology at the University of Chicago (1930-2014), set the future research trends in this sphere in his main works (Becker 1993; Becker 1971; Becker 1967). He was the first one to transfer the human capital notion to the micro level. For this original approach Becker received the 1992 Nobel Prize in economics for "having extended the domain of microeconomic analysis to a wide range of human behavior and interaction, including nonmarket behavior". Becker defined the human capital as the collection of a person's knowledge, skills and abilities.

Amartya Sen (born 1933), an Indian economist and Nobel Prize laureate (1998) participated in creation of a new approach towards the studying of economic phenomena, centered around the problem of human development. The key significance of the new theory is that the end purpose of development is not the growth of macroeconomic statistics, but the improvement of the level and quality of life of the people (Sen 1973). In other words, Sen doesn't simply suggest to increase the production of goods, but to provide people with opportunities to do more, to live longer and healthier lives, to access information and knowledge accumulated by humanity. However, for a long time this problem has been overshadowed by the ideas of economic growth and free development of capitalism.

The role of highly qualified specialists is vital in an innovation economy and will inevitably grow during the transfer to a permanent innovation mode. For example, the Innovation Development Strategy of the Russian Federation until 2020 pays special attention to the issue of formation and effective use of the human capital. The aforementioned document stipulates modernization of state policies in the sphere of education; creation of an education system that is oriented at the formation and development of skills and competences necessary for investment activities; stimulation of acquirement of innovation entrepreneurship skills by the social strata most adapted and ready for it – the higher education graduates; formation of a system for stimulation of innovation activities of younger citizens; formation of a culture of innovations in the society and heightening the prestige of innovation activities.

The abovementioned priorities of innovation development of the economy define new HR demands and new methods of education at higher education institutions.

In order to effectively reach the strategic aims, the infrastructure of higher education must be enhanced with innovation structures (centers, complexes, companies, institutes), so that higher education institutions can form education, scientific and innovation complexes, being a part of the national innovation system. Such development of the higher education system

should effectively integrate the results of higher education, academic and sectoral science during creation and realization of innovation projects and development of innovation activities, which will serve as a pretext for the creation of an effective innovation economy. Newly acquired knowledge serves the improvement of the human capital, but if there is no system in place, and if no efforts are made to implement the acquired knowledge, skills and abilities, the element of innovations becomes futile (Gretchenko and Gretchenko 2016; Nikitskaya 2012; Oveshnikova, Sibirskaya, Mikheykina, Bezrukov and Grigorieva 2017).

Different periods of scientific technical development of the society define the contents of education. Within the framework of modernization, the most important requirement for forming the HR potential of the society is the comprehensive, high-quality education.

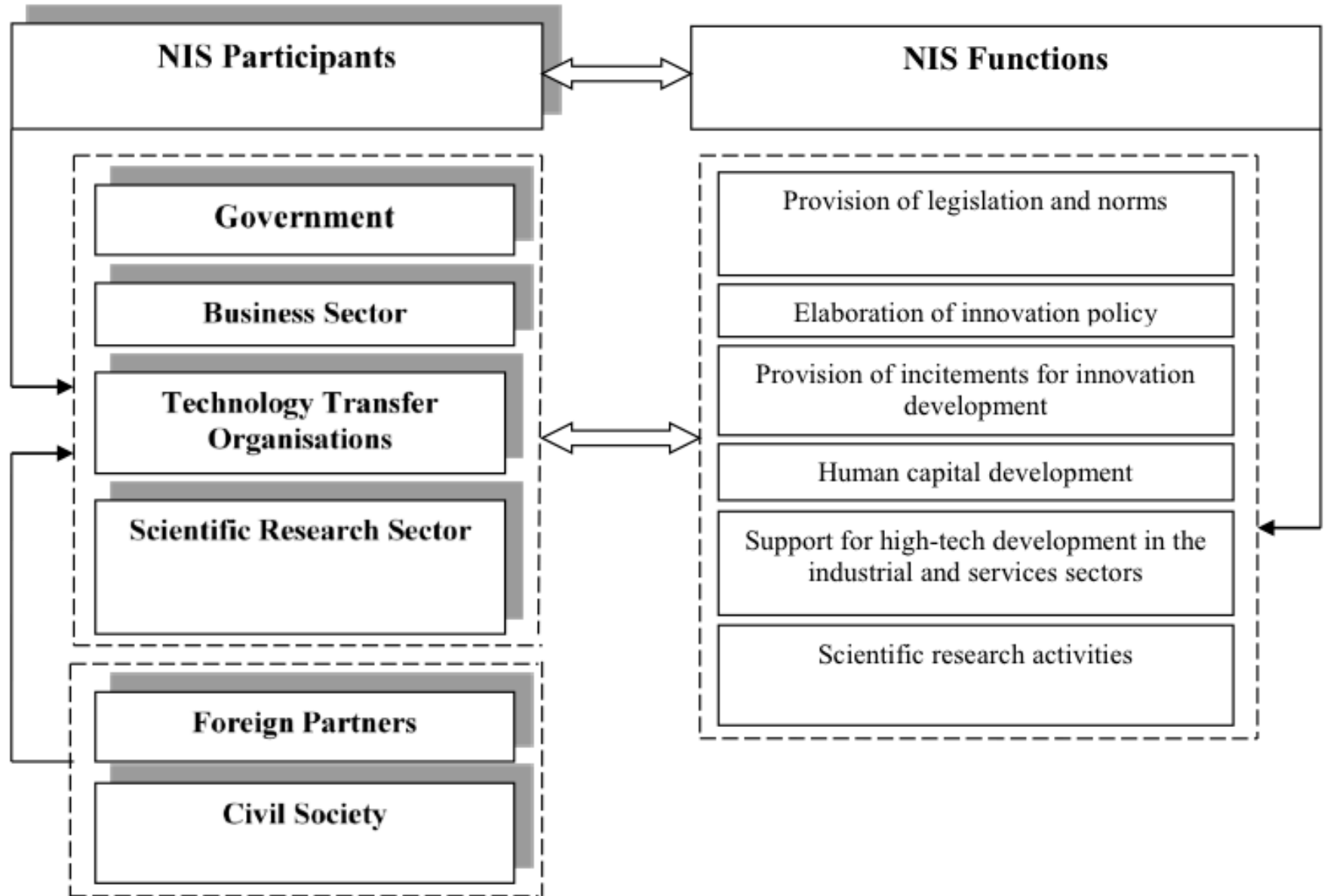
3.2. Models of Integration of Higher Education Institutions into the Innovation System

The development of higher education is the basic premise for reaching the strategic aims of innovation changes in the Russian economy. Another task of education institutions, primarily of universities and institutes, is to acquire new knowledge and apply it in all spheres of social and economic life. In modern societies, the search for new knowledge and new ways to implement it has turned into an important sphere of activities – science, where a large number of people are employed and huge amounts of money are spent. Educated persons are more inclined to introduce novelties, share the acquired results with their colleagues and their experience with the younger generations (Demenko, Makarova, and Konyshcheva 2017; Lukyanova, Nikitskaya and Sedova 2017; Lukyanova 2014). As a result, education does not only mean the accumulation and transfer of scientific and social knowledge, but also the formation of the intellectual potential of a nation as such.

Integration processes that manifest themselves in development and intensification of interaction between economic players are the natural course of action in development of innovation processes. In accordance with international practice, innovation processes developed within the framework of an institutionalized integrated structure, represented by the national innovation system (hereinafter referred to as "NIS"). The concept of NIS appeared in early 1990's, its founders were C. Freeman, R. Nelson and B.-A. Lundvall, and the main synthesizer and proponent of the new theory is the Organization for Economic Cooperation and Development (OECD). The NIS concept was merged with systemic and institutionalized approaches, which allowed to talk about synergy in the development of an innovation economy, caused by interrelations of institutional structures (Nikitskaya 2012).

At the modern stage, NIS is most often defined as the aggregate of interactions between state, private and public organizations, within the framework of which new knowledge is created, developed, preserved, disseminated and transformed into technologies, products and goods. The substantiation of composition and the structure of the Russian economy's NIS was presented in a methodology project "National Innovation Systems of Russia and the EU", made by European and Russian experts within the framework of an EU-Russia cooperation program (National innovation systems in Russia and CIS countries. Series "Innovative development and commercialization of technologies in Russia and EU countries: experience, problems, prospects, 2006). One of the main tasks was to identify the key players, as well as their roles and functions in innovation policies in Russia. The interrelation of participants and functions of Russia's NIS, as suggested in that project, is shown on Figure 1.

Figure 1
Interrelation of NIS' participants and functions



According to V.A. Tsiglyayev, integration processes in higher education institutions are defined as “incorporation of all types of higher education resources aimed at strengthening the innovation potential of higher education institutions, as well as the creation of innovation infrastructure based on cooperation of actors in the spheres of education and science for an active participation in the formation of the NIS” (Tsiglyayev 2011). Such an approach seems constrained, limiting the higher education institutions within the scientific research sector as an element of the NIS. In this regard, it is necessary to consider the concepts and models that suggest that higher education institutions go beyond the tight framework and cooperate with all the NIS participants (Gretchenko 2016; Gretchenko, Gretchenko, Demenko and Gorokhova 2017).

Three education models can be distinguished:

1. The English model. It is characterized by the concept of liberal education, i.e. priority is given to graduates who have broad intellectual capacities and peculiar personal qualities, including character traits, to form which is a kind of super objective for the higher education institution, with all due respect to the research and professional training.
2. The French model. It is distinguished by a high degree of separation between scientific and professional activities, as well as separation between scientific activities directed “inside” or “outside” of the university, higher education institution. The existence of a pragmatically oriented science, directed “to the outside”, makes the higher education institutions work toward professionalization of education.
3. The German model. Here the stress is mainly made on scientific research. The contents of education programs include results of scientific works of the professors: these immediately turn into materials for study programs and are used for education purposes. Professors and students work and cooperate on the basis of scientific research labor cooperation as research partners.

In their work, Sokolova (2014), Fedorova and Peshina (2012) provide scientific overview of modern integration models of innovation development of higher education institutions, elaborated by Russian and foreign scientists (see Table 1).

Experts normally point out two main functions of higher education institutions in innovation processes – the education of specialists and research and inventions, which mirrors the linear model of innovation development of higher education institutions. However, more complex models have formed in developed innovation systems. These provide, on the one hand, that higher education institutions are actively engaged at all stages of the innovation cycle – from creation and dissemination to diffusion of innovations, and on the other hand, that these institutions cooperate with all the other actors of innovation processes in order to create synergy.

Table 1
Models of Integration of Higher Education Institutions in NIS

Model Name	Description
Knowledge Triangle	The “knowledge triangle” is based on the “science – education – innovations” triad. Fundamental, practical scientific research and education are regarded as the basis for the university’s innovation development. This model is dominant in science and in practice (Grudzinskiy and Bedniy 2012).
Double Helix	The following interactions are studied within this model: “universities – enterprises”, “state – universities”, “state – market”, “science – business”, etc. The model is based on the transdisciplinary nature of science, orientation on communications and practical interaction during acquirement and transfer of knowledge.
Triple Helix	The triple helix model acts within the “state – business – science” system. Vertical mechanisms of innovation development management are supplemented by horizontal ties between persons who are members of different groups of NIS participants. Traditional missions of higher education institutions (education and science) are supplemented by the third one – innovations (Uvarov, n. d).
Tetrahedron	On top of the tetrahedron stands the main “product” of universities – the innovator, formed at the intersection of three “surfaces”: practice-focused education ↔ patentable scientific research ↔ innovations. Innovation infrastructure of universities serves as a “test lab” for training of specialists capable of participating in innovation activities in their spheres of expertise (Grudzinskiy and Bedniy 2012)
Penta Helix	The model’s central element is the “innovation” person. The model studies integration processes in the “science – education – business – power – civil society institutes” system, takes into account the interactions and interrelation of all NIS participants. The model is aimed at complex management of innovation processes (Uvarov, n. d)

The Triple Helix model, created in England and the Netherlands in the early 2000’s by Henry Etzkowitz, a Newcastle University professor, and Loet Leydesdorff, an Amsterdam University professor, is becoming overly popular in the innovation sphere. The Triple Helix model goes beyond linear interaction among the three key institutes of knowledge economy (the Power, the Business and the University) and is based on three foundations: 1) the role of higher education institutions is growing in an innovation economy in interrelation with the business and the government; 2) the strive towards cooperation among the science, the business and the state is transformed into an innovation mechanism, working not upon the state’s initiative; 3) each of the three institutes partially assumes additional functions that are characteristic of the other two. In the Triple Helix model, higher education institutions act as a starting point of the innovation process, a generator of new knowledge and technologies, defining the innovation potential of the state and the competitiveness of the national economy.

The Triple Helix model is effective when the following conditions are fulfilled: enterprises create structures in acting universities and create new universities; universities create

enterprises; the government stimulates independent expertise and relies on the opinion of its partners; information channels are open, mutual understanding and cooperation are at their highest. At the same time, innovation cooperation among the government, business and universities in Russia is distorted for a number of reasons. First of all, the business lacks consecutiveness in its actions: production modernization comes before implementation of innovative technologies; second, universities cannot prepare good specialists if there is no demand from the business community; third, the government only cares for innovation development of critically important technologies (National innovation systems in Russia and CIS countries. Series "Innovative development and commercialization of technologies in Russia and EU countries: experience, problems, prospects, 2006; Lukiyanova 2014).

Introduction of innovations concerns not only the production sphere, but the education sphere as well. The qualification of specialists in universities largely depends on the effectiveness of education technologies in use. Two factors are important for the improvement of education technologies: incentives for elaboration of innovation technologies, including material ones, and their maximum availability for implementation in the education process in higher education institutions. In this regard, the modern society offers perspectives of using different types of digital education, both as a complete alternative to the traditional academic system and as its supplement. However, it is necessary to recognize all the existing problems, as well as the threats of online studying in the education process. In particular, the prestige of traditional education is put at risk (Moiseev and Akhmadeev 2017; Akhmadeev and Manakhov 2015).

Countries that have modern personnel training and continuous education systems take the lead in a global competition, are able to meet any technological challenge within a short time by increasing labor capacity and by training the necessary specialists. Since changes in production technologies are ongoing and fast, continuous training of personnel of all organizations is necessary. It is more effective and rational for organizations to increase the productivity of their employees based on their continuous training than to hire new employees.

The authors of a global report prepared by "Skolkovo" Moscow Management School based on the "Education 2030" foresight forecast predict the "death of formats": academic term notes will begin to disappear by 2017; education institution diplomas will be forgotten by 2025; by 2035, an understanding will come that research universities are ineffective "as the dominating form of knowledge communication" in the presence of viable alternatives. The abovementioned foresight predicts that during the 3-5 years of "new education", education trajectories will appear, and massive open online courses (MOOCs) will become ever more popular. Within 7-10 years, a "university for a billion people" will appear along with virtual tutors and education networks, full-fledged opportunities for "non-systematic" education. In the long term, play and teamwork will become the dominating forms of education, artificial intelligence will be a tutor and partner in learning, study in neuronet groups and new pedagogics will appear.

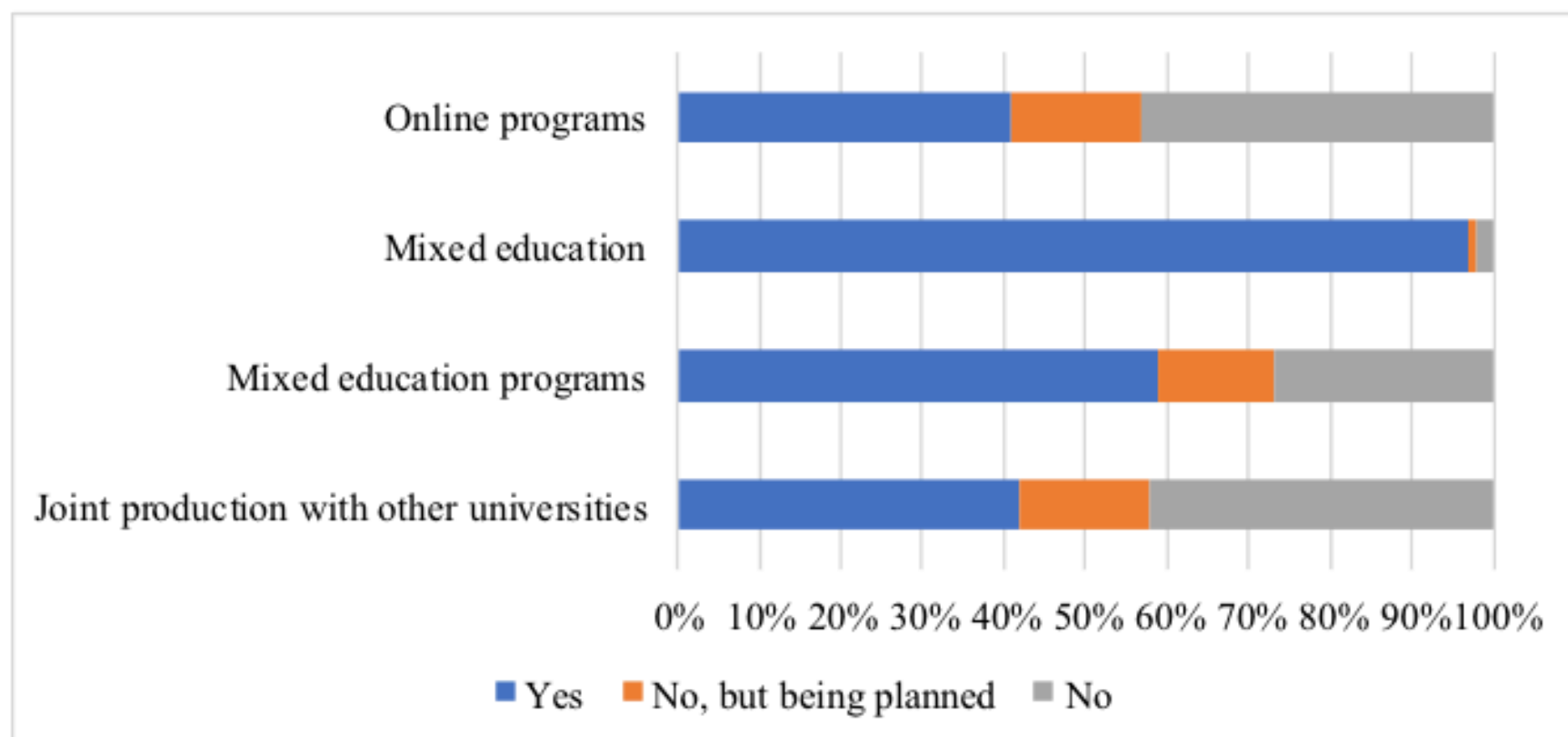
The MOOCs are the advanced direction in education, based on the world's leading universities providing remote academic courses to any person on the planet. The variety of MOOC categories is great and encircles a large number of education directions. Disciplines where e-learning is most popularly used are business, management, pedagogics, engineering and technical disciplines. E-learning is quite rarely used in such spheres as law and the arts (Moiseev, Manakhov and Demenko 2016; Moiseev, 2016).

At the current stage, MOOCs are an overwhelming global trend of education development. They open prospects and possibilities of remote and free training in different disciplines and education spheres to a wide range of students. They are oriented at active use of all capabilities of networking and mobile interaction, i.e. at the broadest possible use of technical and software capabilities of modern information technologies.

Safe for a few exceptions, all European higher education institutions use e-learning technologies in their work. 91 % of institutions use the mixed education model (Sibirskaya, Khokhlova, Oveshnikova and Tulinova 2017) (where the learning of materials and practice may take place both within the university and at home); 82 % of institutions offer online

courses. One of the trends is joint production of courses by different universities, as well as online courses resulting in acquisition of a scientific degree (Figure 2).

Figure 2
Types of e-learning used in higher education institutions



An important feature of the broad use of MOOCs is that the education process becomes more individualized, its contents are tailored to the student's needs thanks to new technologies, and the education process itself takes on mass proportions. The student may learn new material within the time and in ways that are most comfortable and effective for her/him. Information technologies allow using this regime for millions of people simultaneously. Learning through play technologies are being actively implemented – it has already been proved that this way people become familiar with the objects of their studies more efficiently.

4. Conclusions and Recommendations

The human capital is the driver that can transform information, knowledge into a material innovation product or service through the knowledge, skills and experience possessed by highly qualified specialists. Education, science, information are public institutions that participate in formation and development of the human capital.

Within the human capital theory, education is an object of investments with an aim of increasing labor productivity resulting in greater production of goods and services and income received by employees. More than 50 years ago the Universal Declaration of Human Rights stipulated the right to education as one of the basic human rights. Herewith, on the brink of the third millennium, almost a billion people stay functionally illiterate. This condemns them to poverty and disenfranchisement while setting the task of elaborate revolutionary changes in the education system before the national governments and the world community.

The higher education system provides the main development component – the human resources. Education capital traditionally includes the aggregate of a person's comprehensive and professional qualifications. It consists of knowledge, abilities and skills acquired in education institutions, as well as business and professional qualities. If used effectively, these increase labor capacity and income.

A characteristic feature of today's NIS in Russia is the comparatively separate existence of participants of the innovation process, which defines its fragmentary nature and disruption of interrelations in the "state-business-science" triad. On the whole, NIS development should lead to a scenario in accordance with which the establishment of interaction among the

scientific research sector, technology transfer organizations and state structures does not follow the path of directives, but is formed on a decentralized basis (Silvestrov and Rykova 2011)

Russia's scientific and education system is undergoing reforms aimed at making the requirements to the quality of training of specialists and the accreditation of higher education institutions stricter. At the same time, control over the effectiveness of scientific research institutions is growing stronger, higher education institutions form new ties with state and business structures, etc. In order to reach the strategic goals of innovative development, higher education institutions must elaborate their own scientific-innovative policies regarding intellectual property, the commercialization of scientific-technical inventions, at the same time drawing all the teaching staff of the education organizations to participation in the scientific process.

A key direction is the cooperation between higher education institutions and enterprises, based on elaboration of models and methods of specialist training. One of the approaches elaborated in this sphere is the creation of an innovation model of cyclic training of specialists in demand, based on MOOC technologies that have the most prospects and priorities due to their correspondence to the current needs of the economy.

The result of these activities largely depends on the professional business qualities of employees. Therefore, the issue of cooperation between higher education facilities and innovation enterprises should be regarded in the context of research of socioeconomic integration of science, education and production into a single national innovation system. Effective cooperation between all the actors of innovation processes is a necessary requirement for the successful progress of the national economy along the way of innovation development.

Gratitude

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