

# Innovative development of the national university system in Russia: trends and key elements

Development  
of national  
university  
system

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## Abstract

**Purpose** – The goal of the research is to analyze the university development trends in the national innovation system. The paper presents a review of the formation of innovative development strategies and the place of a university in them. The structure is based on the analysis of foreign trends of the transformation of universities and the examination of the efficiency of the interaction between the university, industry and the state. Russian experience in the transformation of universities is presented.

**Design/methodology/approach** – Research methodologies include methods of statistical and comparative analysis and synthesis. The information analysis base of the research is composed of the reports of the World Intellectual Property Organization at year-end 2019, as well as global comparative assessments of the status and development of innovation activities by the Global Innovation Index and Global Competitiveness Index, which are calculated according to the methodology of the World Economic Forum and others.

**Findings** – In the course of research, the authors put forward a new model of universities within the framework of the national innovation system, which is based on the “triple helix model of innovation” implemented by universities, industry and the state. The logic and structure of the research are set forth in the following way. First, a review of the global practice of the formation and implementation of state innovation policy is given, with the university being a key link, the foreign experience in the transformation of universities is analyzed and the efficiency of the interaction between the university, industry and the state is examined. Furthermore, consideration is given to the Russian experience in the transformation of universities. In conclusion, the main findings of the research are presented.

**Practical implications** – Results testify that goals and objectives that can be solved by achieving indicators in the world rankings are important for improving competitiveness of education, but they are only efficient if they conform to management decisions that are taken for achieving them and coincide with strategic goals and directions that should be implemented within the framework of the national innovation and academic system.

**Originality/value** – Research hypothesis is as follows: modern age is characterized by the rapid development of digital technologies and globalization processes, which transform technologies and cultural patterns into techniques and methods of working with information. Despite the fact that a university is the center for the development of society and culture, which serves as an axiological core, it is subject to the transformation, which is mainly manifested in instrumental changes and the expansion of the social procurement range. The modern educational system is yet to find a contemporary conceptual framework of a university that would satisfy the up-to-date requirements of the global information society in an age of digital revolution and dominate in the educational services market.

**Keywords** Transformation of universities, National innovation system, Innovation infrastructure, Competitiveness

**Paper type** Research paper

## Introduction

Modern global development trends reinforce the qualitative and structural characteristics of differences in the level of social and economic development of different countries, where the development of engineering, technologies and innovations offers crucial competitive

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advantages in the global space. The tendencies toward globalization of research studies as well as the increase of knowledge-intensive GDP are intensified; the strategies of large knowledge-intensive businesses have become increasingly differentiating. The era of digitization and globalization is characterized by the rapid development of innovative technologies, which transform technologies, cultural patterns into techniques and methods of working with information. Under current conditions, a university as a centuries-old civilization project must meet contemporary socioeconomic, political, cultural challenges, become the driving force of the economic growth, conform to the current grand challenges of the global economy.

Global development trends and a new technological mode determine the evolutionary scenarios of development of universities, the major purpose of which is to become the full-fledged entities engaged in innovation activities and an integral part of the “triple helix model of innovation” (Etzkowitz *et al.*, 2000; Etzkowitz, 2008) implemented by universities, industry and the state.

### *Theoretical background*

Innovative development of national economies predetermines formation and development of the national innovative system. Within the technological development, the national innovative system is not a linear causal connection from the research works to innovations, but a process of interaction and feedback of complex socioeconomic, political, organizational and managerial factors, which influence the development, implementation and further commercialization of innovations (Lundvall, 1992; Nelson, 2012).

The innovative process (creation and commercialization of innovations) could be implemented in two ways: linear (targeted movement of knowledge from science to production) and nonlinear (close interaction of representatives of various sectors). The linear innovative process is based on the concept of final consumer’s innovation, the concept of strategic innovations, the concept of open innovations and others. However, in the circumstances of wide dissemination of information and communication technologies, “personalization” of production and development of the digital online environment, the linear model has depleted its capabilities.

The necessity for expanding the institutional basis of universities and for transitioning knowledge production from mono-disciplinary studies, which are aimed at practical implementation, to trans-disciplinary studies, which are aimed at solving socioeconomic problems, was substantiated in the concept of the distributive structure of knowledge production (Gibbons, 1994).

Continuous technological innovations and the interactive process of innovations lead to formation of a new nonlinear model of network coordination of ties (Gloor, 2006). It could be created in the regime of collaboration as mutual process of coordination between all stakeholders of the main organizational rules and settings on the regulation of the directions of activities and relations (Thomson and Perry, 2006).

The network model of university envisages creation of an effective environment of knowledge exchange, companies’ access to scientific developments and innovations, investments in commercialization of knowledge and formation of new markets that are based on scientific achievements (Scott, 2009). The network model is characterized by the fact that innovations enter the economy from the sphere of science (universities) and leads to systemic cooperation of the three leading agents of development (government–business–science (universities)) based on the network mechanism of the “triple helix” – a network connection of functions (Etzkowitz *et al.*, 2000; Etzkowitz, 2008).

The concept of triple helix presupposes not just cooperation of actors but also their functioning in the regime of coevolution and interconnection of their responsibilities.

The hybrid nature of network interaction is peculiar by the fact that while performing their main functions in the sphere of education and science, universities influence the economy by creating incubators, technological parks and start-ups. Business partially accepts the educational functions by creating centers for training and educational centers. Meanwhile, financing various projects, government performs the role of business.

As it was mentioned, within this concept, the key generator of knowledge and the link in a national innovative system is a university. Apart from their basic traditional mission (education and research), universities have a special mission to actively participate in socioeconomic development of a country. This role is predetermined by the following factors: (1) university is a place of concentration of youth, whose basic function is innovativeness; (2) organizational structure and nature of universities support the movement of human resources; (3) universities are the most flexible social institutions from the point of view of generation and dissemination of knowledge.

The contemporary trends of the global academic environment and the expansion of the higher education system in society (life-long learning) have been considered in studies conducted by Nelson (2012), among others. The role of the university as a center of development of high technology and a basis for the further transfer of technologies to the economy was analyzed by and Shane (2004). Moreover, Etzkowitz (2008) sets forth the concept of the university as an innovation hub, which plays a critical role in the strategy of the national innovation system and determines the model of a modern university using the “triple helix model of innovation,” which is implemented by universities, industry and the state.

The concept of balance of institutional spheres (government, science and business) was offered by E.G. Carayannis within the “quadruple helix.” The network alliance, which apart from government, university and business also includes civil society, where the society could create and promote ideas in a free creative environment – as the society that is based on knowledge – is formed not based on the leading industrial technologies but on social approaches to creation of a favorable innovative environment (Carayannis and Campbell, 2010). This fact allows concluding that the national innovative system within the implemented innovative policy transforms the system of interrelations of personality and society, in which the key role is acquired by creation of favorable conditions for creative realization of individuals. The university environment is a place of cultivation of the innovative potential, which is necessary for generation of new ideas, creation of new technologies and innovative development of society as a whole.

### Materials and method

The goal of this research is to analyze the transformation processes in the Russian system of higher education. The main research questions are:

- (1) Do Russian universities have the leading position in the national innovative system?
- (2) Are they a global communication link in the knowledge economy?

The logic and structure of the research are set forth in the following way. First, a review of the global practice of the formation and implementation of state innovation policy is given, with the university being a key link, the foreign experience in the transformation of universities is analyzed and the efficiency of the interaction between the university, industry and the state is examined. Furthermore, consideration is given to the Russian experience in the transformation of universities. In conclusion, the main findings of the research are presented.

Research methodologies include methods of statistical and comparative analysis and synthesis. The information analysis base of the research is composed of the reports of the

World Intellectual Property Organization at year-end 2019, as well as global comparative assessments of the status and development of innovation activities by the Global Innovation Index and [Global Competitiveness Index](#), which are calculated according to the methodology of the World Economic Forum and others.

## Results

A review of principles and mechanisms of the formation of innovation policy in the countries of the universal community.

Social and economic processes that take place in the universal community are based on a new type of technological and economical mode where knowledge and information play the dominant role.

The foreign experience in the implementation of innovation policy has its own features and specifics that are determined by the correlation of functions of the state and the market, institutional and management structure of the science and innovation campus, the level of financing of research efforts in the structure of the gross national product. Depending on the level and the form of financing of innovations and innovation activities, the following strategies have been formed: national active intervention strategy, decentralized control strategy, mixed strategy ([Akhmadulina et al., 2019](#)) (Table 1). Japan, Germany, Sweden, South Korea and the United States are among the top countries in terms of research and development activities.

Strategy	Description	Country
Active intervention strategy	Research and innovation activities are a priority area of the social and economic development of the state. The selection of this strategy implies a number of institutional changes (e.g. in the legal and regulatory framework). The state plays the dominant role in the selection of the scientific and technological development. Innovation activities can be intensified through state financing of higher education institutions, as well as through privileges granted to for-profit organizations engaged in research and development activities ( <a href="#">Mollick, Robb, 2016</a> ; <a href="#">Gabison, 2015</a> )	Japan, France
Decentralized control strategy	The peculiarity of this strategy consists in a more complex interaction of the state and economic entities in scientific and technological and innovation activities. The state, in turn, aims to create favorable conditions, infrastructure for shaping demand for innovations: tax incentives and other incentives are applied, government subsidies are provided and so on ( <a href="#">Ruegg, Feller, 2003</a> ; <a href="#">Hicks, 2012</a> )	The United States, the United Kingdom
Mixed strategy	The essence of this strategy is that if the public sector is dominant in the economy, the state is interested in the high export potential of this sector. The active intervention strategy is used in that case. Decentralized control strategy is applied for all other entities engaged in scientific and technological and innovation activities (e.g. higher education institutions, research and development centers, for-profit organizations performing their own research and development activities) ( <a href="#">Kushlin, 2018</a> )	Russia, China, Sweden

**Table 1.**  
National strategies of  
innovation activities

**Source(s):** Compiled by the author

The choice of a particular strategy forms a passive or active position of a state in the field of innovation activities, which is crucial especially when an organization (a higher education institution, a research center, a for-profit organization performing research and development activities) obtains guaranteed access to continuous innovation activities. Additional incentive measures can be implemented through the economic policy (crediting and taxation system, regulation of the international technology transfer, etc.), which allows ensuring consistency, quality and accessibility of innovative products and the economic growth.

Regardless of the chosen strategy, the primary function of a state in the development of innovation activities consists in cooperation of all entities engaged in scientific and technological activities. The efficiency of this cooperation can be assessed through indices and rankings of assessment of the status and development of innovation activities; for example, Global Innovation Index – the main reference points in the current innovation process throughout the world – is drawn up on the basis of 82 indicators for the 127 countries of the world. The second-most important indicator that is used for the assessment of the innovative capacity of nations across the globe is the [Global Competitiveness Index](#) that is calculated according to the methodology of the World Economic Forum, defining national competitiveness as the ability of the country and its institutions to ensure the rate of economic growth ([Table 2](#)).

Both rankings include a number of assessable variables where the results in the field of knowledge and technology hold a special place; the results of creative activity (Global Innovation Index), higher education and professional training and innovative capacity ([Global Competitiveness Index](#)) serve as a sort of points of reference in the top positions of the state in the world rankings. As a result, special emphasis is put on universities as generators of science-intensive innovations. World challenges are a reflection of the fact that nowadays, economic growth of the state, and hence, high world rankings, can only be achieved through the effective interaction between the university, industry and the state.

The foreign experience in the participation of universities in the formation of the national innovation strategy.

Modern universities constitute a key link in the process of reproduction of knowledge and its subsequent application, that is, the primary channel of innovative technology transfer. A contemporary trend of the academic environment is the business activity, which lies in the capability of academic environment not only to grow knowledge and technology but also to

Country	Global innovation index	Global Competitiveness Index	Ranking
Switzerland	67.24	82.3	1/5
Sweden	63.65	81.02	2/8
The United States	61.73	83.7	3/2
The United Kingdom	61.30	81.2	4/9
Singapore	58.37	84.8	8/1
Germany	58.19	81.8	9/7
South Korea	56.55	79.6	11/13
China	54.82	73.9	14/28
Japan	54.67	82.3	15/6
Canada	53.88	79.6	17/14
Russia	37.62	66.7	46/43

**Source(s):** The Global Innovation Index 2019. URL: <https://www.globalinnovationindex.org/gii-2019-report>; [Global Competitiveness Index](#). URL: <https://www.weforum.org/events/world-economic-forum-annual-meeting-2020>

**Table 2.**  
Global indices and rankings of assessment of the development of innovation activities throughout the world in 2019

commercialize the knowledge gained (Kuznetsov and Engovatova, 2016). Currently, universities, together with for-profit organizations and business entities, serve as active participants in the national innovation system. In the context of this study, the national innovation system is understood as a system that includes a network of interconnected institutions (the institute of state power, the institute of education, market institutions) that participate in the reproduction and translation of values, norms and rules for the formation and transfer of knowledge, skills and technologies (Freeman, 1987; Gokhberg, 2008).

The role of a university in the development and modernization of science and technology depends on the institutional structure of the economy; the universities are the leaders during the knowledge and technology transfer for a variety of reasons (e.g. the lack of corporate environment, which restricts participation of other entities). Such countries as China, the United States and Japan serve as a striking example since they have been leading in patent activity in recent decades, with the main share being constituted by universities as patentees (Table 3).

China is an undisputed leader in the number of international patents held, which is largely due to universities, especially at Stage 1, the development and formation stages. The universities of China serve as the basic platform for the formation of the forward-looking innovative development, at both the national and global levels.

When we analyze the international experience in the transformation of universities, we should emphasize the Massachusetts Institute of Technology, which is a demonstrative example of efficient interaction of business entities with the academic community, which effectively combines the educational function with fundamental and empirical researches that conform in advance to the challenges of the society and the economy. The annual research expenditures amount about US\$650m. The number of patents received per year exceeds 300, and the proceeds of licensable activities must reach US\$70–90m a year.

Special attention should be given to the National University of Singapore, which is the largest state university with more than 33,000 students and the annual budget spent on research and development activities being about US\$580m. The university is the third largest patentee in the country, giving way to Hewlett Packard and Chartered Semiconductor, and is included in the top 30 universities of the world.

Stanford University is the oldest research university in the United States. Yahoo and Google, for instance, were established by the Stanford Alumni. It acquires licenses for more than 100 technologies annually, making more than US\$90m profit each year (Kuznetsov and Engovatova, 2016).

Country	Total number of applications filed			The share of universities as patentees, 2018, %	University
	2018	2012	2007		
China	1,318,594	536,415	212,314	33.2	Shanghai Jiao Tong University
United States	606,956	503,582	312,401	41.6	The University of Washington
Japan	318,479	342,610	115,452	26.4	National Aerospace Laboratory
Russia	36,883	41,414	36,415	32.9	Moscow M.V. Lomonosov State University
South Korea	204,775	7,245	3,245	28.3	Korea Advanced Institute of Science and Technology (KAIST)

**Table 3.** Country ranking by the number of patents

**Source(s):** World Intellectual Property Organization – 2019. URL: [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_944\\_2019.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_944_2019.pdf); Rating of inventive activity of universities – 2019 URL: <http://www.acexpert.ru/analytics/ratings/rejting-izobretatelskoy-aktivnosti-vuzov—2019.html>

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Thus, the role of a university in the national development depends on the chosen economic model, where the universities can serve as an infrastructure for the forward-looking technology transfer (e.g. China) or as an innovation and business platform (e.g. the United States). However, regardless of the chosen strategy, the main mission of a university consists in the role of an entity that translates knowledge economy not only on a national basis but also on a global basis, implementing advanced technology practices.

#### Russian experience in the transformation of universities

The educational space in Russia has changed dramatically over the recent years. To have the upper hand in world development, it is necessary to establish first-class universities that will be able to provide a breakthrough in various fields of science and technology. Nevertheless, mass training of personnel in various mid-level universities will not produce the desired effect. By all means, mass-scale higher education allows developing a positive attitude to innovations and innovative development on the part of the population; however, only universities with high reputation, reputable scientific schools and the educative process formed and carried out at the postindustrial level will be able to serve as the guides of innovative development.

Russia has started a global transformation of the entire higher education system. The main goal of the implemented changes is to bring the Russian higher education system closer and integrate with the world higher education system. The key leitmotif of this modernization is to change the vector of the state educational policy, the perspective of which is shifted to improving the competitiveness and quality of Russian education in the international arena (Romanyuk and Sklyarenko, 2014; Mechanic, 2016). This largely explains the intention of public authorities to enhance the role of regional Russian universities in the global competition of higher education institutions around the world.

A reform of higher education institutions has been implementing in Russia since 2005 and can be conveniently divided into three stages.

*Stage 1 (2005–2007)* is characterized by the initiation of the use of program-based and project-based approach to the development of education; the implementation of national priority project “Education” started; the Bologna process was legislatively introduced into the higher education system.

During *Stage 2 (2008–2011)*, the territorial structure of higher education institutions of the country was formed, which includes traditional universities (e.g. St. Petersburg State University), Federal Universities (a total of ten Federal Universities) and national research universities (this list entails 29 universities). The process of commercialization of scientific research results and formation of interaction with business entities began.

*Stage 3 (since 2012 till present)* – sights have been set on improving competitiveness of universities. Scientific and production state clusters have been formed; a strategy to improve the competitiveness of the country’s leading universities among research and education centers all over the world is being developed and implemented.

During the implementation of the reform, Russian universities were given the opportunity of “conversion” from the institute for education to the institute for development, research and innovation growth areas, which gave Russian higher education institutions the opportunity to become the full-fledged entities engaged in innovation and business activities based on research functions of a higher education institution.

The implemented reforms influenced the institutional formation of universities as subjects of the national innovative system. Thus, a question arises: are business structures ready for innovative cooperation, financing and implementation of innovations in their production? Unfortunately, entrepreneurial structures in Russia are reluctant to implement innovations, which is confirmed by statistics (Table 4).



**Table 4.**  
Structure of R&D  
expenditures, %  
of GDP

Country	Share of R&D expenditures in GDP in 2019, %	Business, % (2016)	Government, % (2016)
United States	2.74	62.3	25.1
United Kingdom	1.69	49.0	27.7
Germany	2.94	65.6	27.9
South Korea	4.24	75.4	22.7
China	2.12	76.1	20.0
Japan	3.14	78.1	15.0
Canada	1.60	40.6	33.0
Russia	1.10	28.1	68.2

**Source(s):** Compiled based on OECD Statistics (<https://www.oecd-ilibrary.org/statistics>)

On the whole, government financing of R&D in Russia is significant, though it is behind the level of countries with dynamic national innovative systems (e.g. the United States, South Korea and Germany). However, analysis of the data on the volume of business financing shows that Russia is a vivid outsider. This demonstrates that the innovative model of socioeconomic development based on the concept of “triple helix” has not yet been formed. Entrepreneurial structures do not want to invest in innovations and implement innovations; in fact, only 5% of companies implement technological innovations. Russian sectors are peculiar for low demand for innovations and innovators, which cannot but influence the formation of a model of the national innovative system (Gokhberg, 2013). One of the main tasks of the national innovative policy is creating a favorable innovative climate in society supplemented by the government support for investments in innovations (e.g. tax subsidies).

In the context of the existing challenges and threats, the Russian national innovative system could form an effective model of functioning under the condition of refusal from the resource-based economy and transition to innovative development, which envisages the transition from incomplete “dual helix” with the dominating role of government to formation of an environment of partnership trust (primarily from business), that is, a new culture of social interaction based on the advantages of the concept of “triple helix” as a perspective model of creation of innovations and effective functioning of the national innovative system, which is of the top priority in Germany, Japan and South Korea (Warwick, 2013).

### Conclusion

Effective innovation policy of a government should be built on continuous coordination of ties between all subjects and social groups (vivid examples are the United States, European countries and Scandinavian countries). National innovative systems form an integrated network ecosystem, which is necessary for progressive innovative development of society and national economy.

The national innovative system in Russia is characterized by certain archaism because implementation of the directions and mechanisms of the innovation policy is concentrated in several departments with the minimal participation of business, while universities are just objects of state regulation with postadministrative and command type of management. The Russian model of national innovative system is peculiar for absence of interconnections between the main actors of the system and accordingly, lack of coordination between the actions. The fuzzy and fragmentary character of the Russian model is predetermined mainly by the institutional (weak interaction between government, science and business) and intersectorial (differentiation of the production sectors by the level of innovative activity and technological development) factors.



Regarding universities as subjects of the innovative system, one may state that despite the great amount of measures of institutional and structural changes and transformation, universities are in the state of transition from the old (Soviet) model to a new effective model of functioning (which is still to be found). Russian university management aims primarily at competitive positions in the global rankings. However, orientation at foreign indicators is copying of the foreign model and a strategy that does not take into account the national specifics of organization of science and education.

Thus, the performed analysis allows concluding that no country has an ideal model of the national innovative system. However, certain states have comparative advantages, for instance, developed network of scientific and production clusters (the United States), high level of protection of intellectual property rights (Germany) and innovation value chains (Japan).

Russia implements a rather wide range of programs and projects that aim at development of universities and their cooperation – but in certain direction and in the conditions of absence of a clear strategy and spatial scheme of the universities' development and absence of the system of evaluation of the regulating influence, which does not allow evaluating the performed reforms' influence on the innovative development of society and national economy.

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