

## Transformation of National Innovative Systems: Russian and Foreign Experience

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### Abstract

The article analyzes existing national innovative systems and their characteristics. The authors allocate the preconditions for the formation of innovational system and determine the leading role of the state which consists in cooperation for production of fundamental knowledge and complex of technologies of strategic character, as well as in creation of infrastructure and favorable institutional conditions for innovational activity. The authors state that Russia requires long-term program for development of national innovative system, similar to the EU strategy “Horizon 2020”, which, under the sanctions, can become a serious stimulus for the development of innovational business in Russia.

Comparative analysis of evolution of formation of innovational system of the USA, Japan, and the EU countries leads to the conclusion that Russia is at the initial stage of formation of institutional conditions of formation of national innovative system, but possesses a huge creative fundamental potential of ideas and knowledge.

**Keywords:** national innovative systems, model for innovative systems, innovational stimulation, “model of triple spiral”, innovational entrepreneurship

### 1. Introduction

At present, national economic development of states is closely connected to such phenomenon as globalization: transnational corporations, global technological solutions, monetary development, and other pros and cons of the single global market and global economy became standard and contradictory phenomena of the everyday, to the favor or burden of our life. That’s why the processes of globalization, with all their important meaning, develop in a very discrepant way. The inequality of development of particular countries and regions of the world increases, and there are attempts to impose the influence of certain countries on the development of the whole global potential. As a consequence, economic doctrine becomes a political and ideological norm for certain countries’ prevailing over the whole continents. In its turn, this provokes various countries to self-determination and search for new paths of development, based on knowledge and intellectual & technological and technical dominant.

Certainly, search for own solutions to formation of economy is performed within coordination of development of national economy with tendencies of global economy. The scale of such coordination and models of own development which are born in the process of study of the most economically profitable forms of usage of leading developments are the result of direct influence of the processes of globalization and integration, demonstrating the influence on social and economic changes, formation of regional clusters, and directly in the development of innovational sphere of the countries.

Surely, at present, scientific and technical progress has a key role in the economic development of the state; it allows companies, various economy spheres, and national economies on the whole to increase their competitiveness.

It should be noted that by the middle of 2010s, the system of support for innovative activities in the Russian Federation is characterized by underdevelopment and inefficiency. Such countries as the USA and Japan, due to well-known reasons, occupy the leading positions in the world as to innovations and their commercialization, which produces increased interest to the experience of support for innovational entrepreneurship in these countries.

The main provisions, which lie at the basis of innovational policy, were formulated by the Western scientists. It was them who, in the middle of the XX century, began research in the sphere of problematics of growth, technological changes, and their interconnection. The founders of the theory of formation of national innovative systems are English professor K. Freeman, Swedish scientist B.-A. Lundwal, and American professor R. Nelson. While analyzing innovative activities, each of these authors focused the attention on particular elements and their interconnection.

Surely, the preconditions for this research were the works of J. Shumpeter (theory of economic dynamics), F. Hayeck (concept of dispersed knowledge), D. North (institutional theory), R. Solow (role of scientific and technical progress in economic growth), P. Romer, and R. Lucas (new theory of growth).

The scientific literature also contains the notions of “economy of knowledge” and “new economy” which refer to innovations; they denote “growing interdependence between the markets of capital and new technologies”, and “strengthening of social orientation of new technologies, global character of creation and use of knowledge, technologies, products, and services” (Dynkin & Ivanova, 2004).

“In order to determine innovational policy, the modern Russian economic school uses concepts of evolution of national innovative systems and their central link – large corporation (Dynkin & Ivanova, 2004).

Innovations are in the system of institutional, economic, technological, and organizational factors. The condition for introducing and using the innovations is the optimal combinations of these factors. Disproportions and one-sided development lead to reduction of productivity and aggravation of well-being and level of life. During the consideration of the issues of formation of innovational economy of the state, a lot of attention is paid to the notion of “conception of national innovative systems” (NIS).

## **2. Preconditions for Innovational Systems Formation**

Science is an important factor of innovations. Together with social needs, it is a leading source of innovations. However, it should be noted that as of today, it is not closed and isolated by the limits of scientific establishments – quite on the contrary, it is a mechanism built-in in the system of economic processes which take place in national states, their spheres of economy, companies, etc. Thus, science is an important factor of national informational systems.

The NIS theory is based on the ideas of J. Schumpeter which are devoted to competition, “built on the basis of innovation in corporations as a main factor of economic dynamics” (Schumpeter, 2007). Modern innovational system is formed under the influence of many factors for every country: volumes and availability of resources and peculiarities of institutes’ development. All these factors are long-term determinants of direction and speed of development of innovational activity. For each state, its own national configuration of institutional elements is formed. The simplest NIS model supposes that private sector conducts research, receives technologies, and commercializes innovations. The state participates in creation of fundamental knowledge and complex of technologies of strategic meaning, and also forms the environment for activity of private companies. This very model forms the national peculiarities of NIS. On the whole, they are manifested in the correlation of the influence of the state and private sector in performance of these functions, large and small business, fundamental research, and R&D.

The conception of national innovative systems gives knowledge a special role in economic development. Also, it views the “analysis of institutional context of innovative activity as a factor influencing directly its content and structure” (Ivanova, 2002).

National innovative system is a variety of interconnected organizations (structures), dealing with production and commercial realization of scientific knowledge and technologies within national borders: small and large companies, universities, state laboratories, technological parks, and incubators. Another part of NIS is a complex of institutes of legal, financial, and social character which ensure innovational processes and possess firm national roots, traditions, and political & cultural peculiarities” (Dynkin & Ivanova, 2004).

Coming back to the notion of innovations, it should be noted that at present they are usually divided within several typologies. Firstly, they can be innovations-products and innovations-processes. Secondly, innovations are technological and organizational. Sometimes, it is possible to meet a mention of institutional, social, and other innovations. Besides, they can refer to material and non-material production (Stroeveva, Sibirskaya, Khokhlova, & Oveshnikova, 2014).

Viewing innovations in the technical & economic sphere, they may be defined as radical (essential, revolutionary), evolutionary (gradual, modernization), and continuous or uneven (faltering).

Recently, the stated criteria were supplemented by new approaches. In particular, M. Porter and G. Bond divided innovations into ascending and descending (Porter & Bond, 1999). Ascending innovations are built on scientific research, and descending – on the process of commercialization.

There is still discussion as to the source of innovations within economic theory. Thus, they are subdivided into “technological push” (J. Schumpeter, K. Freeman, N. Rosenberg et al.) and “demand challenge” (J. Schmuckler, G. Mensch et al.). On the basis of this, innovations are divided into “offer innovations” and “demand innovations”. Thus, it is possible to state that innovations are novelties which are formed in close interconnection with scientific & technical progress and R&D and provide qualitative increase of production process and its final result. Innovational entrepreneurship has become a special type of entrepreneurial activities. In order to understand better its meaning, it is necessary to define its components.

Thus, innovation means the process of creating initial idea with its further commercialization and receiving new products, technologies, or conducting cardinal improvements of existing products, services, or technologies. At that, it is necessary to create a prototype or a model which will allow using the new idea in practice. “A final stage of innovation is industrial manufacture of production which is demanded by the market and receiving the expected profit from selling this production (or from selling the license for corresponding patent)” (Bediy & Kolesnikov, 2011). This stage is called commercialization. Therefore, innovation is a process which includes several stages: from the idea of implementation of product, service, or technology to their commercialization.

The notion of “entrepreneurship” has several definitions which are presented in modern scientific literature. “Thus, in the publications of economic nature (R. Catillon, J. B. Say, A. Marshall), entrepreneurship is defined as the most important economic function which is characterized by risk, search, and implementation of novelties, and by combination of production factors. In other works (F. Hayek, Campbell R. McConnell, Stanley L. Brew, P. Samuelson, P. Drucker), entrepreneurship is defined as understood as psychology of behavior and management, supposing independent decision-making, organizational innovation, creative search, etc.” (Popkov & Evstafieva, 2007).

Analysis of the existing national innovative systems allows structuring the following types of NIS models (Figure 1).

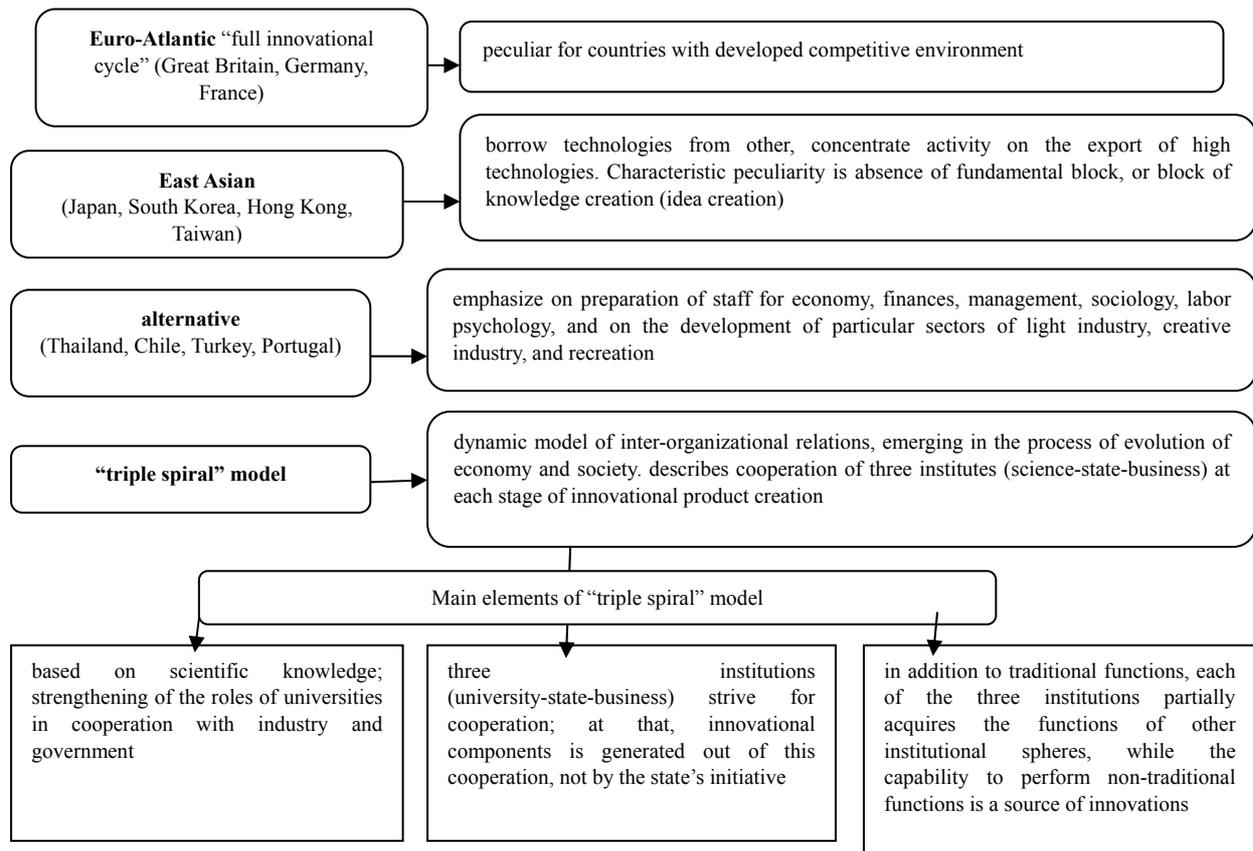


Figure 1. Models of national innovative systems and their characteristics

A special attention should be paid to the “triple spiral” model, which is peculiar for the USA, while its particular elements – for some developed countries of Western Europe, Brazil, and Japan.

The simplest model of cooperation of NIS elements is brought down to the fact that the role of private sector consists in the development of technologies on the basis of their own research and market acquisition of innovations. The role of the state is to facilitate the production of fundamental knowledge and complex of technologies of strategic nature, as well as creation of infrastructure and favorable institutional conditions for innovational activity. That’s why it should be noted that F. Fukuyama in his work “Trust” (Fukuyama, 1995) calls local systems the “radius of spontaneous cooperation”.

Interesting enough, M. Porter in his work “Clusters in new economy” (Porter, 1998) concentrates on the local level of knowledge, trust, relations, and culture, as a basis for rivalry, which causes: better access to employees and suppliers; access to specialized information; complementarity of various kinds; coordination with local companies; accessibility of social benefits (pool of skills, reputation, and technologies); better motivation.

It is pretty clear, that further development and prosperity of economy depends directly on innovations which increase the labor efficiency and productivity of invested capital.

Everything happening in Russia is aimed at stable development of the country through creation of innovational system, which includes orienting applied and fundamental science at modernization of domestic industry and creating new productions and technologies. Against the background of the globalization of the world economy, our country faces several problems (Sibirskaya, Stroeva, Khokhlova, & Oveshnikova, 2014):

- resource-based economy;
- joining WTO and significant imbalance of integration with the global economy;
- lagging behind in the development of infrastructure and general underdevelopment of industrial enterprises;
- low level of ties between scientific and industrial sector;
- complex mechanisms of financing scientific & research and R&D works.

This process (achieving stable development of the country) is many-sided and supposes participation of four groups of members. Firstly, it’s producers of new knowledge – organizations working in fundamental research, such as scientific laboratories, research centers, etc. Secondly, entrepreneurial sector, responsible for production and commercialization of the results of applied and fundamental research. Together with these two groups, there is also a sector of education. i.e., higher educational establishments which form new knowledge with research organizations, and are also suppliers of staff for research centers and enterprises. The fourth member is the state.

Cooperation of these groups takes place in certain environment, i.e., innovational environment, which produces transformation of national innovative systems.

It should be noted that innovational environment is a complex of components which are supported by a system of measures of organizational, methodological, and economic character, which ensure creation of innovations (Sibirskaya, Stroeva, Gubareva, & Mikheykina, 2014).

The basis of innovational environment is formal rules, i.e., “game rules”, listed in regulatory legal acts. Thus, Item 1 Article 2 of the Civil Code of the RF contains the definition of the notion “entrepreneurial activity is independent activity by a person conducted at its own risk pursuing as a basic purpose the extraction of profit from the use of property, sale of goods, doing work, or rendering of service, by registered persons in accordance with the procedure established by law” (Civil Code of the RF, 1994).

## **2. New Technologies and Crisis-Factor of Entrepreneurial Activity**

Having viewed and determined the notion of “innovation” and “entrepreneurship”, it is possible to pass directly to the definition of the notion “innovational entrepreneurship”.

Thus, according to D. P. Ermilov, “innovational entrepreneurship is entrepreneurial activity which uses or concentrates on a certain stage (or several stages) of the production of innovation” (Ermilov, 2007).

This definition does not fully reflect the main meaning of innovational entrepreneurship, so, within this work, we shall understand innovational entrepreneurship as the “process of creation and commercial usage of technical and technological innovations” (Rudakova & Shaporova, 2011).

The last definition renders the meaning of innovational entrepreneurship better, as, apart from creation of new product or technology, it also supposes entrepreneurial income which is acquired due to the created product or technology.

In the broadest sense, innovational entrepreneurship is the segment of economy which deals with satisfying the changing social needs and forming completely new objects of demand. At that, the defining and obligatory feature of entrepreneur who develops new technologies and implements new combinations of production factors is not the status of owner. His main function consists in innovational activity.

It should be also noted that, as E. A. Yaroslavskaya and B. A. Yakubov state, “innovational entrepreneurship is a many-sided type of economic activity, the subjects of which are individuals and legal entities which can perform the following types of initiative activity, related to reproductive cycle of innovational product” (Yaroslavskaya & Yakubov, 2012): creating innovational product (direct innovational entrepreneurship); performing intermediary functions (providing services which relate to promotion of innovational products and its transfer from manufacturer to consumer); performing functions in financial sphere for the purpose of provision of innovative activities.

On the whole, innovative entrepreneurial activities are based on transformation of ideas (mainly, results of R&D) into new or modernized products, for the purpose of their implementation into the market or new (modernized) technologies or means for provision of services, for the purpose of their use in practice.

It should be noted that while conducting innovative activities, a necessary condition for acquiring innovation is using the variety of scientific, organizational, technological, and financial measures. Let us emphasize that scientific research and developments are not only the source of new ideas, but, at various stages of innovational process, can be the means of solving the problems which emerge at any stage of the cycle “research-production” (Bugayan & Kaymachnikova, 2010). Of course, transformation of national innovative systems is largely determined by the vector of entrepreneurial forms, by mental and creative potential. At that, we shall agree with O. A. Golikova’s opinion that “the very meaning of entrepreneurship is most fully manifested in innovations, where a completely new combination of production factors is created (new production function)” (Golikova, 2011).

At present, after the 2009 crisis and 2014 sanctions, the situation of formation of national innovative system of Russia is not favorable at all.

Over the recent years, owners of small and micro-business were one of the most active clients of most of the Russian banks. The technologies of mass crediting (“credit factories”) and special products were created specifically for small and medium business. As the technology of “crediting factory” developed, large banks were able to stabilize and successfully manage the higher level of past due debt which is peculiar for such products. However, slowing of economic growth, foreign policy instability, and fluctuations of currency exchange performed a substantial blow to paying capacity of small and medium business (SMB). Those were unsecured loans that began to fall in arrears. As of 01.01.2015, the level of past due debt in the segment of SMB reached 8.3%, which is 1.1 percentage points higher than for 01.01.2014. At that, the share of past due debts of SMB in banks from top-30 increased up to 10% - against 9% as of 01.01.2014. For this same period, the past due debt in financing retail customers grew by 1 percentage point and reached 6.2%, while in financing the large business the past due rate constituted 3.8%.

Crisis phenomena in economic in 2014 dealt substantial damage to small business, among other things from reduced access to financing. Thus, the cost of credits for entrepreneurs increased. While in September 2014, the average interest rate was 17-19%, in December 2014 it increased to 25-35%.

During 2014, the share of loans, given for the period of more than three years dropped from 15 to 11%, while the share of loans given for the period of up to 1 year grew from 20 to 21%.

Negative dynamics of the portfolio in SMB segment in 2014 is caused by two key factors. On the one hand, aggravation of financial state and reduction of repayment discipline of SMB subjects, due to which the banks tightened the requirements to their borrowers during 2014. On the other hand, re-orientation of leading members of the market to financing large Russian companies which lost access to large Western markets of capital due to sanctions.

That’s why the loan portfolio of SMB in banks from top-30 reduced by 8% as to the assets in 2014, while other members of the market had a growth by 9%.

The top-3 of the market remained the same (Figure 2). VTB 24 bank, unlike its neighbors in top-3, showed positive rates of growth, increasing the portfolio by 6.3%, as compared to 01.01.2014. In the aggregate, the share of top-20 banks which finance SMB grew by 2 percentage points up to 44% (42% at the year-end of 2013) (Financing SMB: melting growth, 2014).

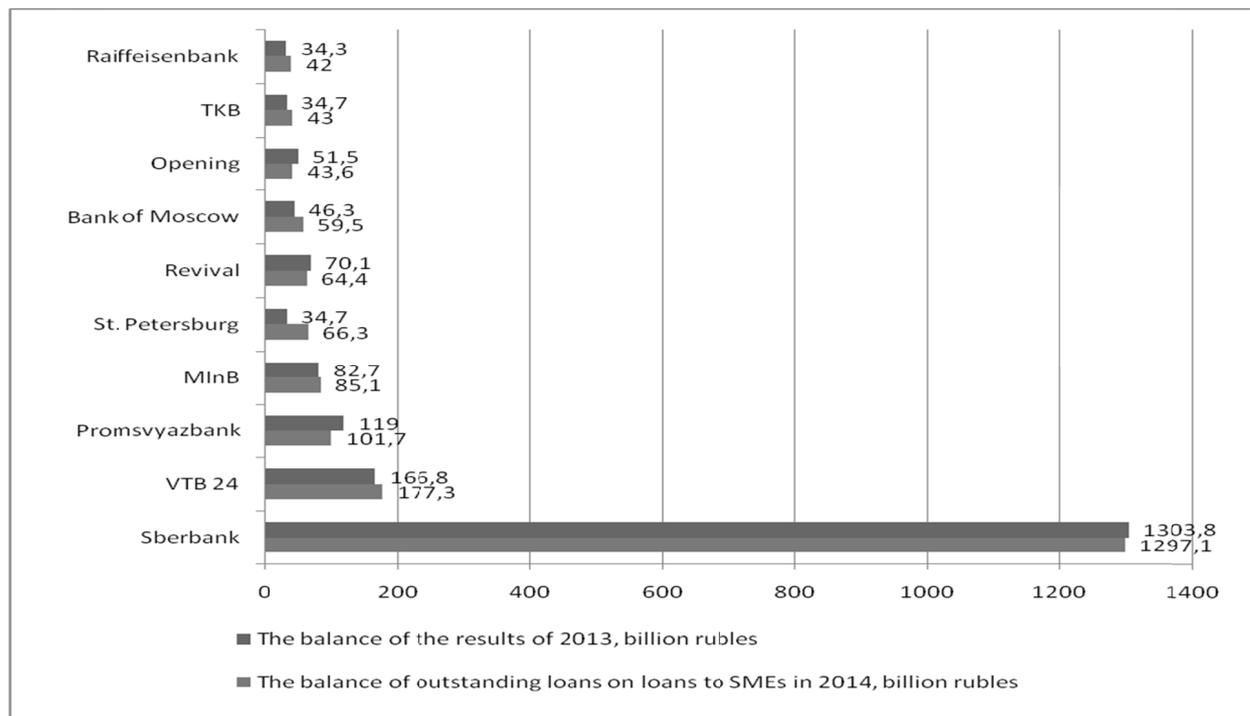


Figure 2. Top10 banks as to the volume of the loan portfolio for small and medium business (Financing small business..., 2014)

At present, there is a huge work for complex support and stimulation of activities of SMB at the state level. In July 2014, the Agency for Loan Guarantees began working; it is supposed to lead the creation of the national guarantee system. The guarantee provisional mechanism, offered by the Agency, will allow increasing the accessibility of credit resources for SMB, especially in view of significant liberalization of criteria for selecting projects and clients, including removing constraints as to 209-FZ (as to the structure of property and quantity). Implementation of these products into the line-up of the Agency will allow expanding the access to credit resources for enterprises of small and medium business and can be a serious stimulus for the development of SMB. However, the vivid effect from creation of the Agency for SMB can be observed not sooner than the end of 2015.

An additional driver for financing small and medium enterprises is the growth of import-substituting productions against the background of the Russian Government's using "food" sanctions for a range of Western countries, which can give a new push to the development of business in Russia. However, this effect will be observed not sooner than 2016, and only under the condition of successful implementation of state programs for the development of domestic production.

### 3. Regional Innovational and Economic Priorities

Innovational course of development of Russia is conducted with a direct participation of the state, business society, and scientific staff. Some regions of the Russian Federation already have an experience of integration into the world economy with the use of the most efficient methods of economic solvation. This path will stipulate Russia's taking the leading positions in the global economy, i.e., innovation and competitive economy.

At the modern stage of globalization, there is activation of national systems' participation in the global processes. Density of economic relations at the regional level grows. Under the conditions of the change of political structure of the world at transition from bipolar world to depolarization and multipolarity, the role of regional associations grows; these associations gravitate toward emerging "poles" or "centers of force" and influence the tendencies of the global economic development.

Modern economic situation is characterized with uncertainty of perspectives of the global economic growth against the background of the world economic activity center's transferring from West to East, from America and Europe – to Asia, from developed regions – to developing ones. Accordingly, the influence of large

developing economies and regional integration associations with them grows, which creates new preconditions for transformation of innovational systems.

The model of globalization, formed by developed countries according to the principles of neoliberalism, turned out to be unstable and insufficiently flexible for preserving the dynamics of development, under the conditions of the crisis. As a matter of fact, developed countries used all economic benefits from one-sided global integration, related to development of regional product markets and advantages of cheap production resources, which became one of the reasons for the global crisis. However, the large markets of the North America and Europe were formed, and they still play the main role in the processes of regionalization and selection of strategies for regional integration. According to the World Bank report “New view on economic geography” (Report on the global development, 2014), selection of effective strategy of regional integration is influenced by density of international economic connections and remoteness from main global markets.

It should be noted that large-scale acquisition of new technologies and growth of globalization led to reduction of the meaning of traditional productions in many spheres, while the potential attributes of small enterprises strengthened. Small and medium enterprises are numerous and constitute around 95% of all enterprises, providing 60-70% of employment and creating new jobs in the USA and the EU.

Despite the fact that small enterprises possess less - as compared to large enterprises – assets for research, they, however, “have greater innovational potential, for example, a possibility for quick creation and re-engineering of goods and services which can quickly respond to demands of new markets. Small enterprises quickly acquire new organizational models for reduction of costs and implement technologies for increasing the sales” (Mamontova, 2009).

Most of these enterprises refer to highly specialized spheres and are located in the spheres of active economic development. Very often, these leaders of economic development are formally and informally united unto network structures of connected enterprises (Mironenko, 2013).

Small innovational enterprises play a key role in the development of new production and new markets in the spheres of high-tech, including informatics, biotechnologies, medical and pharmaceutical industry, telecommunication and information processing, research and development, marketing research, and production and personnel management.

Active role of entrepreneurship is an important condition for development of small innovational enterprises. Position, qualification, and activity of entrepreneurs influence the economic development: creation and development, crisis and decline, breakdown of enterprises, and their full life cycle. It should be noted that the process of entrepreneurship still remains a kind of art. “In every country, social, cultural, and political factors influence the entrepreneurial possibilities and capability for risk. Among the factors which hinder entrepreneurship and creation of new innovational enterprises, it is possible to name low educational level, norms, and obstacle from state authorities” (Mamontova, 2009).

Thus, innovational environment is an outpost of formation of national innovative system; in 1990s, governments of the European countries began to put emphasis on solving problems of innovations. Various measures were taken for stimulation of innovational enterprises.

The state’s attention is concentrated on supporting the “environment” which stimulates innovations and risk. There is a shift of focus of state support from specific companies to support for competition, improvement of the system of protection of intellectual property and creation of innovational clusters.

Informational component becomes an important part of state policy. With the globalization of economy, national innovative system turns to institutional factors. Due to the development of Internet technologies, the state faces new tasks: struggle with piracy, increasing the security of online trade operations, protection confidentiality, and solving the problems of national jurisdiction.

In the globalized world, the support for innovations leaves the national limits and becomes a prerogative of the European Union and supranational organizations which work on the “code of behavior” of the companies and states in the global markets of new technologies. The character of scientific and technical programs of the EU also changes: “technological” course changed to orientation at the creation of infrastructure of distribution of new informational technologies.

Due to wide use of informational technologies, there goes a unification of national patent systems with creation of multilevel mechanism of protection of intellectual property, when frame norms are developed at the supranational level and national departments perfect the patent protection.

Scientific and technical factor (R&D, cooperation in development of new technology, results of patent work) becomes one of the main landmarks of the market in the evaluation of cost of capital of a company.

As the experience of the countries of Northern Europe showed, favorable environment is a guarantee for active innovational activity of companies.

Another task of the EU is deepening the processes of economic integration and its expansion by means of new members from Eastern Europe. It was successfully realized, and the EU formed productive and economic potential, equal to the American one. Against this background, an interesting European paradox is shown: having good scientific base and possibilities for commercialization of the results of this activity, the EU was losing in the innovational race at the global scale.

#### **4. Innovational Strategy of the EU**

The EU implements various programs in innovational sphere. One of such programs is “Eureka”, started in 1985 for the purpose of liquidation of growing technological gap between Western Europe and Japan & USA. It was supposed to solve to tasks: overcoming regional and sectorial division of scientific and innovational potentials; mobilization of entrepreneurial sectors, especially small and medium enterprises, for manufacture of high-tech production with state support.

At present, a special importance belongs to the following programs: Framework Program of the EU (in 2014, it was the eighth framework program “Horizon 2020”); the European scientific environment, etc.

Thus, in 2014, the Seventh Framework Program of the EU was replaced by a new program for scientific studies and innovations “Horizon 2020” (Framework program for scientific research and innovations “Horizon 2020”, 2014).

The new program united the Framework program for scientific and technological development of the EU (FP7), Competiveness and Innovation Programme – CIP, and the European Institute of Innovation and Technology. In general, the implementation of the “Horizon 2020” program will cost around EUR 80 billion.

The program consists of three main priorities:

- Excellent Science – supports the best scientific ideas and provides the access to research infrastructure for scientists;
- Industrial Leadership – facilitating the attraction of investments into key industrial technologies, growth, and the European companies’ entering the global markets; i.e., stipulating Europe’s turning into the center for attracting investments into R&D.
- Societal Challenges – aimed at solving main societal problems: the program will unite resources and knowledge in various scientific spheres: healthcare, demographic changes, and well-being; safety of food products, agriculture, sea studies, and bioeconomics; clean, safe, and effective energy; ecologically safe transport.

Then, within the international cooperation, there is planned participation in Framework Programs with scientific organizations from the US and BRICS (Brazil, Russia, India, China, South Africa). Thus, as a result of implementation of the seventh framework program (for scientific and technological development of the EU (FP7), 452 scientific organizations participated in realization of 281 projects for an overall amount of EUR 54.9 million.

At present, innovations are given special priority by the Government of the RF both at regional and federal level, for the state attempts to create the Russia’s image as “high-tech nation”.

At present, for the purpose of support for innovational development, Russia created the following state institutions for support for innovational entrepreneurship.

In particular, Development Fund of the Center of development and commercialization of new technologies (Skolkovo Fund) provides the formation of the full cycle of innovational process. The Fund also finances scientific research, R&D works, organization of compact production, start and development of sales, and promotion of innovational product and technologies in the market. The volume of financing: the stage of idea – up to RUB 1.5 million; seed stage – up to RUB 30 million; early stage – up to RUB 150 million; advanced stage – up to RUB 300 million.

Then, the Fund for support for development of venture investments into small enterprises in the scientific and technical sphere of Moscow was created for the purpose of satisfying the needs of small innovational enterprises in financial resources and creation of favorable conditions for leading business activity in scientific and technical

spheres in Moscow. The main task of the Fund is to grant access for small innovational enterprises to the sources of non-budget financing (from RUB 10 million to 120 million) for implementation of venture projects.

Table 1. Period of reforming of legislation for support for innovative entrepreneurial activities in Russia

period	characteristics	Methods and measures of realization
1993-1994 Government Decree dated February 3, 1994, No. 65)	(RF Creation of the Fund for support for development of small enterprises in scientific and technical sphere in the type of state non-commercial organization	Accumulation of financial assets for support for small and medium business; the Fund receives 1.5 % of the assets of the federal budget for science.
1995-1996 Federal Law dated August 23, 1996 No. 127-FZ “Concerning science and state scientific and technical policy”	State support for innovative activities (introduced by the Federal Law dated June 21, 2011, No. 254-FZ), Article 16.1	The measures are aimed at modernization of the Russian economy, provision of competitiveness of domestic goods, works, and services in the internal and external markets.  Priority use of market tools and tools of public-private partnership for stimulating the innovational activity; provision of efficiency of state support for the purpose of socio-economic development of the RF and the subjects of the RF; purposive character of using the budget assets
2007 (Federal Law No. 139)	Creation of state corporation “Russian Corporation of Nanotechnologies”	The Corporation invests into the projects related to nanotechnologies

It should be noted that the main part of institutions are located in agglomerations: the Fund for support for financing small business of Moscow was created by the Moscow Government; Moscow Fund for personnel training and support for development of innovative activities; Moscow Venture Company OJSC – institute for development of Moscow.

Thus, a “transitional” model of national innovative system is being formed in Russia.

The influence of the processes of globalization and integration on the development of national economy stipulates the formation of innovational environment as a basis for competitive advantage of macro-, meso-, and micro-levels of Russia’s economy. Due to that, there is a necessity for study of the influence of processes of globalization and integration on the development of innovational environment.

## 5. NIS in the USA

It should be noted that in the USA, the main support in the sphere of innovative entrepreneurial activity is granted for small and medium enterprises, as they are one of the drivers of the scientific and technical progress. A significant role in that belongs to programs of federal ministries and departments which are oriented directly at supporting small and medium business. We do not seek the detailed analysis of formation of national innovative system of the USA, but we have made an attempt to structure the main stages of formation of national innovative system in the USA (Table 2).

As is seen from Table 2, national innovative system of the USA has been forming for more than 50 years, transforming in view of the factors of external and institutional environment.

Thus, the program Small Business Investment Company (SBIC) provides SMB with capital at the initial stage.

The program Business Information Center (BIC) supports the activity of 400 informational centers which provide services for support for small innovational enterprises as to the use of innovational methods of work with the help of new achievements in programming and communication devices.

The program Service Corps of Retired Executives (SCORE) (Table 2) provides free consultations as to almost all issues relating to starting new business. The program members include professional managers and businessmen, which stipulates the transfer of experience to the young generation from successful entrepreneurs, this increasing the efficiency of implementation of innovational programs and projects.

Table 2. Evolution of formation of national innovative system of the USA

period	Characteristics	Measures for implementation
1958	The Congress created the Small Business Investment Company (SBIC) program for easy movement of long-term capital of America's small business	SBA does not provide capital directly for business, but are partners with private investors of professionally managed investment funds (known as "SBICs") which finance small enterprises (SBA Loan Programs, 2014).
1964 – until now	Appearance of association SCORE which provides free consultations as to almost all issues relating to starting new business	Formation of the system for reducing transaction costs. In 1996, SCORE started providing consultations for small business with the help of e-mail (services used by more than 8.5 million clients); the organization expanded its range of services, offering business meetings and seminars in various business topics
1980	Bayh-Dole Act, the purpose of which was to increase the stimulus of scientific workers for commercialization of their inventions	Regulatory position which give universities the possibility to receive profit, implementing R&D into revenue item
1981 – 1990	Regulatory positions in the form of variety of federal programs for support of projects and creation of infrastructure in financing R&D	Creation of "Administration for small and medium business which successfully implements many programs" (Official USA portal, 2015).
1982	The Law "The Small Business Innovation Development Act" which was further supplemented by minor amendments, passed in 1982	Stimulating technological innovations; using small business for satisfying the needs of federal government in the sphere of R&D; providing access to technological innovations for least protected groups of society (disabled, minorities, etc.); intensifying the process of transfer to private sector and further commercialization of the developments made by state R&D laboratories (Andrianov, 2012).
1982 – until 2017	Government programs for innovations support are "The Small Business Innovation Research" (SBIR). The goal of the SBIR program is supporting scientific knowledge and technological innovations through investing the assets of federal budget in order to abide by the most important American priorities and to create a strong national economy	Created for strengthening the role of small innovational entrepreneurship in research and developments, financed by the state; covers 10 largest federal ministries and national agencies, including defense, education, energy, astronautic science, etc. By 2009, 112,500 grants for the total sum of more than USD 26.9 billion were given. It includes three stages: 1 <sup>st</sup> – creation of technical advantages, technical & economic and commercial possibilities of the offered innovations (grants do not exceed USD 150,000 for 6 months); 2 <sup>nd</sup> – development of commercial potential of the project (grants do not exceed USD 1 million for 2 years); 3 <sup>rd</sup> – commercialization of innovations created during the first two stages (if necessary).
1992 – until now	STTR (Small business technologies transfer) (Department of the Army of the USA, 2015).	The goals of the program are stimulating technological innovations and possibility for transferring innovational technologies between small enterprises and scientific establishments.

It should be noted that besides the federal government, the assets for conducting research in the sphere of innovations are provided by particular American states and venture funds. The system of venture funds of the USA appeared in the 1950s and is a very popular source of financing – as it gives around USD 36 billion annually and "allows concentrating more than half of venture capital in the USA" (Small business: foreign experience, 2014).

"Over 1995-2001, the investments of the American venture capital – according to a famous audit company Pricewaterhouse Coopers – increased from USD 7.6 billion to USD 41.3 billion" (Tsikhan, 2011). Such volumes

of venture investments became the basis for decisive innovations and large transnational companies – Apple Computers, Microsoft, Intel, Google, etc.

Such active development of venture industry in the USA, according to experts, is largely caused by the fact that stock and national markets are at the high level of development in the USA.

There appeared a term of “business angel”. “Business angel” includes state and private investors which are ready to invest into development of SMB at the period of early start.

The SBIR program is still active, with the following criteria: representatives of small business have to be American companies with the number of employees of no more than 500 and with commercial purposes” (Manina & Shevrov, 2012).

It should be also noted that federal departments with R&D budgets of more than USD 100 million, should give 2.5% annually for SBIR. Each department manages its own individual program, sets the topics of research, and receives applications from small business enterprises. The awards are granted on the basis of competition after the evaluation of the offers. At present, 11 federal agencies participate in the program, including Ministry for Defense, Department of Energy, Department of Education, and Department of Homeland Security. This is a very serious program for departments and a real resource for attracting innovations for the purpose of protection of national interests.

Interesting enough, in 1992 there appeared a program which stimulates the cooperation of SMB with non-profit research structures – The Small Business Technology Transfer Program (STTR). This program allows creating joint ventures on the basis of small business and non-commercial research institutes.

The important role of STTR consists in the fact that it liquidates the gap between achievements of fundamental science and results of commercialization of innovations.

A unique peculiarity of STTR program is the requirement to small business to officially cooperate with R&D establishment within stages I and II (Table 2).

The program also has three stages: 1<sup>st</sup> stage is granted USD 100,000 for 1 year, and the total fund for 2<sup>nd</sup> stage does not exceed 750,000 for 2 years. At present, five establishments participate in the program: Ministry of Defense, Department of Energy, Department of Health, NASA, and the National Scientific Fund. (Manina & Shevrov, 2012).

Apart from the stated programs for support for innovative entrepreneurial activity, there are also other programs in the USA.

“Another peculiarity of small business of the US is popularity of franchising. As far back as the middle of XIX century, such companies and Zinger and General Motors founded their franchise networks. At present, according to the International Franchising Association, there are more than 2,000 franchisors and around 600,000 receivers of franchise in the USA” (Dalakova, 2011).

Among high-tech business in the USA, the leading positions belong to nanotechnologies. “Their use in electronics (chips, semi-conductors), energetics (batteries, accumulator), chemistry, petrochemistry and oil processing, and for manufacture of medicine is enabled by scientific research on the basis of modern ultrasensitive and extremely-precise equipment which provides high quality of analysis. The specifics of economy in the sphere of nanotechnologies is caused by the peculiarities of the very nanotechnological product – the rate of appearance, distribution, and replacement. Due to that, the life cycle of products market reduced to 7-9 years” (Avilova, 2010). That’s why large enterprises, possessing wide and complex hierarchy of management, cannot take flexible managerial decisions – so, nanotechnologies become a prerogative of small and medium innovational business.

“As a result, more than 6,000 projects for the total sum of USD 2 billion are realized within the programs of support for small and medium innovational business annually” (Avilova & Bashkirtseva. 2011).

Summarizing, the mechanisms for support for innovative entrepreneurial activities in the USA consist of law initiative and dedicated programs. The goal of the programs is helping science-based enterprises in attraction of venture investments, the share of which in high-tech sphere grows annually.

## **6. NIS in Japan**

The experience of creation of national innovative system of Japan is especially interesting, as of today.

The Japanese national innovative system is based on registration of rights for intellectual property. That’s why the legal basis for provision of innovational development of Japan is “The main law concerning the intellectual

responsibility” (December 2002). The law is aimed at organizing the “cycle of intellectual creation” at the national scale. This cycle should include the three important components, united into the interconnected system: creation of innovation – receiving patent – commercialization of innovation. The last stage turns innovation into a real item of revenue, and then the assets will be invested into the first stage of the second cycle.

The law provides that the state is responsible for development of implementation of the policy which ensures the formation and reproduction of the cycle. At that, certain responsibility for its realization is put on regional authorities who are responsible for personnel training and supporting the technologies transfer. In their turn, universities are responsible – together with the state – for creation of favorable conditions for activity of researchers and engineers and the most effective use of their knowledge and experience.

The model of NIS for small entrepreneurship is aimed at implementation of the growth of competitiveness level among the developed countries. For this purpose, Japan, while forming innovational system, focuses not only on technical and technological factors but also on technologies in the sphere of organization and management.

It is possible to state that a special feature of the Japan’s NIS is that it consistently forms and develops, beginning from the middle of XX century and having passed several stages. At that, at each stage, government bodies and entrepreneurial circles acted as a team, strengthening financial, HR, and material base of science, still focusing at constant renewal of equipment and perfection of productive and organizational technologies, and developing the system for quality control, this developing the staff’s need for further training and active use of new knowledge.

In Japan, there is the Small and Medium Enterprise Agency (SMEA). This agency coordinates the work of all infrastructure of support and development of SME, cooperating with large state organizations, scientific centers, and research institutes.

An important role in support for innovational SME belongs to Organization for SME and Regional Innovation of Japan (SMRJ). This structure consists of 9 institutes which develop new methods for managing innovational enterprises, several technological parks, and business incubators. SMRJ agency created, with support from administration of municipal establishments and municipal chambers of commerce & industry, the network of regional organizations: “Venture centers for entrepreneurship support”; “Municipal centers for SME support”, and “Regional centers for SME support”. The staff of these centers includes local entrepreneurs and managers with large experience and professional knowledge. This regional network consists of 8 ventures, more than 50 regional, and more than 250 municipal centers for SME support.

In 10 largest cities of each prefecture, there are regional centers for entrepreneurship support. These centers are oriented at the needs of corresponding prefectures. While implementing the programs for SME support, these centers provide consultations for entrepreneurs and provide support in the spheres of finances, technologies, equipment, etc. These centers host seminars and programs for entrepreneurs training.

Municipal authorities also play a large role in supporting innovational SME. Thus, for example, during construction of technological park on the Kyushu Island, large long-term loans under low interest (from 1% to 8%) were granted for the purpose of stimulating foreign investors.

In Japan, there are more than 100 technological parks which are the center for cooperation of universities and industry. Most of technological parks were created in the regions with support from municipal authorities, and more than 50% of them are oriented at the manufacture of high-tech production.

The 1999 “Small and Medium Enterprise Basic Law” (Act No. 154 of 1963: Amended in December 3, 1999) allowed the further development of support for innovational SME. Thus, the budget financing of perspective R&D increased, and perspective R&D with large period of research received special financial support. The financing of R&D was increased by 50% due to government orders. The financing of support for commercialization of R&D was increased by 30%, while financing of the help for young researchers – for 20%. It is expected that over several years, the quantity of patents, issued to universities, will increase by 10 times due to the growth of budget financing of transfer of technologies into industry.

The Temporary Law concerning Measures for the Promotion of the Creative Business Activities of Small and Medium Enterprises provided support for starting SME which specialize in R&D and commercialization of innovations. The support consists in granting subsidies, preferential credits, and tax exemptions from local authorities.

“The Law concerning the Promotion of Creative Activities of SMEs and “The Law on Supporting Business Innovation of Small and Medium Enterprises” provided new mechanisms for support for innovational SME. These are Limited Partnerships for Venture Capital Investment which generate into local venture SME. It should

be noted that such partnership must include the SMRJ agency which is one of the investors. The system for tax remissions for purchase of equipment, manufacture of prototype, and attraction of specialists is an important mechanism for support for venture and innovational enterprises.

Administration of municipal establishments develops the programs for development and creation of local production centers which unite the activities of specialized SME.

## 7. Conclusion

Having studied the experience of formation of national innovative systems, it is possible to state some features which are peculiar for innovational enterprises of small and medium business of all national innovative systems.

It is worth noting that financing of small enterprises has a range of serious problems. Firstly, it should be emphasized that, in comparison with large enterprises, small innovational enterprises are characterized by instability of volumes of profit and short life cycles. Managerial staff of small enterprises often does not have commercial experience and/or entrepreneurial past. Thus, both in production and marketing, first stages of development are characterized with uncertainty. Small innovational enterprises work in very complicated conditions which change quickly. Besides, small innovational enterprises often face difficulties in obtaining loans, as banks and traditional credit organizations are not inclined to finance risky projects of enterprises.

Transformation of national innovative systems is largely caused by such factors as innovational environment and efficiency of institutional systems (formality of norms and rules).

Probably, Russia needs creation of separate zone which would become an analogue of Silicon Valley, producing the transfer from the "triple spiral" model, taking into account transformations of national innovative systems and forming the core of especially active innovational small enterprises with a high level of growth which will constitute 5-10% of other developing small and medium enterprises.

As innovational technologies and business models stipulate the organizations' taking their multiple operations as separately functioning elements, they have a possibility to combine them. They can combine and disconnect them, according to the strategic evaluation of the fact, what actions would allow independent achievement of necessary results and which organization would trust its business partners.

Nowadays, as a rule, national innovative systems are transformed under the influence of the global open economy with a high level of competition and growing speed of generating innovations and their propaganda.

As a result, we observe the growth of intensity of interaction between countries, organizations, and societies in all spheres of life, which demonstrates the influence of the processes of globalization and integration on the development of national innovative systems.

## References

- Andrianov, K. N. (2012). Innovational component of industrial policy of the USA: federal and regional aspects. *Horizons of Economics, 1*, 66.
- Avilova, V. V. (2010). From regional economy to economy of innovations: succession of tasks and perspective of the course. *Bulletin of KSU, 4*, 250-266.
- Avilova, V. V., & Bashkirtseva, S. A. (2011). Experience of support for small and medium entrepreneurship in the developed countries. *Bulletin of KSU, 10*, 230.
- Bediy, A. B., & Kolesnikov, D. S. (2011). Organizing innovative activities in the universities of the USA. *Collection of informational and analytical materials* (p. 5). Nizhny Novgorod: NNSU.
- Bugayan, I. R., & Kaymachnikova, N. V. (2010). Innovational entrepreneurship in Russia. *Science and education; husbandry and economy; entrepreneurship; law and management, 2*, 57.
- Dalakova, L. M. (2011). Experience of organizing investments for small entrepreneurship in economically developed countries. *Terra Economicus, 3-4*, 233.
- Department of the Army of the US. Retrieved February 3, 2015, from <http://www.acq.osd.mil/osbp/sbir/>
- Dynkin, A. A., & Ivanova, M. V. (2004). *Innovational economy* (p. 352). Moscow: Nauka.
- Ermilov, D. P. (2007). Concerning the issue of innovational entrepreneurship. *Bulletin of VolSU, 2*, 116.
- Financing of small business reduced in 2014 for the first time in 10 years. Retrieved February 2, 2015, from <http://top.rbc.ru/finances/18/03/2015/5508636e9a79479d844ad16d>
- Financing of SMB: melting growth. *Expert RA*. Retrieved February 1, 2015, from <http://raexpert.ru/press/articles/>

frb\_1h2014

*Framework program for scientific research and innovations "Horizon 2020"*. Retrieved March 17, 2014, from <http://fp7-health.ru/text/29/>

Fukuyama, F. (1995). *Trust*. New York: The Free Press.

Golikova, O. A. (2011). Innovational entrepreneurship in the age of globalization. *Socio-economic phenomena and processes*, 7, 27.

[http://siteresources.worldbank.org/INTWDR2009//Resources/4231006-1225840759068/WDR09\\_OVERVIEW\\_RU\\_Web.pdf](http://siteresources.worldbank.org/INTWDR2009//Resources/4231006-1225840759068/WDR09_OVERVIEW_RU_Web.pdf) (Accessed on December 1, 2014)

Ivanova, N. I. (2002). *National innovative systems* (p. 79). Moscow: Nauka.

Mamontova, N. G. (2009). Role and scale of innovational forms of entrepreneurship in the US and the EU members. *Scientific works: INKP RAN*, 7, 161-176.

Manina, N. V., & Shevrov, V. Y. (2012). Study of the foreign system of state regulation of innovational environment of business and formation of key directions of innovational policy of small entrepreneurship in Russia. *Problems of modern economy*, 4, 175.

Mironenko, N. V. (2013). *Processes of networkization in the markets of informational intermediaries* (p. 230). Monograph. Orel: OF RANKiGS.

*Official portal of the USA "Small business innovation research"*. Retrieved February 3, 2015, from <http://sbir.gov>

Popkov, V. P., & Evstafyeva, E. V. (2007). *Organizing entrepreneurial activity* (p. 15). Schemes and tables. St. Petersburg: Piter.

Porter, M. (1998). Clusters and the new economics of competition. *Harvard Business Review*, November-December, 77-90.

Porter, M., & Bond, G. (1999). *Innovative Capacity and Prosperity: The Next Competitiveness Challenge. The Global Competitiveness Report*. Geneva: World Economic Forum

Rudakova, O. V., & Shaporova, O. A. (2011). Innovational entrepreneurship in the system of sustainable economic development. *Bulletin of OrelGIET*, 4, 19.

*SBA Loan Programs*. Retrieved March 17, 2014, from <https://www.sba.gov/category/lender-navigation/sba-loan-programs>

Schumpeter, J. (2007). *Theory of economic development. Capitalism, socialism, and democracy* (p. 365). Moscow: EKSMO.

Sibirskaya, E. V., Stroeva, O. A., Gubareva, L. I., & Mikheykina, L. A. (2014). The monitoring of the subject and object of the economic activity population in the innovative sector. *Life Sci J*, 11(8s), 292-296.

Sibirskaya, E. V., Stroeva, O. A., Khokhlova, O. A., & Oveshnikova, L. V. (2014). An analysis of investment-innovation activity in Russia. *Life Sci J*, 11(7s), 155-158.

*Small business: foreign experience. TPP-Inform*. Retrieved December 13, 2014, from [http://www.nisse.ru/business/article/article\\_1141.html](http://www.nisse.ru/business/article/article_1141.html)

Stroeva, O. A., Sibirskaya, E. V., Khokhlova, O. A., & Oveshnikova, L. V. (2014). Regionalization of the innovation management process. *Life Sci J*, 11(8s), 297-301.

The Civil Code of the Russian Federation (part I) dated November 30, 1994, No. 51-FZ (ed. dated February 11, 2013), 1994. *Official gazette*, 32, 3301.

Tsikhon, T. (2011). The role of venture industry in the formation of national innovative system. *Theory and practice of management*, 4.

Yaroslavskaya, E. A., & Yakubov, B. A. (2012). Innovational entrepreneurship in the unity of three main components. *Modern problems of science and education*, 6, 473.

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