

Russia's National System of Innovation: Strengths and Weaknesses.

Studying the Business Sector of Russia's NSI

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The experience of developed countries has shown that it is the effectively functioning National Systems of Innovation (NSI) that increase the scientific and technological potential and provide higher competitive position of the country.

Finland, for example, is the leader in the NSI quality, which is estimated by Global Summary Innovation Index, GSII. For Finland GSII is 0.76¹. The Knowledge Economy Index, KEI, is 9.07 and gives Finland 4th place in the world out of 140 countries evaluated². In economy competitiveness Finland has been in the frontline for several years: Global Competitiveness Index, GCI equals to 5.49, 6th place out of 131³.

Russia's economy is now characterized as constantly growing, but its NSI is not functioning effectively, which is proved by the following data: KEI for Russia is 5.95 (47th out of 140)², GCI is 4.19 (48th out of 131)³ and GSII equals to 0.39 (25th out of 49 countries explored)¹. Comparison of R&D expenses per capita in Finland and Russia is also the reason for concern: in 2006 in Finland these expenses were \$905.2 while in Russia they were only \$102.3. Now Russia's technological development is based mainly on imported technologies. Russia's expenses on fundamental science and all applied research is 1% of GDP.

¹ European Innovation Scoreboard 2006

² The World Bank Report, www.worldbank.org

³ The Global Competitiveness Report 2007-2008, www.weforum.org.

From those 0.7% comes from Federal budget and 0.3% comes from private businesses. In institutional development Russia is on 166th place.⁴ Therefore, it is essential that NSI be reformed now in order to provide our country a respectable place in the World innovation space, and provide people a good standard of living, which should be defined not only by the size of the salary, but also by the range of opportunities given to everyone to develop themselves.

The objective of our research is to analyze the peculiarities of NSI functioning in Russia, its strengths and weaknesses, and also to work out recommendations on its improvement. In order to achieve this it is important to answer the following questions:

- 1) What are the peculiarities of Russia's NSI, its problems and disproportions, that originate from the Soviet period and still have an effect on Russia's NSI?
- 2) What are the main subjects of Russia's NSI, and how they interact?
- 3) Which organizational and economic forms increase the effectiveness of innovation processes on the federal and regional levels?
- 4) How are the innovation processes regulated on the municipal level?
- 5) How can the State initiate innovation processes?
- 6) How can we summarize foreign experience of NSI shaping and developing and apply it for improving Russia's NSI?

Answering each question would require separate research. Therefore, in this article we will pay more attention to the business sector of Russia's NSI as the

⁴ The Global Competitiveness Report 2007-2008, www.weforum.org.

key element and indicator of the whole NSI effectiveness. The other issues will be given a short overview.

The methodological basis for the research is provided by the theory of innovative economic development (J.A.Schumpeter, G.Mensch), the concept of national systems of innovation (B.-A.Lundvall, C. Freeman, R.Nelson, S.Metcalfе, N.Ivanova, O.Golichenko).

What are the peculiarities of Russia's NSI?

Before we start analyzing the strengths and weaknesses of Russia's NSI, let us review its problems and disproportions, which originate from the Soviet period and still have effect on the NSI.⁵ These are:

- 1). Underdeveloped infrastructure of innovation activity, disconnection between science and industry, which appeared as a result of planned economy and had existed for 70 years in the Soviet times. Therefore, Russia's market economy started to develop without institutes of technology transfer essential for effective innovation activity.
- 2). In the past there was state monopoly on foreign trade, everything was controlled by state authorities, by the Academy of Science; so there was no independence in innovation activity.
- 3). For over 70 years private property was forbidden in Russia; it was not allowed to start own business. Huge state industrial enterprises dominated in the country's economy. Now the climate for SMEs has just started to improve in Moscow and

⁵ Гапоненко. В.Ф. Финансово-правовые проблемы регулирования инновационной деятельности. Монография. М.: «ИПК МГОУ», 2005

St.Petersburg, while in the other areas of Russia it is still difficult to start own company and survive.

4). Telecommunications are not well developed in Russia: in 2006 in only 3% of households and 22% of organizations had access to cable internet.⁶ It impedes information and knowledge transfer.

5). Science is excessively concentrated in big scientific and industrial centers.

6). There are not enough high quality specialists to manage innovation processes and financial institutions.

7). Insurance, financial and legislative institutions are underdeveloped.

8). Russia's NSI started to be formed in unstable economic and political situation in the country when Ministries were being reformed, their functions were constantly changing. Now there are many unresolved problems. For example, centralized model of managing all spheres of activity still has a lot of impact on interaction and coordination between federal and local authorities.

In order to see which steps should be taken to improve the effectiveness of innovation process in all sectors, first of all it is important to analyze the main subjects of Russia's NSI.

What are the main subjects of Russia's NSI and how they interact?

At present there are 3 main ways to define National System of Innovation (NSI). The first point of view considers NSI as a complex of institutions whose activity is aimed at generation and diffusion of innovations. This definition shows

⁶ Европейский Союз и Россия. Статистические сопоставления 1995-2006: Стат.сб./Росстат - ИИЦ «Статистика России», 2007 – 216с.

that innovation processes appear together with practical processes in the economy. In this concept the main emphasis is on commercialization, and practical output of science, because new products appear as a result of many subjects' interaction.

The second concept interprets NSI as a set of interconnected economic mechanisms and activities that serve innovation processes. This definition is more functional because it emphasizes the dynamics of NSI's subjects interaction and a non-linear structure of innovation cycle. However, it doesn't say anything about the driving forces of innovation processes.

The third point of view is more deeply connected with the essence of economic relations. NSI is treated as a part of national economic system that builds in the innovation processes into economic and social development. In this concept it is suggested that creation of formal innovation structures doesn't guarantee success of innovations. It is essential that favorable economic atmosphere and social climate be created. In our research we follow this point of view.

Revealing groups that form Russia's NSI

Russia's NSI is quite young. The first attempts to formulate national innovation policy took place in 1997-1998. Before there were a number of laws, initiatives and projects which were supposed to encourage innovation activity, such as "The Patent Law of the Russian Federation" (1992), "The Law on Intellectual Property" (1993), the SME Assistance Fund. However, in the early 1990s more attention was paid to organizational steps rather than to creation of

legislative basis for the innovation sector of the economy. In 1999 the State Duma (the Parliament of Russia) worked out the Project “On innovation activity and State innovation policy”, but it was not approved by President V.Putin because of the lack of detailed innovation activity definition and weak structure of the suggested innovation infrastructure. It is worth mentioning that neither experts from industries nor leading scientists participated in the Project formulation.

In 2002 the President formulated the main objectives of Russia’s State policy in science and technology, which were meant to provide Russia’s transition to innovation way of development. Soon after the Council of Science and High Technology approved the Policy of science and technologies development until 2010. Since that time there have been discussions on NSI issues, “technoparks”, centers of technology transfer. In 2005 The Investment Fund for Technologies and Innovations was created, with its budget being \$100 mln.: 75% is given by Federal budget and the rest – by Russian and foreign investors. A number of various law amendments have been made, for example, the amendment granting VAT benefits to taxpayers involved in innovation activity, etc. Still, Russia’s NSI is not yet functioning effectively, which is proved by a number of economic and innovation indicators. To reveal strengths and weaknesses of Russia’s NSI, let us study its structure.

Russia’s NSI consists of (Fig.1): a) structures that use technological innovations (private and state enterprises, corporations, financial-industrial groups, etc.); b) R&D system (scientific organizations that create innovations

including scientific research institutes, universities, etc); c) institutional structures that formulate policy and monitor its results and NSI development; d) infrastructure of innovational activity (institutions that transfer technologies, technoparks, business-incubators, business centers, financial institutions, patent institutions, etc); and e) institutions that support innovational activity (professional unions and associations, various funds, etc). All these groups exist and interact in a certain context which includes market needs, macroeconomic trends, etc. This context is also included into Fig.1 as an important component of NSI and a catalyst of innovation activity in the society.

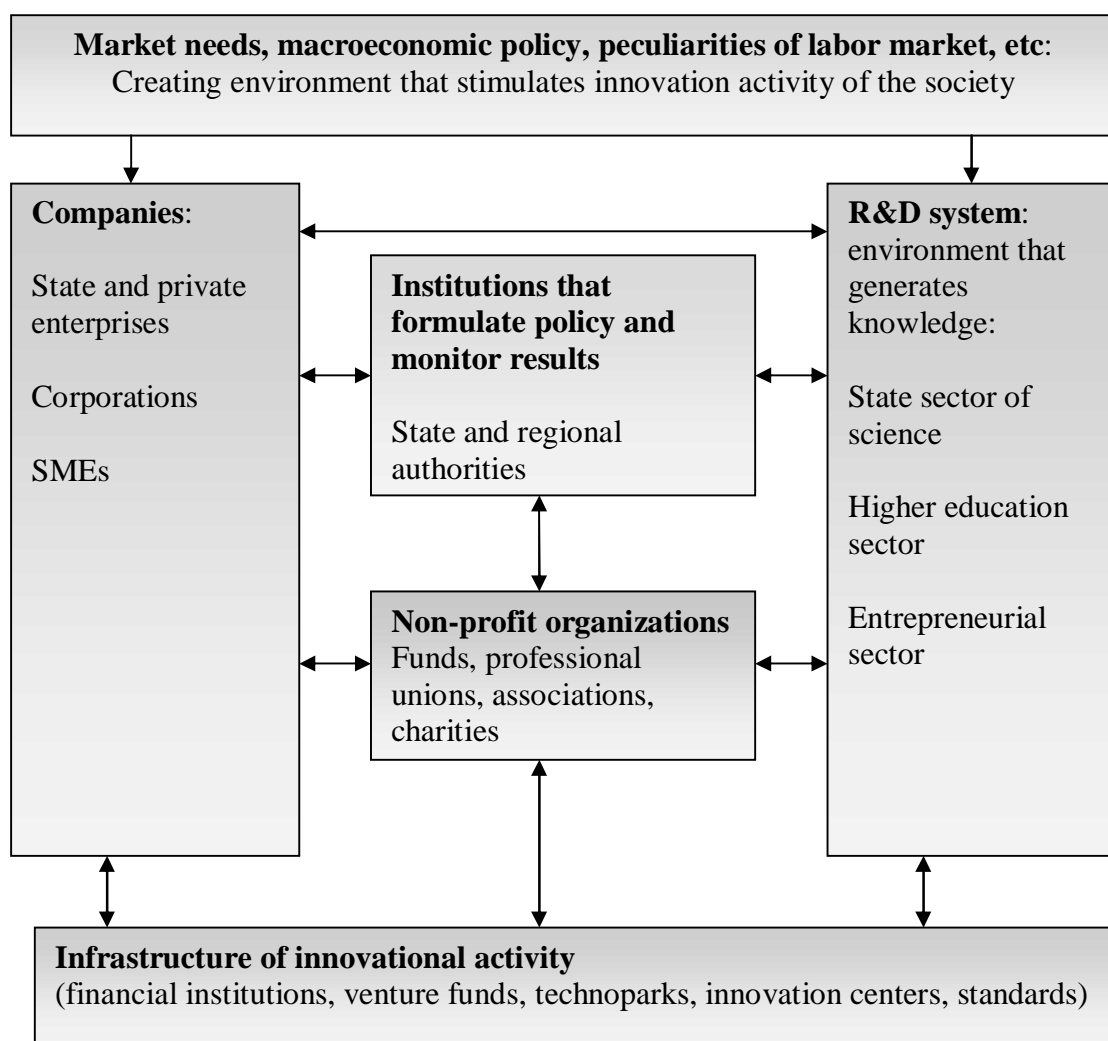


Fig.1 Main subjects of Russia's NSI

Let us consider the elements of Russia's NSI in more detail.

Market needs

The intensiveness of innovation activity and knowledge exchange depends on the innovation susceptibility of the society. Innovation impulse may cause an effect immediately or produce no effect at all if the subject is not innovation susceptible because of its internal reasons and external circumstances.

The internal reasons could be, for example, such as lack of technological opportunities at the enterprise, low qualification of personnel and management, lack of finance. The external reasons are low innovation culture in the society, low living standards and purchasing abilities, orientation on high technologies import.

Business sector

Enterprises, companies, corporations compose the main block of any NSI and their innovation performance is the main criterion of the whole NSI effectiveness.

At present, innovation activity of companies in Russia remains comparatively low, innovation enterprises composed only 15% in 2006 (see Fig.2).

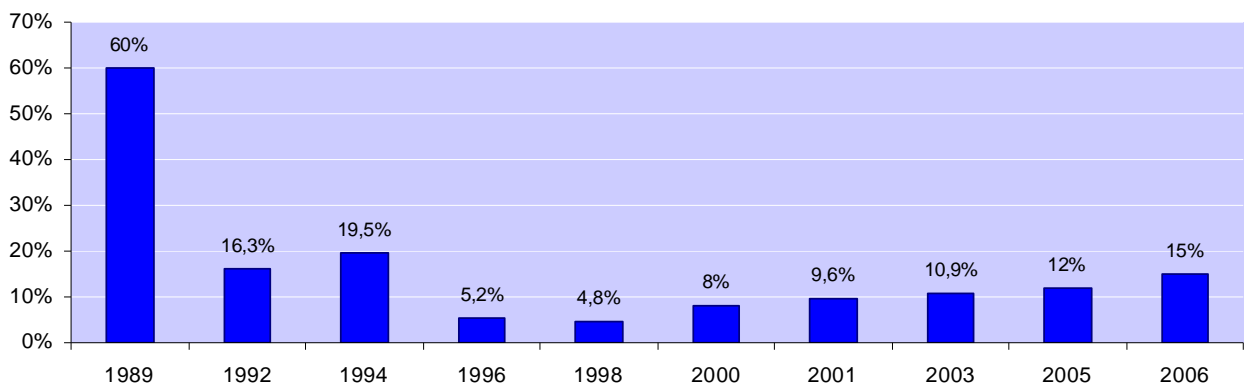


Fig.2 Proportion of innovation enterprises in Russia

According to statistical data⁷, technological innovations took place at 1173 production enterprises out of 158900. The structure of innovation active industrial enterprises is represented in Table 1.

Table 1.

Innovation activity of industrial enterprises with various types of property

Type of Property	Total number of industrial enterprises	Number of innovation-active industrial enterprises	Percentage of innovation-active enterprises, %
State	46000	162	3.52
Municipal	24000	5	0.21
Private	1400000	444	0.32
Non-commercial organizations'	6000	11	1.83
Mixed property	88000	517	5.88
Foreign and joint property	25000	34	1.36

From the point of view of the innovative orientation of the economic activity, the companies with mixed property type are the most effective: the proportion of innovative companies of this type is 18.4 times higher than, for example, private companies. Quite moderate innovation activity is observed in foreign and joint-venture enterprises.

The distribution of organizations involved in R&D activities in various sectors of science in Russia is represented in Fig.3. From Fig.3 we can see that entrepreneurial sector of science composes the biggest part of scientific-technical system in Russia – 48% of firms and almost 50% of employed people participate in this sector. On the second place is the state sector – 36% of organizations and

⁷ Россия в цифрах 2007: Крат. стат. сб. / Росстат. М., 2007.

33.5% of employees; the higher education sector accounts for 15% of organizations and 5.34% of R&D personnel.

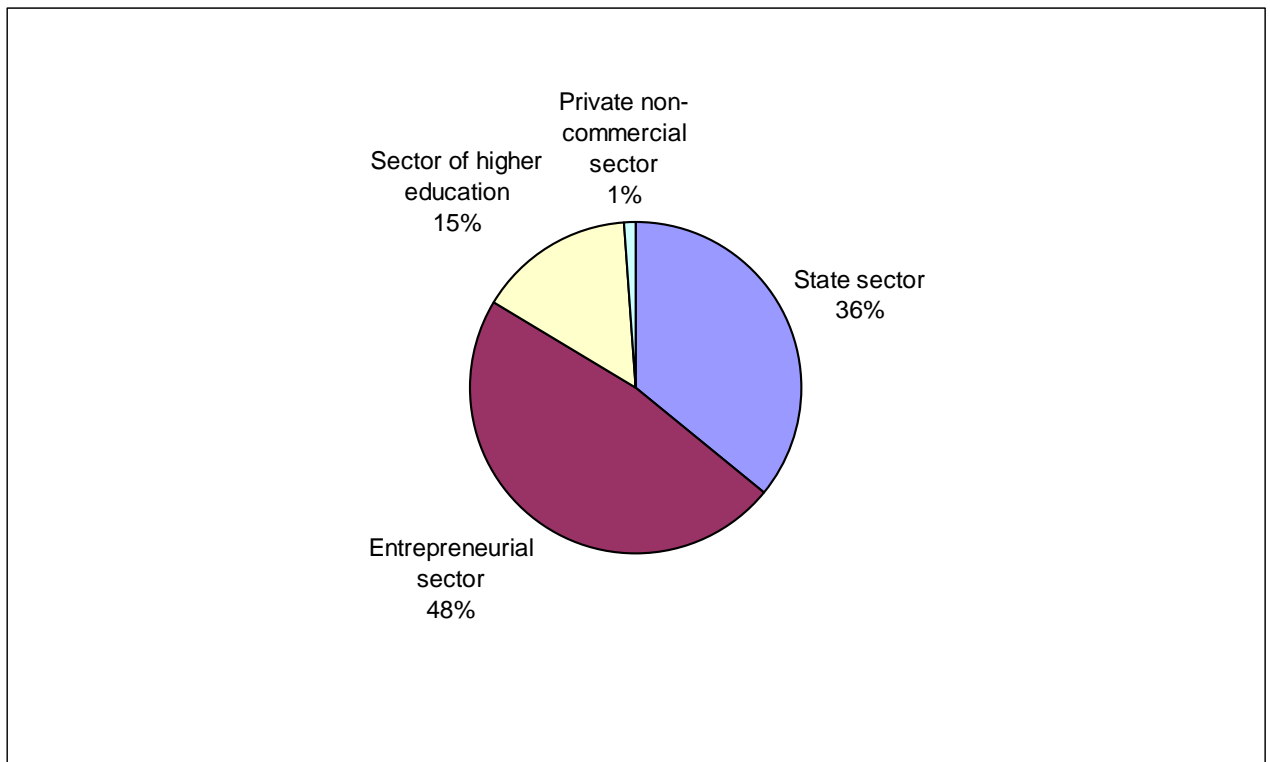


Fig.3 Distribution of organizations involved in R&D activities in various sectors of science in Russia

Russia's entrepreneurial sector of science is characterized by quite a high proportion of state property. The State owns 2.9 thousand of scientific organizations. From those 1.8 thousand are state sector organizations and higher education sector. So, the other 1.1 thousand of state owned organizations belong to entrepreneurial sector of science, which forms 50% of all enterprises and businesses in Russia.

According to Rosstat⁸, the proportions of innovation projects in various sectors of industry are: 14% in information and communication technologies; 12% in biotechnologies; 9% in nano systems and nano materials; 10% in energy

⁸ Россия в цифрах 2007: Крат. стат. сб. / Росстат. М., 2007.

and energy saving technologies; 5% in ecology and resource-saving technologies; 10% in electronics; 14% in space and aircraft; 11% in military industry; 3% in anti-terror and security systems. The companies in automobile construction sector are very weak in comparison with their foreign competitors (Table 2). Among industries, which serve consumer markets, food industry has the highest indicators of innovation activity, with 8% of all innovation active enterprises being composed by food companies.

Table 2.

Industries with strong and weak market positions

Market position	Branches of industries
Strong on external and internal markets	Oil industry Gas industry Metallurgy Basic chemical production Military industries (military planes, air defense equipment, shipbuilding)
Weak on external and internal markets	Electrical industry Machine construction Instrument-making Automobile construction Road construction Pharmaceuticals

Oil and gas processing companies in Russia are economically the most successful, but most companies from raw material sector do not require high tech technologies, their demand for scientific achievements is comparatively low. The leaders of Russian business, such as Lukoil and Gazprom, are comparable with their foreign competitors in economic potential; their structure includes scientific institutes and departments that perform high-scale modernization projects. But

their significance for scientific potential of the country cannot be compared with the results of innovation processes at the companies, which are recognized world leaders in high technologies. Microsoft, Ford Motors and Pfitzer spent \$7.7, 7.5 and 7.1 bln. correspondingly, Daimler and Siemens - \$6.6 and 6.0 bln., Toyota - \$6.2 bln., etc.⁹ Gazprom spent about \$100 mln. on R&D, Lukoil - \$25 mln. only. In Russia the core of high-tech companies, whose technological development determines scientific potential of the country, has not yet been formed. Scientific processes at firms or plants don't have as high a status as they do in other countries.

The main reasons for this situation are the following:

- 1). There is not enough demand for innovative products; many enterprises have obsolete equipment and try to harvest as much as possible without any costly innovation;
- 2). There is no stable technological unity between new technologies and product development and their commercialization;
- 3). Unfriendly climate for SME, complicated taxation. The total number of taxes a firm has to pay is 22 in Russia, which is twice as high as in the USA and Japan.¹⁰ For every thousand of people in Russia there are only 7.9 SME, in the USA 181.7 SME, in Japan – 60.8 SME. As a result of this, only 12-17% of Russia's GDP is produced by SME (in developed countries they produce up to 70% of GDP).

⁹ Бизнес-журнал № 9 (118), 2007.

¹⁰ PricewaterhouseCoopers, IFC, Worldbank rating for tax system complexity, 2007.

- 4). The banks' interest rates are very high; for example, the interest on a loan for SME is 16-17%, for larger companies it is 12% on average; the market for SME loans is growing fast in St.Petersburg and Moscow, but still, crediting SME is considered to be quite risky; as a result, enterprises don't have enough finance;
- 5). Investors do not like to invest money into fundamental research because of high risks (estimated at about 90%);
- 6). Certain transitional links in Russia's NSI, such as venture company, small innovative high tech company, are missing, which presents an impediment for technology transfer;
- 7). Such issues as external environment control, forecasting, strategy evaluation and control are not paid enough attention to;
- 8). Administrative workers lack theoretical and practical knowledge in managing projects, time, finance, risks, personnel, contracts, technology transfer. The same person usually performs functions of managing enterprise as well as planning.

In order to overcome these problems, in our opinion it is important to do the following:

- 1). Create better climate for innovative SME;
- 2). Provide interest-free loans to individual inventors and small start-ups;
- 3). Create venture funds and provide tax benefits for them;
- 4). Create nets of technoparks and technopolices;
- 5). Introduce benefits system for participants of technologies transfer;
- 6). Improve coordination between ministries and departments as well as between different levels of government – federal, regional and municipal;

- 7). Increase volumes of state and private investment into R&D;
- 8). Stimulate purchasing of high-tech products produced in Russia;
- 9). Improve the system of managerial education; for this we suggest the system represented in Fig.4. ¹¹

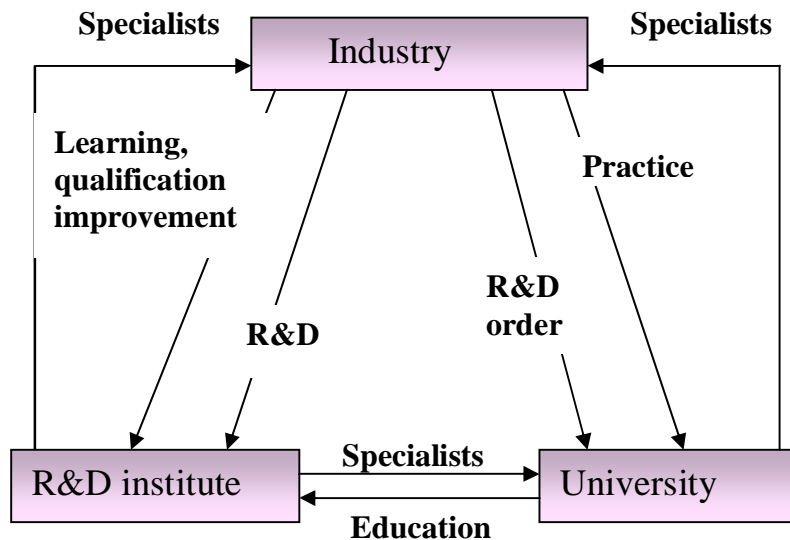


Fig.4 System of knowledge transfer between industry, R&D sphere and university

In this system industries order new knowledge and new qualified personnel able to master this new knowledge; specialists from R&D institutes and enterprises participate in the University education processes. This approach was used in St.Petersburg State Polytechnic University by the Faculty of Intellectual Systems and Technologies. The department was financed by “Leninets” plant (aero-space radio electronic systems construction). Starting from the 3rd year students attended lectures at the University 4 days a week, and spent two days at “Leninets” where they had practical lessons. The studying process was very

¹¹ Куроедова М.А., Хватова Т.Ю. "Организация и стимулирование инновационной деятельности на предприятиях РФ" / Материалы Всероссийского Форума студентов, аспирантов и молодых ученых «Наука и инновации в технических университетах». СПб.: Изд-во Политехн. ун-та, 2007

efficient. Unfortunately, the faculty was closed because after graduating in 2004 young specialists didn't want to become employees at "Leninets" because of low salary offer.¹² In this example, technology and knowledge transfer was provided, there was demand for innovations in this branch of industry, and there were high quality specialists who wanted to transfer their experience to the young. But several milestones for NSI were missing: the plant either did not have enough opportunity to pay competitive salary to the young employees or the top managers did not yet realize that people need investment and it is a long-term investment. Actually this is what top managers of big (former state-owned) enterprises often overlook.

10). Introduce tax benefits using experience of foreign countries, such as

- lowering tax rates for profit spent on R&D;
- lowering taxes paid on dividends from innovation enterprises shares;
- lower tax on profit received as a result of using patents, licenses, know-how

and other intangible assets;

- reducing taxable profit on the price for equipment given to universities and

R&D enterprises;

- subtracting charity payments to funds financing innovations from taxable

income;

- etc.

¹² Куроедова М.А., Хватова Т.Ю. «Национальные инновационные системы: опыт Германии и возможности для России» (в печати, Российский журнал менеджмента, 2008).

Summary of Russia's NSI strengths and weaknesses

Weaknesses:

- 1). Low legislative activity;
- 2). Underdeveloped market of innovation intermediaries;
- 3). Weak interconnections between elements of NSI;
- 4). Insufficient motivation of R&D personnel for producing innovations;
- 5). High export and import taxes;
- 6). Lack of long-term industrial policy aimed at producing competitive products;
- 7). Ineffective system of bank loans, lack of experience in management of innovations.

Strengths:

- 1). Strong positions or leadership in many areas of fundamental science (Table 2);
- 2). Developed system of R&D institutes in various R&D spheres;
- 3). Strong positions in the world market in such technological areas as aero-space industry, metallurgy and energy;
- 4). Improved positions of higher education sector in Russia's NSI in comparison with previous years.

Positive steps towards formulating effective NSI in Russia

There are examples of successful innovation activity in our country.

In the city of Ekaterinburg (in the Urals) the system of intellectual resources commercialization is being built; this system is aimed at reviving the alliance

between academic science and industry. In 1998 the non-commercial partnership “Center for innovations and technology “Akademichesky” was created; it acted as a business-incubator, which connected the potential of scientists with demands of real sector of economy and then “packed” the results into commercial projects. Six investors ventured and put money into the construction of 6000 sq.m. of production facilities; then 7 innovative companies (producing anti-corrosion materials, high-dispersion powders, technologies for rare metals production, etc) were placed there. Now “High-dispersion powders”, plc, has turnover of several trillion dollars and covers 75% of Russia’s market for the powders. Then The Urals Venture Fund was created; in 2003 this Fund and “Akademichesky” center were awarded the Ministry of Technology grant. These two subjects support all stages of innovation process with participation of regional budget and private investors.

In 2002 Tomsk in Siberia became an experimental site for the creation of a model for regional economy development. Before that gross regional product of that area was formed mainly by production of natural oil and gas. During the last 3 years the number of innovation and high-technology enterprises tripled, production of high-technology products grows 40-50% per year. Tomsk cluster has got the status of Special economic zone (SEZ; there are only four of them in Russia). Companies registered in SEZ are exempt from property, land and transport taxes for the first 5 years of their existence; the unified social tax is 14% (instead of regular 26.5%); corporate income tax is 20% (instead of regular 24%); imported equipment is free of VAT and import taxes.

Another example of successful innovation policy is the scientific cluster of Dubna, a town in Moscow region. This town was the first in Russia to get the status of “*naukograd*” – “the town of science” as over one third of the town inhabitants are involved in science. The main developments are in nuclear power and its applications in medicine, etc. Now Dubna has also got the status of SEZ.

Conclusion

This article gives an overview of Russia’s NSI peculiarities. We explored the features Russia inherited from the Soviet past, the steps made to build the NSI, the main existing problems and steps to be taken to solve them. A lot of positive changes are happening in Russia today, the science is being revived after 15 years of hard times and underfinancing and it is becoming more and more prestigious to do scientific work. In this article we explored mainly the issues of building the institutions and legal system for Russia’s NSI business sector. But without any doubt it is people who are the key factor of any country’s NSI and it is the most important to form the culture of innovation and creativity, raise prestige of education and improve its quality. This is the direction for our further research.

In the long run the NSI development in any country will increasingly depend on the development of other countries’ NSIs and their successful interaction will be able to contribute to all the participants of the global innovation environment. Therefore, joint research and knowledge exchange in the field of national innovation systems of various countries is nowadays

especially important. How to build the NSI that could easily integrate into the world innovation environment? This issue is also to be studied.

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