

National innovation system and state innovation policy of the Russian Federation

MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION

NATIONAL INNOVATION SYSTEM AND STATE INNOVATION POLICY OF THE RUSSIAN FEDERATION

**Background Report
to the OECD Country Review of
the Russian Innovation Policy**

**MOSCOW
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PREFACE

The Ministry of Education and Science of the Russian Federation (Minobrnauka of Russia) submits the report on the current state and short-term forecast assessments of the situation in the national innovation system of Russia. This Report is going to serve as a background paper for the Country Review of the National Innovation System and Innovation Policy of the Russian Federation to be prepared by the Organization for Economic Cooperation and Development (OECD) on the request of Minobrnauka of Russia.

Applying to OECD with the request on preparation of this Review the Ministry of Education and Science had in mind, first, to sum up the progress in the innovation system in Russia for 15 years that have passed since the previous OECD Review implemented in 1992-1994 and, second, to present to the Russian public and federal management authorities an opportunity to acquaint with the results achieved in such sectors as research and development, higher education and business in Russia and also with the efficiency of management of the innovative development of the country in the past period taking a kind of a detached view as if being representatives of the world expert community.

This Report was prepared by a consortium of research organizations including:

- Center for Science Research and Statistics of the Ministry of Education and Science of the Russian Federation;
- Federal Institute for Education Development of the Ministry of Education and Science of the Russian Federation;
- Institute of World Economics and International Relations of the Russian Academy of Sciences;
- Institute for National Economic Forecast of the Russian Academy of Sciences;
- Fund "Center for Strategic Developments "North-West".

The materials for this Report were discussed by leading Russian experts whose opinions and comments were taken into consideration in the Report finalizing.

Ministry of Education and Science
of the Russian Federation

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INTRODUCTION

The Concept of Long-Term Social and Economic Development of the Russian Federation Until 2020 adopted on November 2008 defined as the key objective in the coming period the transition from the export-raw material to the innovation model of economic growth capable to improve competitiveness of the Russian products and services on the domestic and world markets.

Improvement of the national competitiveness is a multifaceted task which success depends on development of labor resources, economic institutions, implementation and consolidation of the available competitiveness of Russia in such sectors as energy and raw material, transport infrastructure as well as creation of new competitive advantages related to diversification of economics and improvement of the research and technological complex.

The innovative road for the country's economic development is impossible without creation of a globally competitive national innovation system. And accomplishment of this objective requires the growing demand to innovations from many industries, the growing efficiency in the sector of knowledge generation (fundamental and applied science), overcoming of fragmentation in the created innovation infrastructure.

This Report makes an attempt to provide the general characteristic of the national innovation system in Russia. It describes the key tendencies in economic and innovation development, presents institutional profile of RF Research System (RS), including higher education, research and development sector, business enterprise sector, infrastructure and state innovation policy.

The Report consists of three parts, ten chapters and attachments.

Part 1 deals with assessment of the tendencies in economic and innovation development of Russia. In particular, it provides the analysis of changes in the macroeconomic conditions and structure of economic growth in the 2000s, the international comparison of innovation indicators, some provisions from strategic federal documents and some forecast assessments of indicators reflecting progress in the research, technological and innovation spheres.

Part II analyzes the condition of the key elements of the Russian innovation system:

- System of higher and postgraduation education;
- Research and development sector;
- Business enterprise sector;
- Innovation infrastructure.

This part also includes SWOT-analysis of the Russian innovation system.

Part III deals with analysis of the present stage of the innovation policy at the federal level and also key aspects of the innovation policy at the regional level. This chapter also describes innovation activity of the Russian regions in quantitative terms. It is used as a basis in preparation of the Innovation Map showing differences in the levels of innovation developments of the subjects in the Russian Federation.

The attachments to this Report contain statistical data, official documents regarding the federal research, technological and innovation policies as well as materials describing the experience in organization and management of innovation activities in some regions of the Russian Federation.

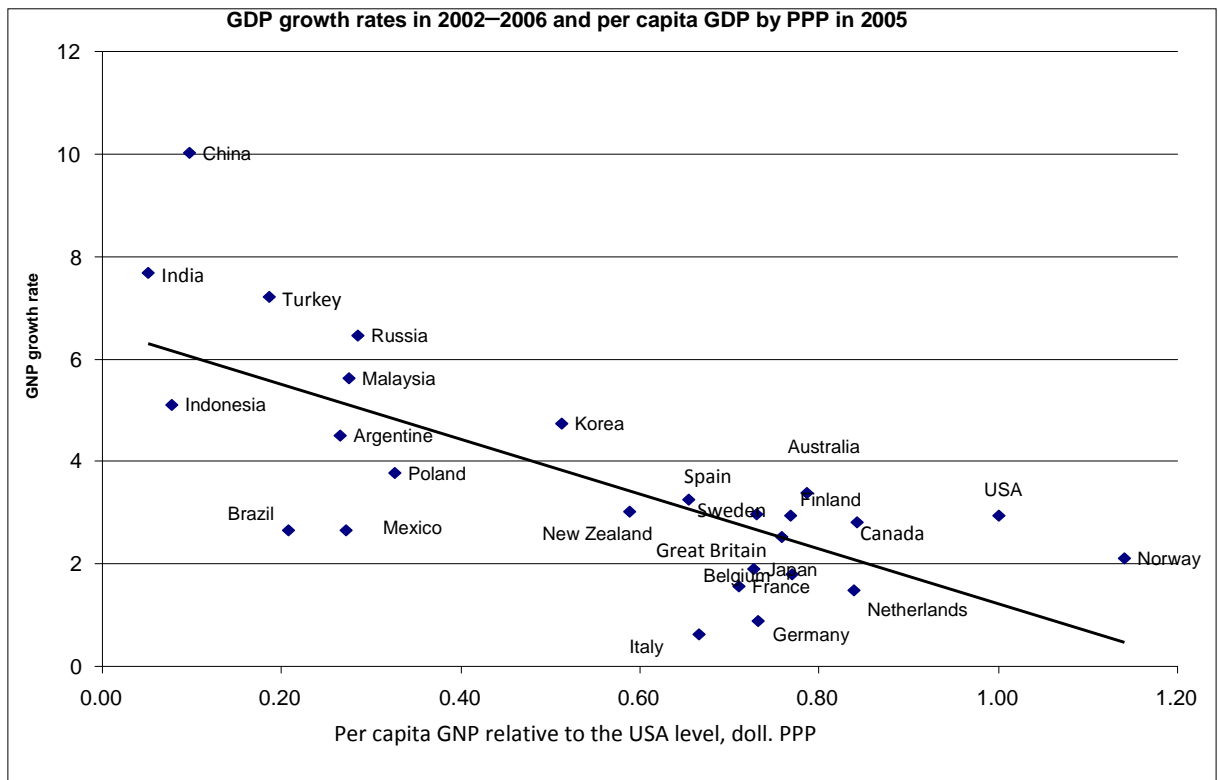
This paper may be a basis for elaboration of recommendations concerning improvement of the federal innovation policy and further development of the national innovation system of the Russian Federation.

PART I. MAIN TENDENCIES IN ECONOMIC AND INNOVATION DEVELOPMENT OF THE COUNTRY

1. Economic growth rates and structure

In 2006 the Russian economics by its GDP became the seventh in the world and the per capita GDP evaluated by purchasing power parity (PPP) has grown from 8.8 thou USD in 2002 to 13.1 thou USD in 2006.

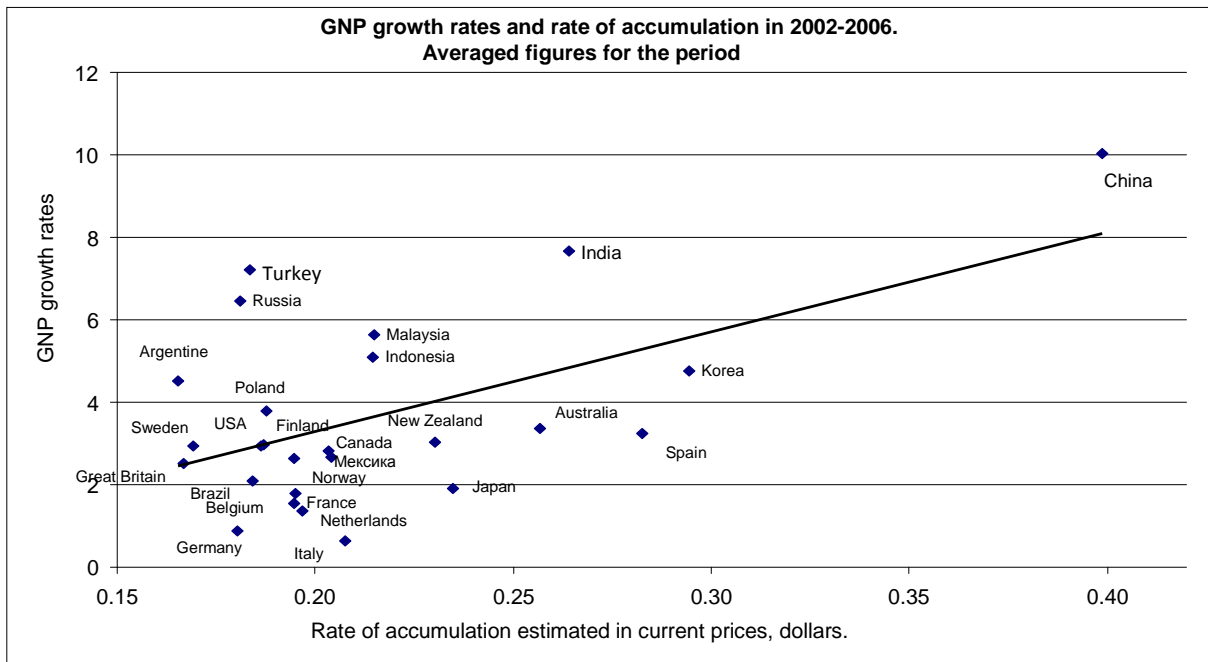
The comparison of the of GDP growth rates and the average per capital GDP rates in major world countries (Fig. 1) has shown that the countries close by their development level to the USA revealed in 2002-2006 the GDP growth rate no more than 4%. At the same time the average annual growth rate of GDP in seven out of ten countries with the average per capita consumption lower than in the USA was 4% higher, while for five countries, including Russia, it exceeded 5%.



Source: World Bank, Estimates of IEF RAS.

Figure 1.1 Average per capital GDP by PPP vs. GDP growth rates

Fig. 1.2 shows the economic growth vs. the rate of accumulation: the countries with the higher rate of accumulation in 2002-2006 demonstrated the higher GDP growth rates. However, among the countries with the highest economic growth rates Russia reveals the lowest (together with Turkey) accumulation rate of the fixed assets. It is clear that such situation cannot last forever and the opportunities for development at the expense of the production potential built up still in the USSR time have depleted to a great extent. Table 2.1 shows that the reserve of capacities in the extraction industry and other industries of the fuel-energy complex is depleted in full.



Source: World Bank, Estimates of IEF RAS.

Figure 1.2. GDP growth rates and the rate of accumulation in 2002-2006
(averaged figures for the period)

Table 1.1. Loading of production capacities by kinds of economic activities in 2005-2008 (in %)

	2005	2006	2007	2008*
Mining	79.6	82.4	82.9	83.1
Extraction of fuel and power materials	80.0	84.3	86.1	86.0
Extraction of other materials	76.7	69.7	70.2	71.0
Manufacturing	58.6	61.1	64.4	65.4
Production of coke, oil products and nuclear materials	81.2	83.3	84.2	84.6
Chemical production	60.8	62.2	63.7	65.7
Manufacturing of rubber and plastic products	45.5	49.4	55.1	55.4
Machinery and equipment production	38.8	41.9	47.2	49.2
Manufacturing of electric, electronic and optic equipment	41.3	38.1	42.3	44.3
Manufacturing of transport machinery and equipment	56.2	61.7	68.5	69.5

Source: Russian State Committee for Statistics (Rosstat)¹⁵

* - estimates of IEF RAS.

In the processing industry the situation with the idling capacities is somewhat better. However, the quality of these capacities is not high and the need for updating the applied technologies becomes more urgent.

A large share of imported products with the high added value proves that the Russian manufacturers regardless of availability of free production capacities have to give up some part of the domestic market to their foreign rivals. In the expenses on machinery and equipment the share of import makes 30-40% and this is so with the Russian fixed production assets being used only for 50% or slightly more.

Table 1.2. Import share in the domestic consumption by economic activity in industry (%)

Economic activity	2004	2005	2006	2007	2008
Mineral deposit extraction	6	4	4	4	4
Coke, oil product and nuclear material production	2	1	1	3	3
Chemical production	29	29	31	33	33
Machinery and equipment manufacturing	35	35	34	35	35
Manufacturing of electric, electronic and optic equipment	34	32	33	32	32
Manufacturing of transport machinery and equipment	14	17	22	22	22
Production, transfer and distribution of electricity, gas, steam and hot water supply	0.1	0.1	0.2	0.2	0.2

Source: "Rosstat"

The commodity structure of the Russian is dominated by the products of processing industry, while the export of processed products is growing, but slowly.

The inflation level in Russia is high and despite the efforts for its lowering in 2007-2008 it continued growing. At such high inflation rates the risks of the innovation activities grow, too. The enhanced inflation rate in 2007-2008 was due to the growth of money quantity that reached 47.5% by the results of 2007. The essential factor contributing to consumer inflation in the Russian economics is the cost-push inflation, including the anticipating growth of tariffs on the products of natural monopolies.

The important macroeconomic tendency observed in the 2000s was a high growth rate of the domestic final demand – 10% a year. On the one hand, this is connected with the growing compound incomes of households and, on the other, with the decreasing savings of the population (in view of high inflation) and rapid development of consumer crediting (imbalance between the income and expenditure levels has become an important feature of the Russian consumption). However, the intensive domestic demand was not transformed into the adequate dynamics of internal production.

The gap between the dynamics of the final internal demand and production was constantly widening. Therefore, while in 2003 the ratio between the growth rates of internal demand and GDP was close to 1, then in 2004 this ratio approached 1.3, in 2005 reached 1.45 and in 2008 exceeded 1.5. And such gap is bridged naturally by import. The import growth rate for many groups of products made 30, 40 and even 60% per annum. This tendency was also supported by revaluation of the Russian Ruble. Table 1.3 contains basic macroeconomic indicators characterizing the Russian economics development in 2003-2007.

¹⁵ Here and hereinafter the initial data of the federal statistic observations were used.

Table 1.3. Basic macroeconomic indicators in 2003-2009

	2003	2004	2005	2006	2007	2008	2009*
Prices on oil Urals (world), USD/barrel	27.2	34.4	50.6	61.1	69.3	94.4	54
Prices on gas (average contract), USD/thou cu. m	105.1	109.1	150.8	216.0	233.7	353.6	228.7
Oil export, mln tons	227.8	256.7	252.5	248.4	258.6	243.1	245.5
Natural gas export, bill cu. m	190.0	200.4	207.9	202.8	191.9	195.4	160.8
Oil product export, mln tons	77.8	82.1	97.1	103.5	112.3	117.9	117.3
Oil production, mln tons	421.4	459.0	470.2	480.5	490.7	487.5	488
Gas production, bill cu. m	620.2	632.6	640.8	656.3	651.0	663.2	580
Inflation (IPC) for this period, price growth, in %	12	11.7	10.9	9.0	11.9	13.3	12-12.5
Dollar exchange rate (average annual), Rbls./dollar	30.7	28.8	28.3	27.2	25.5	24.9	32.6
Population, year average, mln people	144.6	143.8	143.1	142.5	142.1	142	141.9
Number of the economically active population, mln people	72.2	72.4	72.4	72.5	73.4	73.3	73.2
Government investments (consolidated budget), in % to GDP	1.4	1.4	3.3	3.3	4.2	4.1	2.9

Source: "Rosstat"

* - estimates of the Ministry for Economic Development of Russia

The industry structure in 2003-2008 revealed a steady tendency to the anticipating growth rates in a small group of high-technology industries and a less drop in them in 2009 (Table 1.4).

Table 1.4. Production indicators by some economic activities (in % to the previous year)

	2003	2004	2005	2006	2007	2008	2009*
Mineral deposit extraction	108.7	106.8	101.3	102.5	101.9	100.2	87.5
High-technology industries	128.2	129.0	115.4	110.2	113.8	101.6	93.3
Pharmaceutical production	106.7	94.9	95.6	110.2	107.0	98.1	99.5
Manufacturing of office machinery and computer equipment	129.6	162.7	115.4	102.4	115.0	76.9	88.3
Manufacturing of radio, TV and communication equipment	109.8	167.5	119.8	112.5	112.5	109.2	88.6
Manufacturing of medical, measurement and optical equipment, clocks	218.5	130.3	115.7	116.6	112.2	93.1	71.3
Production of aircraft, including spacecraft	128.7	120.7	124.0	105.5	111.3	102.6	101.8
Medium-technological high-level industries	104.7	107.7	103.4	104.8	109.0	101.4	73.6
Chemical production	104.7	107.8	103.7	104.8	108.9	95.8	91.1
Manufacturing of machinery and equipment	112.2	120.8	99.7	109.4	119.1	104	66.1
Manufacturing of electric machinery and equipment	93.5	120.8	105.9	113.3	115.7	87.9	59.6
Manufacturing of vehicles, trailers and semi-trailers	106.2	111.5	107.1	103.9	117.3	104.6	66.4
Manufacturing of ships and other transport means	105.4	100.2	89.9	102.5	112.0	110.5	100.1
Medium-technological low-level industries	106.4	104.9	101.9	108.3	103.9	99.1	84.7
Manufacturing of coke and oil products	102.5	102.4	104.4	107.1	102.1	102.7	99.7
Manufacturing of rubber and plastic products	105.5	113.5	116.4	121.7	122.1	112.5	88.2
Manufacturing of other non-metal mineral products	109.2	110.5	102.4	115.7	110.3	99.1	71.2
Metallurgical production	108.7	103.3	104.2	105.1	102.1	94.8	77.5
Manufacturing of ready metal products	106.6	107.4	93.6	110.2	102.9	105.6	86.5
Low-technological industries	104.8	104.2	106.2	107.1	106.0	100.9	93.2
Manufacturing of foodstuffs, including beverages	104.3	104.4	106.6	107.0	106.1	101.1	97.7

Textile production	100.3	96.0	103.6	112.1	98.7	95.5	80.9
Woodworking and manufacturing of wood products	109.7	108.7	107.1	103.6	106.2	101.4	77
Manufacturing of cellulose, wood pulp, paper, cardboard and products from them, printing activity	107.4	105.1	103.6	107.0	108.9	100.8	89.1
Processing of secondary raw material	110.6	108.7	112.0	105.0	114.3	105.2	89.3
Production and distribution of electricity, gas, water	103.3	101.6	100.9	104.9	99.8	101.4	96.9

Source: "Rosstat"

* Estimates of IEF RAS on the basis of data of Minprodtorg of Russia

As a result the share of these industries has sustained a 1.8-fold increase (Table 1.5). There is also a persistent tendency of dropping of the mineral deposit extraction.

Table 1.5. Structure of industrial production by economic activity (in %)

	2003	2004	2005	2006	2007	2008
Mineral deposit extraction	17.4	17.3	17.1	16.5	15.9	15.8
High-technology industries	5.5	7.8	8.8	9.1	9.8	9.8
Medium-technology high-level industries	12.7	12.5	11.4	11.2	11.8	12.2
Medium-technology low-level industries	29.6	28.9	28.7	29.2	28.7	28.1
Low-technology industries	22.7	22.1	22.8	23.0	23.0	23.2
Production and distribution of electricity, gas, water	12.0	11.4	11.2	11.0	10.9	10.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: "Rosstat"

The dynamics of the energy and electricity consumption in economics may be also one of the indicators of economic growth. In 2003-2008 the indicators of specific energy consumption in the Russian economy dropped down. But still these indicators in Russia were traditionally higher than in developed countries even with similar climatic conditions (Table 1.6).

Table 1.6. Dynamics of energy and electricity consumption of GDP in the period 2003-2008

	2003	2004	2005	2006	2007	2008*
Energy consumption, t f.e./mIn Rbls.	118	107	101	96	89	87
Electricity consumption, kWh/thou Rbls.	200	193	187	182	172	170

Source: "Rosstat"

* - estimates of IEF RAS

In 2008 the economic growth pace slowed down. By estimates of the Ministry for Economic Development of the Russian Federation, the GDP growth rates in quarter I were 8.5%, in quarter II – 7.5%, in quarter III – 6.2% and in quarter IV – 1.1%. The greatest drop in the growth rates was observed in construction, transport and industrial production.

In 2008 the investments into the fixed assets were 9.1% more than in 2007, which is much less than in 2007 compared to 2006 – 21.6%.

In the first quarter of 2009 GDP dropped by 9.5% compared to the respective period in 2008. The decline of industrial production, investments, construction went on, the external demand decreased (the growth rate of actual export volumes lowered down with the declining price dynamics). From

January through March 2009 the investments into the fixed assets became 15% less compared to the first quarter of 2008. In March the investment decline persisted and by March 2008 it reached 15.4%.

In 2009 the Russian economic was in recession due to the global financial and economic crisis. By estimates of the Ministry for Economic Development of Russia, GDP may drop by more than 8% during a year.

The government of the Russian Federation¹⁶ names the following factors that contributed to the Russian crisis:

- high dependence on export of natural resources the price and demand for which dropped significantly;
- inadequate competitiveness of non-raw material industries;
- insufficient development of the financial sector and banking system.

In the recent years the national economics was developing mostly due to external sources – high prices on raw materials, “cheap” credits of foreign banks. And now the internal sources of growth should be found for “exit” from the crisis and ensuring long-term sustainable development.

The strategy of the Russian government as defined in the Concept of Long-Term Socio-Economic Development of the Russian Federation Till 2020¹⁷ (hereinafter – “CLTD 2020”) and aimed at updating of the country’s economics will not be changed even in the face of crisis. Accordingly, the Program of Anticrisis Measures of the Russian Government was elaborated providing for pursuance of the policy of structural renovation and diversification of economics, macroeconomic rehabilitation, high social security. This anticrisis policy will be invariably combined with the measures on comprehensive modernization of the Russian society.

¹⁶ “Rosyiskaya Gazeta”, 20 March 2009, No. 48 (4872).

¹⁷ Approved by Resolution of the Government of the Russian Federation No. 1662-r of 17 November 2008.

2. Science, technology and innovation activities (international indicators)

This chapter presents comparisons of the science and innovation development in Russia and in G7 developed countries – USA, Japan, Germany, Great Britain, France, Italy and Canada, in the countries of OECD (30 countries of the organization in general) and EU (27 European countries in general) and in China for the period from 2000 to 2006. This comparative analysis is based on the system of indicators on science and technology development adopted in the OECD countries.

2.1. Intramural expenditure on R&D

The intramural expenditure (IE) on R&D is the key criterion in international indicators of science, technology and innovation development. Table 2.1 presents the intramural expenditure on R&D in 10 science-leading world states, including Russia, as well as EU and OECD, in general. By the scales of IE and its share in GDP, Russia is inferior to all leading countries, except Italy.

Table 2.1. Intramural expenditure on R&D (by main sectors) in 2006

	IE, mln USD, by PPP	IE in % to GDO	IE growth rate in 2000-2006*	By source of funds		By sectors of performance		
				Business enterprise sector, % to GDP	Government sector, % to GDP	Business enterprise sector, % to GDP	Government sector, % to GDP	Higher education sector, % to GDP
Russia	20154.9	1.08	48.49	0.31	0.66	0.71	0.29	0.07
China	86758.2	1.42	171.82	0.98	0.35	1.01	0.28	0.13
USA	343747.5	2.62	10.12	1.70	0.77	1.84	0.29	0.37
Japan	138782.1	3.39	21.86	2.62	0.55	2.62	0.28	0.43
S. Korea	35886	3.23	1.94	2.43	0.74	2.49	0.37	0.32
Germany	66688.6	2.53	9.29	1.68 (2005)	0.70 (2005)	1.77	0.35	0.41
Great Britain	35590.8	1.78	12.00	0.81	0.57	1.10	0.18	0.47
France	41436.3	2.11	8.73	1.11 (2005r.)	0.82 (2005r.)	1.34	0.37	0.38
Canada	23306.0	1.94	17.96	0.93	0.63	1.06	0.18	0.69
Italy	17827.0 (2005)	1.09 (2005)	8.99 (2005)	0.43 (2005)	0.55 (2005)	0.54	0.19	0.33 (2005)
EU	242815.6	1.76	15.03	0.94 (2005)	0.61 (2005)	1.11	0.24	0.39
OECD	817768.9	2.26	16.53	1.44	0.66 (2005)	1.56	0.26	0.39

Source: OECD, *Main Science and Technology Indicators*, April 2008.

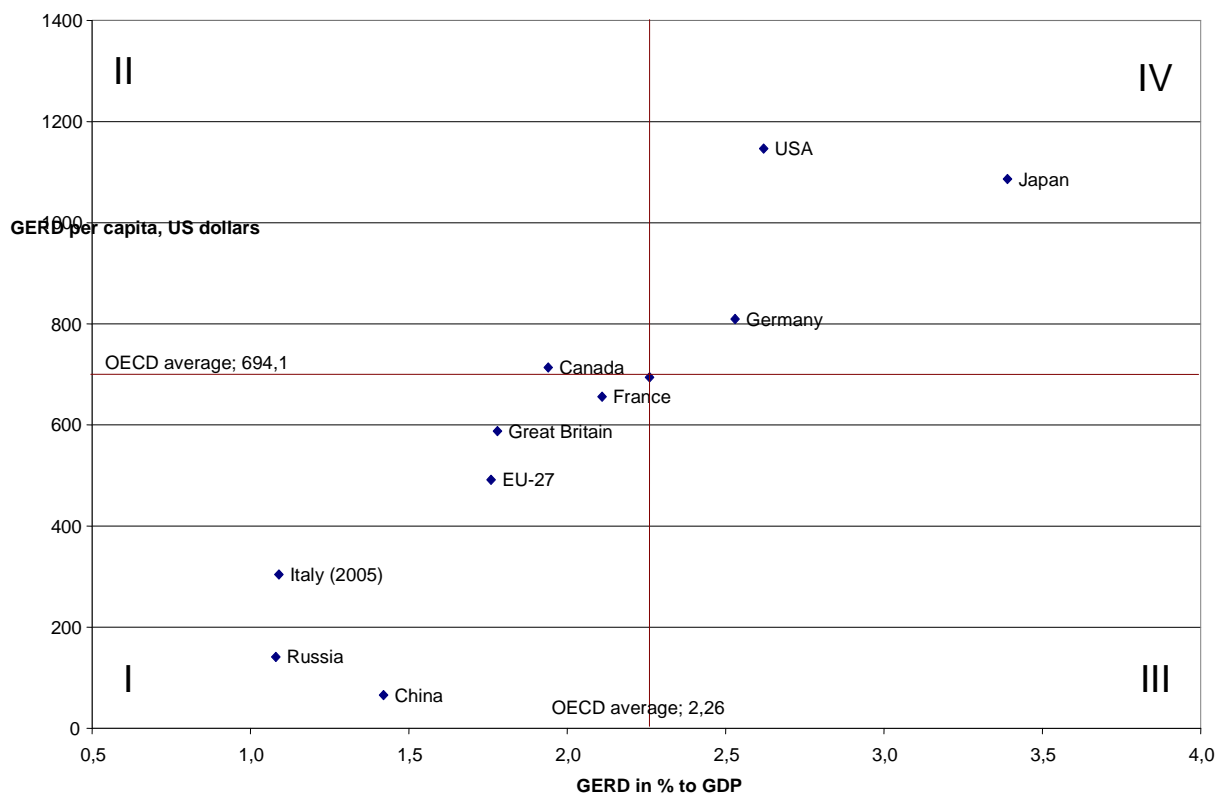
China demonstrates the highest growth rates of IE on R&D – 172%. By this indicator Russia takes the second line – 48.5%. Among other countries the greatest growth rate is shown by Japan – 22% and Canada – 18%, which is higher than the average figure for OECD that is equal to 16.5%. Ranking of the countries by the international indicators on the IE level on R&D in 2005 is presented in Fig. 2.1 (the ratio of y to x coordinates show the per capita GDP level). The average level in the OECD countries is as

follows: IE on R&D in percentage to GDP is equal to 2.26% and IE on R&D in per capita figures is 694.1 US dollars.

The comparison indicator means the position of a country in relation to the average level over the OECD countries. The pattern is divided into four quadrants; the larger number of a quadrant corresponds to a higher level. Quadrant IV includes leading countries – Japan, USA and Germany; quadrant II includes Canada, which is indicative of a rather high position of this country. It can be said that the positions of France and Great Britain are not bad. Although these countries are put in quadrant I, but their levels are close the OECD average and even higher than in the EU countries, in general. Among the outsiders there are Russia, Italy and China. However, it may be expected that in the next years China will move from quadrant I to “prestigious” quadrant III. Therefore, it will, in fact, become one of the leaders in researches, but its per capita GDP remains rather low.

The structural analysis of IE and R&D is conducted in two directions: by sources of funds and by executors of works

Figure 2.2 shows the structure of IE and R&D by sources of funds that in all countries include business and government. These sectors take over 90% of all financial investments. The average indicator for the OECD countries is 93%, for EU – 89% and for Russia – about 90%.



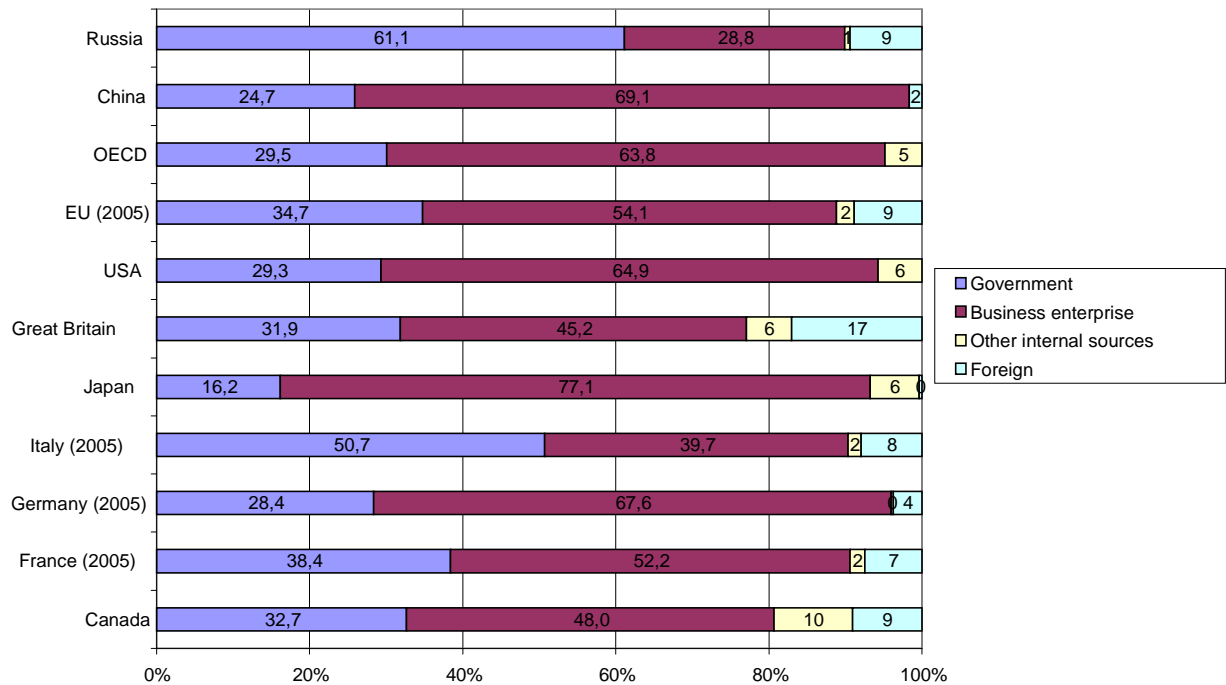
Source: OECD, *Main Science and Technology Indicators*, April 2008.

Figure 2.1. Level of intramural expenditure on R&D in 2005 (US dollars, PPP)

The main structural feature of Russia that distinguishes it from the G7 countries and China is the dominating share of the government funding. While in the considered countries the share of business funding exceeds the government funding, in Russia the situation is vice versa. In the leading countries (by IE on R&D relative to GDP) the share of business funding is: in Japan – 77%, in the USA – 65% and in Germany – about 68%. In China this indicator is equal to 69%, while in Russia – only 29%. The share of

the government funding in the leading countries is as follows: in Japan – about 16%, in the USA – about 29%, in Germany – about 28%, in China – about 25% and in Russia – 61%.

Structure of intramural expenditure on research and development (GERD) by sources of funds in 2006 (in %)



Source: OECD, *Main Science and Technology Indicators*, April 2008.

Figure 2.2. Structure of intramural expenditure on R&D by sources of funds in 2006

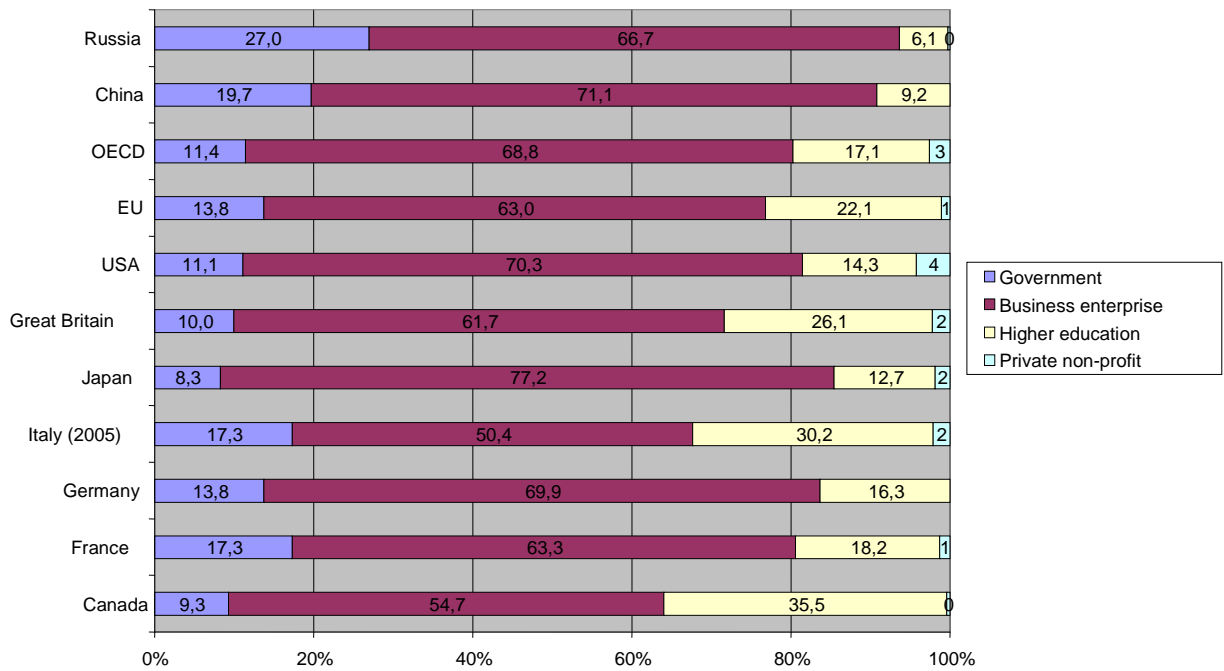
In most countries the share of government funding in GDP is practically the same varying from 0.6 to 0.8% with the exception of China where this share is equal to 0.4%. In Russia it is 0.66%, the share of business funding is 0.31% and the share of funding from abroad – about 0.10%.

Figure 2.3 presents the IE structure on R&D by sectors of performance. In all Western countries the share of expenditure of the business enterprise sector and of the higher education sector exceeds 80%. In Russia and China the main contractors are the business enterprise and government sectors and their share of expenditure is over 90%.

In all countries without exception the key role in the research activity is played by the business enterprise sector. The share of expenditure of the business enterprise varies from 50% (the minimum) in Italy to 77% (the maximum) in Japan. In Russia this indicator makes about 67%.

It should be said that Russia has the smallest share of expenditure of the higher education sector – only some 6%, which is indicative of its inadequate role in the research activities of the country.

Structure of gross domestic expenditure on research and development (GERD) by sectors in 2005 (in%)



Source: OECD, *Main Science and Technology Indicators*, April 2008.

Figure 2.3. Structure of intramural expenditure on R&D by sectors of performance in 2006

2.2. Number of researchers

In the developed countries the recent decade witnessed the growth of the number of researchers that outstripped significantly the growth rate of employment in economics, in general. In Russia the number of researchers was shrinking. In 2006 it was 464,000 people (Table 2.2). By this indicator Russia lags behind the USA, China and Japan, while by the number of researchers per 1000 total employment the Russian indicator is close to the OECD average, is better than in EU and several times better than in China. The growth rate of the number of researchers in Russia was negative – minus 8%.

The number of researchers in the business enterprise sector in most EU countries and in Russia is slightly more than the total number of researchers, while in the OECD countries this indicator, on the average, is higher due to the USA (nearly 80% of researchers are working in business) and Japan (68%).

Table 2.2. Indicator of the number of researchers (FTE) and its derivatives

	Absolute number of researchers	Growth rate of researchers in 2000-2006	Number of researchers per 1000	Number of researchers in business	Number of researchers in government	Number of researchers in higher

			economically active population	enterprise sector ¹⁸ , %	sector, %	education sector, %
Russia	464357	-8.31	6.8	51.0	33.1	15.6
China	1223756	76.06	1.6	63.5	17.2	19.3
USA (2005)	1387882	7.61	9.6	79.1	3.6	17.3
Japan	709691	9.59	11.1	68.1	4.7	26.0
Germany	282063	9.38	7.2	60.7	14.2	25.2
Great Britain	183535	13.75	5.8	51.1	4.9	44.0
France (2005)	204484	18.84	8.2	53.2	12.7	32.4
Canada (2004)	125330	15.52	7.7	60.9	5.8	33.0
Italy (2005)	82489	24.78	3.4	33.9	17.5	44.9
EU	1332397	20.20	6.0	48.6	13.4	36.7
OECD (2005)	3879394	14.61	7.3	64.1	7.4	28.5

Source: OECD, *Main Science and Technology Indicators*, April 2008.

2.3. Research results

In the practice of international indicators the research activity output is assessed by the patent activity and technology balance, while of fundamental research – by bibliometric indicators.

Patents. Table 2.3 gives the number of patents registered in the “triadic patent families¹⁹” in Russia and other countries in 2005 and some characteristics of the patent activity. All Russian indicators, except the growth rate of the patent number, are quite meager.

Table 2.3. Indicator of the patent number and its derivatives, 2005

	Absolute number of patents	Growth rate of patent number in 2000-2006	Share of countries in the international patent business	Number of patents per mln population
Russia	63	17.00	0.12	0.44
China	356	339.14	0.70	0.27
USA	15774	5.89	31.10	53.12
Japan	14976	3.42	29.53	117.21
Germany	6298	3.75	12.42	76.38
Great Britain	1651	-0.52	3.25	27.41
France	2472	8.42	4.87	39.36
Canada	777	37.29	1.53	24.04
Italy	722	8.87	1.42	12.33
EU	14575	4.57	28.74	29.63

¹⁸ Here and hereinafter the term “government sector” unlike the “state sector in the Russian methodology” is applied to distinguish the science sector operating largely to satisfy the needs of the state. According to the OECD methodology (para 184 of Frascati Manual), this sector includes institutions and organizations being in charge mainly of delivery, not sale of public services other than educational. It is assumed that the provided services cannot be ensured in the rational and efficient manner other than as a result of state control and pursuance of a certain state economic and social policy. This sector also includes the non-profit institutions controlled and funded by the government, but not administered by the higher education sector.

¹⁹ Patent in “Triadic patent families” means a patent registered with the patent institutions in EU, USA and Japan.

OECD	50299	9.54	99.17	42.97
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Source: OECD, *Main Science and Technology Indicators*, April 2008.

The main reason is that patenting abroad is often rather burdensome for the Russian private persons and legal entities due to significant insufficiency of finance and, in part, due to specificity of their legal status. Such situation that was established still in the Soviet time has not been overcome as yet regardless of the shaping tendency to the growth of patent number in the country and abroad.

Payment technology balance. The important indicator of the R&D output is the ratio of receipts from technology transfer abroad to payments for technology purchase in other countries, i.e. the trade in technology balance and the cover ratio by incoming payments. These indicators demonstrate the scale of international recognition of applied research achievements of a country and the development level of intangible technologies in a country.

On the world market there is a tendency to growing trade in technologies.

Table 2.4 presents the technology balance of payments between 2000 and 2006 (for some countries by the last year of available information). Here as well as in the patent business the leading countries by expenditure on R&D activity are the main net-traders that in the recent years have increased the positive balance from trade in technologies.

In Russia we observe the reverse process: if at the beginning it had insignificant, but positive balance, but later, during the whole period the deficit of trade in technologies was growing. Such tendency indicates to intensification in Russia of the process of catching up of foreign technologies at the early stages of their development.

Table 2.4. Technology balance of payments (million \$)

	2000	2001	2002	2003	2004	2005	2006
Canada							
payments	1278	1049.2	1097.9	1123.4	1180.6	..	..
Receipts	2599.8	2076.5	1437.6	1768	2072.2	..	..
Balance	1321.8	1027.3	339.7	644.6	891.6		
France							
Payments	2644.2	2695.3	2801.3	3233.5	..	..	..
Receipts	2741.8	3196.4	3619.7	5188.3	..	..	..
Balance	97.6	501.1	818.4	1954.8			
Germany							
Payments	18215.4	21029.8	21726	23277.9	25862.8	29368.8	31941.7
Receipts	13583	14576.2	16552.6	23249.7	28629.3	33094.6	34315.1
Balance	-4632.4	-6453.6	-5173.4	-28.2	2766.5	3725.8	2373.4
Italy							
Payments	3505.4	3439.8	2993.2	3794.9	4069.8	4553.3	3989.9
Receipts	2806.6	2683.6	2977.5	3108.5	3861.5	4265.2	4968
Balance	-698.8	-756.2	-15.7	-686.4	-208.3	-288.1	978.1
Japan							
Payments	4113.5	4512.3	4320.3	4862.8	5246.6	6384.7	6065.3
Receipts	9816.3	10259.4	11059.8	13043.6	16354.4	18402.5	20448.8
Balance	5702.8	5747.1	6739.5	8180.8	11107.8	12017.8	14383.5
Great Britain							
Payments	8344.3	8589.9	8548.9	10449.5	13956.9	14867.3	15424.5

Receipts	16330	18023.3	19665.1	23539	29569	30803.7	30405.5
Balance	7985.7	9433.4	11116.2	13089.5	15612.1	15936.4	14981
USA							
Payments	16468	18963	22381	23443	28336	31376	35479
Receipts	43233	47442	52650	56364	63178	69600	75380
Balance	26765	28479	30269	32921	34842	38224	39901
Russia							
Payments	183.6	398.8	577.2	659.3	818.7	960.9	1137.9
Receipts	204	242.2	211.1	236.4	379.6	391.6	528.5
Balance	20.4	-156.6	-366.1	-422.9	-439.1	-569.3	-609.4

Source: OECD, *Main Science and Technology Indicators*, April 2008.

Research publications and citations. This indicator is estimated²⁰ on the basis of:

- number of publications in international scientific journals;
- citation level of publications.

In their turn, the bibliometric indicators indirectly reflect the results of R&D in international indicators.

In the USA, the world's major research state, the share of scientific publications from all scientific papers published in international journals is about 26%. The respective share in Great Britain, Germany, Japan and China is 6% in each. In Russia this indicator is equal to about 2%.

This indicator may be used as an indicator of R&D output taking into consideration some specific features. First, it depends greatly on the R&D structure, i.e. on the ratio between fundamental and applied R&D. And the structure of the fundamental researches proper influence significantly its values. Second, only about a hundred of the Russian scientific journals out of approximately 5,000 names are put on the Science Citation Index (ICI) on the basis of which the number of papers is often determined. Inclusion of new journals into this Index depends on the quantity of their citations in the ICI publications, and the greater part of registered citations is in English. The second essential factor is intensive reduction of the number of researchers of the elder generation. Therefore, it is not surprising that the reduction of the number of Russian papers published in foreign journals speeded up after 2000.

By the indicator of the number of publications per 1000 people Canada – 1.37, Great Britain – 1.28 and USA – 0.99 have the best positions. In Russia this indicator is one of the lowest – 0.14; still lower is only in China – 0.5 (for some unknown reasons) (Table 2.5).

Important also are indicators of the absolute and relative level of citation. The absolute citation level is determined by the number of publications. However, such approach fails to characterize adequately their quality. In addition, there are essential differences in citation regarding different scientific disciplines and their "popularity" in developed countries. Therefore, the indicator of a relative citation level that is estimated on the basis of the standard values is of greatest interest. It shows the level of citation of scientific publications of a country in relation to the average world citation level assumed to be 100. And such indicator permits to perform direct international comparisons.

The best indicators have USA – 135 and Great Britain – 125. The indicators lower than the world level were found in Japan – 91, China – 73 and Russia – 57. In other countries the relative citation level is higher than the world level.

Table 2.5. Scientific publications in 2006

²⁰ The indicators are estimated on the basis of bibliometric data of the Thompson Scientific Step.

Country	Share in world publications	Number of papers per 1000 people	Relative citation level
Canada	3.9	1.37	116
France	4.5	0.83	110
Germany	6.4	0.88	119
Italy	3.5	0.68	107
Japan	6.3	0.56	91
Great Britain	6.8	1.28	125
USA	25.8	0.99	135
China	6.1	0.05	73
Russia	1.8	0.14	57

Source: National Science Indicators Thompson Scientific/NIFU STEP.

2.4. Innovation activity of business

For ranking of the Russian business by the level of innovation activity the European Innovation Scoreboard 2007 was applied in which the world countries by the results of innovation activity were broken into 4 groups: (1) leaders – Denmark, Finland, Germany, Israel, Japan, Sweden, Switzerland, Great Britain and USA; (2) leader catchup countries – Austria, Belgium, Canada, France, Iceland, Ireland, Luxembourg and the Netherlands; (3) modest innovators – Australia, Cyprus, Czechia, Estonia, Italy, Norway, Slovenia and Spain; (4) lagging-behind – (Bulgaria, Croatia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Rumania and Slovakia).

This rating took into account such indicators collected by Eurostat as stimulation to innovations, knowledge production, knowledge application, innovation business enterprise, protection of the rights to intellectual property. For demonstration purposes the indicators for one country in each groups were used (Table 2.6).

The scales of lagging behind in quality and depth of innovation processes are most serious: the share of innovation products in the receipt is more than three times less than in the leading countries, while the share of the products new for the market is an order less. There are only two indicators on which the Russian companies exceed significantly at least the group of lagging behind European countries. These are the share of high-technology export in the industry export (9% in 2006 compared to 6% in the group of lagging countries) and intensity of expenditure on technological innovations (1.44% compared to 0.89% in lagging countries).

Table 2.6. Indicators of innovation activity in Russia and EU countries

	Russia	EU (27 countries)	Group of innovation leaders: Denmark	Group of leader catchup countries: Belgium	Group of modest innovators: Czechia	Group of lagging-behind: Bulgaria
Share of the personnel employed in innovation-active organizations, %*	36.0	42	52	51	41	16
Share of receipts of innovation-active organizations in total receipts, %**	48.0	-	83.0	80.7	65.6	39.7
Share of high-technology products in the industry export, 2006, %	9.0	-	20.0	8.0	14.0	6.0
Share of innovation products in receipts, 2004, %	5.5	-	16.1	17.8	25.1	36.2
Intensity of expenditure to technological innovations, %***	1.44	-	3.81	4.09	2.69	0.89

Notes: * Estimates of the share of innovation-active organizations took into account the general data on industry and services. ** - without services, the data for Russia are of 2007, for European countries – of 2004. *** - without services, the data for Russia are of 2006, for European countries – of 2004.

Sources: European Innovation Scoreboard 2007. Comparative Analysis of Innovation Performance. European Commission, February 2008 InnoMetrics. Pro Inno Union Paper 6. http://iri.jrc.ec.europa.eu/research/docs/2008/Scoreboard_2008.pdf
Eurostat. Database on innovation activity of organizations in the European Union countries http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/science/inn/inn_cis5&language=en&product=EU_science_technology_innovation&root=EU_science_technology_innovation&scrollto=189

Indicators of innovation activity: 2008. Statistical Book. RF Ministry for Education and Science, Federal Statistic Service, GU-VShE Moscow: GU-VShE Publishers

By kinds of economic activity (EA) the intensity of innovation expenses in Russia in the mining industry is comparable with Ireland (1.44% and 1.86%, respectively), in the food industry with Italy (0.83% and 11%, respectively), in the woodworking industry with Spain. In chemistry by expenditure on innovations (4.49%) Russia is positioned somewhere among France and Norway (3.62% and 3.97%) and Germany (7.98%). In metallurgy and machinery industries this indicator is most close to France (1.26% and 1.2% in metallurgy and 1.83% and 1.92% in machinery-building). By these indicators the high technology industries show considerable lagging compared to the leading countries, however, they are close to a group of “modest innovators”²¹.

By the structure of expenses on technology innovations (Fig. 2.4) the Russian indicators are closer to a group of “modest innovators” where the expenses on purchase of machinery and equipment prevail, while in the leading countries the expenses on own and custom R&D are dominating and they are as large as 80%. But it should be taken into account that the business in East European countries belonging to the “modest” and “lagging behind” groups likewise the Russian business are in process of modernization of their production capacities and prevailing of the investment mode of technologies renovation is quite natural at this stage.

²¹ Innovation Activity Indicators. 2008. Statistical Book. RF Ministry for Education and Science, Federal Statistic Service, GU-VShE Moscow: GU-VShE Publishers.

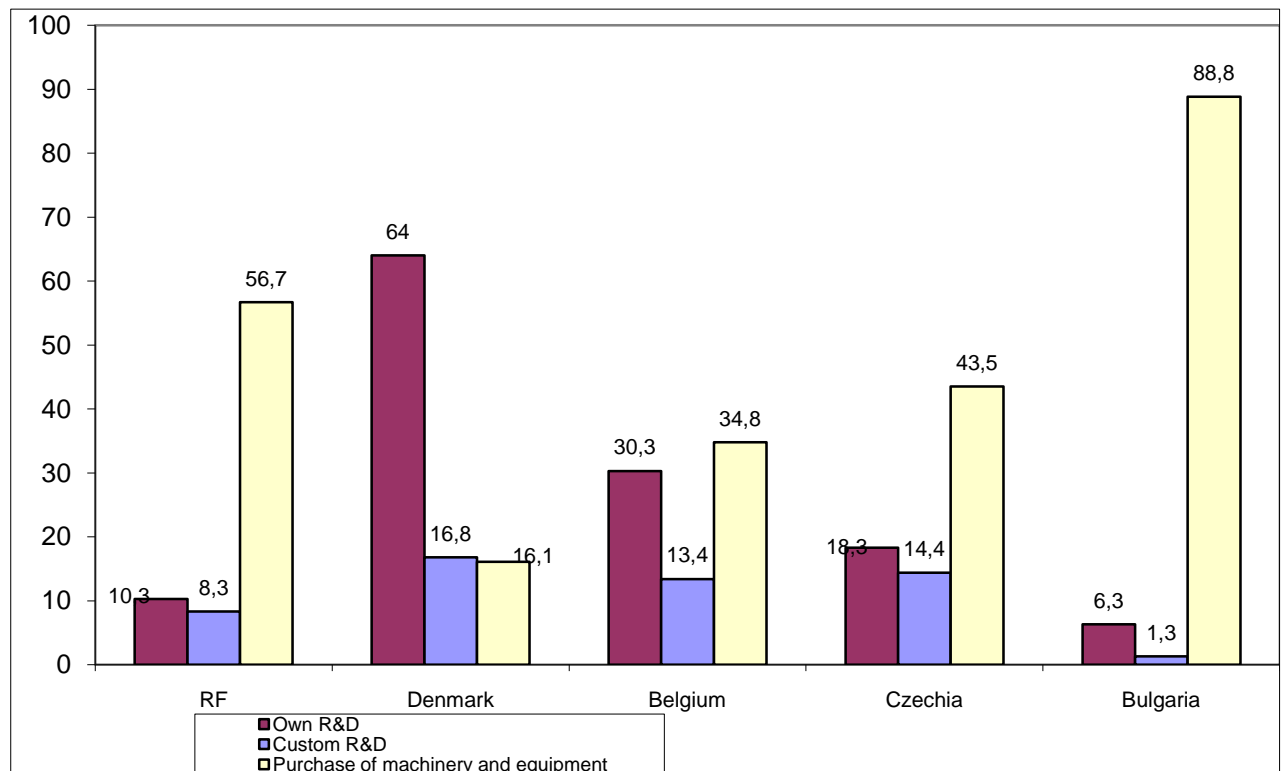


Figure 2.4. Share of expenditure on own, custom R&D and on purchase of machinery and equipment in the structure of expenditure on technology innovation (without services)²²

Some key trends revealed in the Russian business are also typical of European countries. Thus, in Russia the cooperation level of enterprises in technology innovations is comparable with the countries being innovation leaders (33% of the total number of innovation enterprises in Russia compared to 36% in Belgium and 31% in Great Britain). And practically in all countries the companies name insufficiency of own funds and a high cost of innovation introduction as the main obstacles for innovation activity.

The comparison of main indicators pertaining to technology and innovation spheres in Russia with the OECD average figures (see Fig. 2.5) reveals the initial level from which Russia should force its economics to the innovation road of development.

A very low number of international patents granted to Russian organizations and inventors may be partially attributed to the fact that the ratio of expenditure on receiving and maintenance of foreign patents to the receipts of Russian applicants for these patents is very large. In addition, seeking international patenting is indicative of high export ambitions of the applicants, which has not become so far the typical feature of Russian scientists and businessmen.

By some indicators our country is close to the OECD data and by such important indicator as the number of scientific publications per 1000 population it even keeps ahead of OECD countries. But as concerns no less important indicator as the share of innovation products in the receipts of companies, here Russia shows more than five-fold lagging. This may be explained by the fact that high and permanently soaring prices on raw materials attracted the greater part of investments into their extraction and initial processing and also into the trade sphere as the internal demand was growing quickly and it was satisfied, to a great extent, by import.

The gap between the dynamics of internal final demand and production was constantly widening.

²² Source: op.cit.

However, the Russian industry was not passive. In 2003-2007 the share of high technology sectors was steadily growing and nearly doubled.

The Russian government took substantial efforts to change the economic development tendency creating serious prerequisites for this (for more details see Chapter 9).

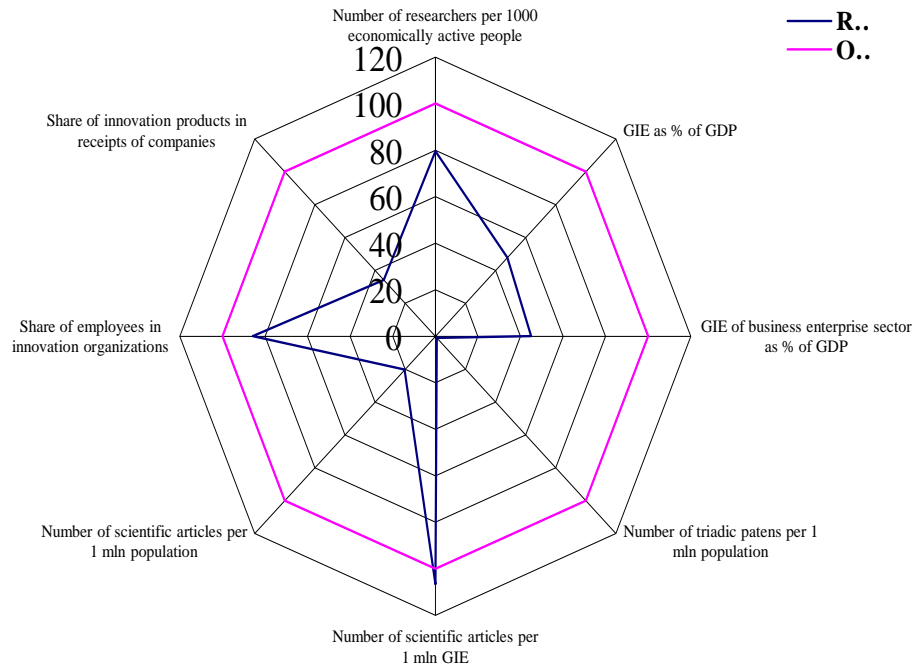


Figure 2.5. Position of Russia in international indicators of science and innovation development. OECD – 100%

3. Problems facing the innovation system in Russia

3.1. Main guidelines of the innovation strategy

The Concept of Long-Term Socio-Economic Development of the Russian Federation for the Period Till 2020 (hereinafter – “Concept 2020” or “CLTD 2020”)²³ adopted in November 2008 defined the main directions of transition to the innovation socially-oriented type of economic development of the country.

Concept 2020 states that the transition of the Russian economics to the innovation development is impossible without formation of a globally competitive national innovation system and set up of legal, financial and social institutions that would ensure interaction of the education, science, business enterprise and non-profit organizations and structures in all spheres of economics and public life. Creation of the effective national innovation systems needs the following:

- to increase the innovation demand from the greater part of industries;
- to improve efficiency of the knowledge generation sector (fundamental and applied science) in view of gradual loss of the reserves accumulated in the past years, gradual ageing of the personnel, lowering of the research level, weak integration into the world science and world market of innovations and lack of orientation to economic requirements;
- to overcome fragmentation of developed innovation infrastructure as many its elements are created, but they do not support the innovation process through the whole period of innovation generation, commercialization and introduction.

CLTD 2020 assumes that by 2020 the share of the innovation sector in the value added structure created in various industries of Russia will reach 17%, i.e. it will be comparable with the share of wholesale and retail trade and will exceed the oil and gas sector (see Table 3.1).

Table 3.1. Structure of value added by economic sectors that should be formed as a result of implementation of CLTD 2020 (in prices of 2007, %)

	2007	2010	2015	2020
Value added – total	100	100	100	100
Innovation sector	10.9	11.1	13	17
Oil and gas sector	18.7	16.6	13.7	12.7
Raw material sector	7.7	7.3	7	6.9
Transport	5.2	4.9	4.4	4.1
Wholesale and retail trade	16.2	17.1	17.2	17
Other sectors	41.3	43	44.6	42.3

Source: Concept of Long-Term Socio-Economic Development of the Russian Federation for the Period Till 2020, Annex 2.

Transition from the export raw material to the innovation model of economic growth involves also formation of a new mechanism for social development based on balancing the business enterprise freedom, social justice and national competitiveness, which, in its turn, requires reforms harmonized by resources and terms in the following directions.

²³ Approved by Resolution of the Government of the Russian Federation No. 1662-p of 17 November 2008.

The first direction is development of the labor potential in Russia, including overcoming of the negative demographic tendencies, creation of economic and social conditions for improvement of the education level of the population, addressing the problems of continuous education.

The second direction is creation of the competitive institutional setup stimulating business activity and attracting capitals into economics, including wider access for organizations to the financial, information and other resources.

The third direction is structural diversification of the economics on the basis of innovation technology development, including:

- creation of the national innovation system providing for efficient integration of higher education and science;
- creation of a powerful science and technology complex for attainment and support of the Russia leading positions in researches and technologies in priority areas;
- creation of the global competence centers in processing industries, including high technology industries and knowledge economics;
- promotion of competitiveness of the leading economic sectors applying the mechanisms of state and private partnership, ensuring better access for the Russian companies to the sources of long-term investments, provision of economic sectors with professional personnel, such as managers, engineers and workers, support of export of the high value-added products and rational protection of domestic markets taking into consideration the international practices in this field.

The fourth direction is strengthening and widening of the global competitive advantages of Russia in traditional economic areas, such as power generation, transport, agriculture, natural mineral processing.

The fifth direction is widening and consolidation of the foreign economic positions of Russia, its more efficient involvement in the world division of labor.

The sixth direction is transition to a new model of spatial development of the Russian economics.

In 2008-2020 the transition to the innovation model of economic development should pass two stages. At the first stage (2008-2012) it is planned to expand the global competitive advantages available in the traditional areas of the Russian economics – power generation, transport, agriculture, natural mineral processing. At the same time the institutional conditions and technology reserves will be created for support of the transition of the Russian economics to the innovation road at the next stage.

At the second stage (2013-202) it is planned to enhance significantly the competitiveness of the Russian economics, but this time on a new technological base. It is also contemplated to improve the quality of labor force and social environment, to ensure structural diversification of economics.

The high technology sectors identified in Concept 2020 as locomotives of innovation development of the Russian economics that are really capable at present to trigger development of a modern science and technology base and contribute to modernization of the Russian economics include the following:

- aviation industry and engine building;
- space industry;
- shipbuilding industry;
- radioelectronic industry;
- nuclear power complex;
- information and communication technologies.

With the progress in high technology industries the technological modernization of economics assumes the efficient built-in of innovation solutions, including management and marketing, into the existing technological and production structures. In this way the development process may be organized simply as substitution of production and management technologies in the structure of a project (economics in general, separate industry, enterprise).

3.2. Key tasks of innovation development

The section in CLTD 2020 entitled “Development of the National Innovation System and Technologies” envisages solution of the following tasks:

- support of innovation business and growing demand to innovations in economics;
- development of the Russian science and education potential and improvement of its efficiency;
- development of an innovation infrastructure;
- efficient integration into the global innovation system;
- implementation of technological and research initiatives (projects) that will ensure the breakthrough of Russia in competition in science and technology on the world markets;
- growing awareness of the public about innovations and higher status of an innovator.

The key targets defined in CLTD 2020 are as follows:

- the share of organizations implementing technological innovations should grow to 15% in 2010 and to 40-50% in 2020 (10% in 2007);
- the share of Russia on the world markets of high technology products and services should reach by 2020 in 5-7 and more economic sectors at least 5-10%, including nuclear power generation, aerospace equipment and services, special shipbuilding, some niches on the software market;
- the specific share of export of the Russian high technology products in the world’s total export of high technology products should grow to 2% by 2020 (0.3% in 2007);
- the specific share of innovation products in the total industrial products should grow to 6-7% in 2010 and to 25-35% in 2020 (5.5% in 2007);
- the intramural expenditure on research and development should reach 2.5-3.0% by 2020 (1.1% in 2007), of which more than the half in the private sector).

The main provisions contained in CLTD 2020 concerning transition of Russia to the innovation road of development are further developed in the new document “Long-Term Forecast of Science and Technology Development in the Russian Federation Till 2025”²⁴ prepared on the basis of the Forsite technological methodology. It provides the general assessment of the present condition and problems in the science and technology complex of Russia focusing on its effect on economic development. Thus, in particular, it outlines the strong and weak aspects of R&D and its elements, including assessment of the condition and development tendencies of the research and development sector, some high technology industries. It also presents evaluations of the Russia positions on the markets of high technology products and prospects of technological advancement in the key sectors of the Russian economics.

In general, the obtained forecasts show that at present Russia has all necessary prerequisites and capacities for putting its economics on the innovation road of development and, as a result, for attainment of the strategic targets of the country development.

Apart from the mentioned two documents, the key tasks of the science and technology development, including decisive for strategic targets of the RF innovation policy, are described in some other legislative acts and documents (see Chapter 9).

²⁴ <http://mon.gov.ru/files/materials/5053/prognoz.doc>

The strategic course of the Russian Government defined in the Concept of Long-Term Socio-Economic Development of the Russian Federation for the Period Till 2020 and aimed at advancement of the country's economics will not be changed even in the face of the global crisis. The crisis as it is also becomes an essential stimulus for improvement of the innovation activity in the country and focusing more attention on science that will satisfy the needs of this process in the future.

PART II. NATIONAL INNOVATION SYSTEM

4. Tertiary (secondary vocational, higher and postgraduate) education

4.1. General description

The Russian Federation has a developed and wide system of the tertiary education that may be received in 5,400 educational institutions, including 2,800 institutions providing education of the 5B level by the International Standard Classification of Education (ISCED), 1,100 institutions – education of 5A level by ISCE and 1,400 educational institutions train their students by the programs of level 6 of ISCED (see Table 4.1).²⁵

In the Soviet time (in the conditions of the planned economics) the number of specialists trained at various levels of such three-level education was strictly controlled. In 1990 per each 100 people with the secondary vocational education (level 5B by ISCED) there were 63 people with the higher professional education (level 5A by ISCED) (approximately the same proportions were maintained during two previous decades). From the early 1990s after canceling the strictly controlled number of the trained specialists of various levels this proportion started changing in favor of the higher education and in 2007 per 100 people with the secondary professional education (level 5B by ISCED) there were already 190 people with the higher professional education (level 5A by ISCED).

Table 4.1. General description of the three-level education in Russia by categories of International Standard Classification of Education

Years	Number of educational institutions				Number of students, thou			
	Total	ISHE* (5B)	IHPE* (5A)	IPPE* (6)	Total	ISHE (5B)	IHPE (5A)	IPPE (6)
2002	5271	2816	1039	1416	8722	2586	5947	189
2003	5294	2809	1044	1441	9263	2612	6456	195
2004	5328	2805	1071	1452	9682	2600	6884	198
2005	5446	2905	1068	1473	9857	2591	7065	201
2006	5430	2847	1090	1493	10027	2514	7310	203
2007	5397	2799	1108	1490	n/a	2408	7461	n/a

*ISVE – institutions of secondary vocational education – vocational training schools, colleges, etc.

IHPE – institutions of higher professional education – academies, universities, institutes

IPPE – institutions of postgraduate professional education – postgraduate studies

Source: Federal Institute of Education Development

²⁵ The number of institutions training by programs of level 6 exceeds the number of institutions training by level 5A programs due to research organizations. In 2006 teaching by ISCED programs of level 6 was conducted in 673 institutes out of 1090 (62%) teaching by the programs of level 5A and add here 820 research organizations that trained only 13% of total students taking ISCED programs of level 6.

At present by the number of all students in the system of tertiary education (in equivalent of full-time students) per 10,000 total population Russia has the indicators being maximum for the OECD countries (see Table 4.2). By the relative number of students (per 10,000 total population) taught by the 5B programs Russia is inferior only to Korea, Greece and Belgium. By the relative number of students taught by the 5A programs only Iceland, Poland, Finland and Korea have the indicators higher than in Russia.

Table 4.2. Number of students of tertiary education (levels 5/6 ISCED) in equivalent of full-time students per 10,00 total population in the OECD countries (2006) and in Russia

	Total	Including:		
		5B ISCED	5A ISCED	6 ISCED
OECD (maximum)	663	245	450	23
	Korea	Korea	Iceland	Switzerland
OECD (medium)	354	37	306	11
Russia				
2002	474	153	311	10
2003	503	156	337	10
2004	527	158	359	10
2005	539	159	369	10
2006	548	155	382	11
2007	n/a	149	388	n/a

Source: OECD.Stat; Rosstat.

The educational institutions providing training by the programs of tertiary education in the Russian Federation may be both public and private. The public institutions include those that are in the ownership of the federal and regional powers as well as municipalities. The private educational institutions include those that are owned by private persons and also commercial and non-commercial organizations. The greater part of the students being involved in tertiary education studies in public educational institutions.

Apart from breaking into public and private institutions there is also division into “paid” and “budget” education. The “paid” education (officially this is “education with full repayment of education costs”) assumes that the education is paid either by the students proper (their families) or organizations (establishments), i.e. private or legal persons. The “budget” education is funded from the state budget (federal or regional budgets), rarely – from budgets of municipal bodies.

Education in non-public educational institutions is always “paid”, i.e. it is paid by private persons and/or legal entities. The public educational institutions have a mixed system (as, for example, in Czechia) when some students are taught on the “non-paid” basis, i.e. on the basis of the federal and municipal funding, while the other part is taught on the “paid” basis, i.e. their education is funded by private persons and/or legal entities. The persons that are taught on the “budget” and “paid” basis in one institute are not separated and are taught jointly.

The distribution of students by federal/private and budget/paid types of education is presented in Table 4.3. The greater part of the students being taught by programs of the tertiary level studies in federal institutions, the share of students attending private institutions is about 5% at level 5B, about 15% at

level 5A and less than 1% at level 6 ISCED. But there is other situation with the differences between “budget” (government funded) and “paid” education. At level 5B about one-third of the students pay for their education, at level 5A – about 60% and at level 6 ISCED – more than 25% of students.

The total number of the “budget” places (funded from the federal budget) in higher educational institutions (5A ISCED) remained practically unchanged since the 1970s, i.e. during the last four decades (see Fig. 4.1). The growth of enrolment to the higher educational institutions that has been observed in the recent decades is mostly due to the “paid” students. Increase (absolute and relative) of the number of students studying on the “paid” basis and in particular in private educational institutions has become, according to expert estimates, the factor of lowering of the general level and quality of higher education.

Table 4.3. Structure of the tertiary education (number of students) by sources of funds, 2002-2006, %

Years	Secondary professional education (5B ISCED)					Higher professional education (5A ISCED)					Post-institute professional education (6 ISCED)*		
	Total	Budg et fundi ng	Paid education			Total	Budg et fundi ng	Paid education			Total	Budg et fundi ng	Private organiz ations
			Total	Fed. organ izatio ns	Private organiz ations			Total	Fed. organ izatio ns	Private organiz ations			
2002	100	63	37	33	4	100	49	51	39	12	100	88	12
2003	100	62	38	34	4	100	46	54	41	13	100	86	14
2004	100	62	38	34	4	100	44	56	42	15	100	84	16
2005	100	66	34	29	5	100	43	57	42	15	100	80	20
2006	100	68	32	27	5	100	41	59	43	16	100	75	25

* These data are only on postgraduate students (without aspirants for the academic degree of a candidate of sciences studying as extramural students).

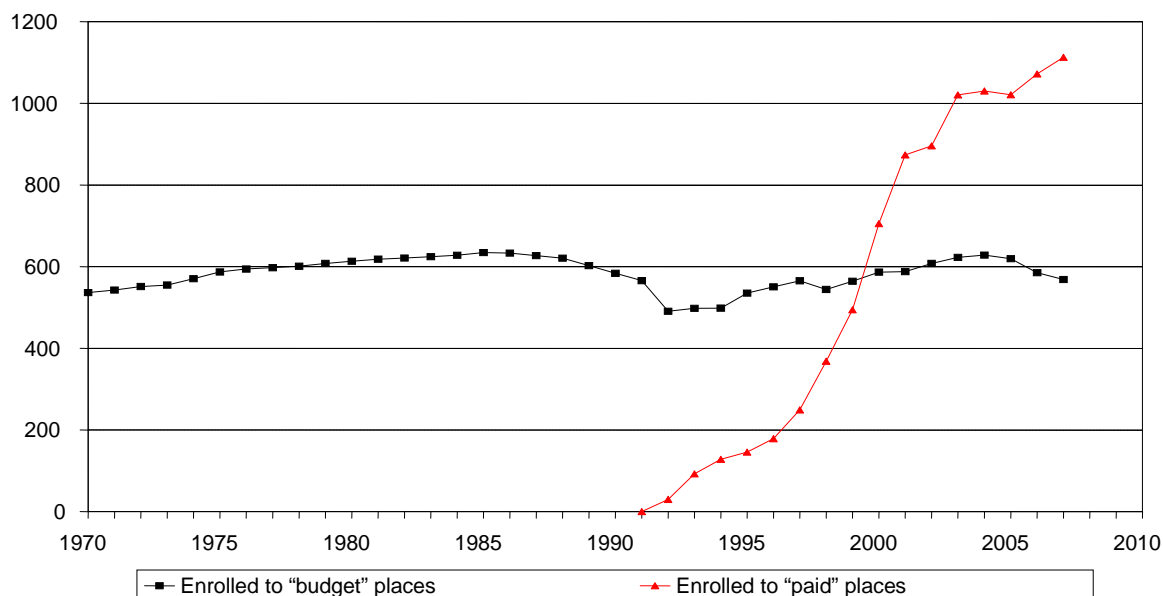


Figure 4.1. Enrolment into higher educational institutions (5A ISCED) by sources of funding, thou people

The difference between “budget” and “paid” study is closely related to the form of study, i.e. the full-time study at daytime departments and the part-time study at the evening, distance and extramural departments. The greater part of the “budget” students studies at daytime full-time departments. Thus, in higher educational institutions (level 5A ISCED) they make two-thirds of the total number of students (see Table 4.4). On the contrary, among the “paid” students the share of full-time students is minor: at level 5A ISCED – slightly more than 1/3. Among the “paid” students of federal educational institutions the share of full-time students is about 40%, while in private institutions – only 1/4.

Table 4.4. Share of full-time students of higher educational institutions (level 5A of ISCED) by sources of funds, %

Years	Total	“Budget” study	“Paid” study	Including	
				In federal institutions	In private institutions
2002	52.2	66.8	38.1	39.4	33.7
2003	50.8	66.7	37.2	39.2	31.0
2004	49.9	66.9	36.7	39.7	28.3
2005	49.7	66.7	37.1	40.0	29.0
2006	49.0	67.2	36.4	39.5	28.1
2007	47.9	н.д.	н.д.	н.д.	26.4

In the recent years in Russia the growing share of the full-time students at level 5B ISCED has been witnessed, but at levels 5A and 6 ISCED it continued dropping steadily and by now it reached its critical values, which is clearly visible in international indicators (Table 4.5). If at level 5B the share of the full-time students in Russia is only slightly inferior to the medium indicator for the OECD countries and gradually approaches it, then at levels 5A and 6 the Russian indicators are lower than in all OECD countries and, what is most important, they tend to drop further on.

Table 4.5. Specific share of the full-time students in the OECD countries (2006) and in Russia, %

	5B ISCED	5A/6 ISCED
ISCED (maximum)	100.0 (1)	100.0 (2)
ISCED (median)	80.2	83.4
ISCED (minimum)	23.3 Switzerland	49.2 Sweden
Russia		
2002	71.8	52.1
2003	72.9	50.7
2004	74.4	49.9
2005	75.7	49.6
2006	76.0	49.0

(1) Finland, France, Greece, Italy, Mexico, Poland, Turkey.

(2) France, Greece, Italy, Mexico, Turkey.

Source: Education at a Glance. OECD, 2008; "Rosstat".

One more indirect indicator of the quality of tertiary education in Russia may be the share of foreign students. Of course, this indicator depends also on many other factors – geographical, language, etc. (see Table 4.6). By the share of foreign students Russia is inferior to many OECD countries. At level 5B ISCED the share of foreign students is lower than in Russia only in two OECD countries – Turkey and Poland; at level 5A ISCED in four countries – Turkey, Slovakia, Korea and Poland; at level 6 ISCED in four countries – Poland, Turkey, Greece and Slovakia.

**Table 4.6. Specific share of foreign students in the OECD countries (2006) and in Russia, %
России, %**

	5B ISCED	5A ISCED	6 ISCED
OECD (maximum)	27.6 New Zealand	28.3 New Zealand	44.2 Switzerland
OECD (median)	4.2	6.2	18.0
Russia*			
2002	0.3	1.2	4.3
2003	0.3	1.2	3.8
2004	0.3	1.3	4.3
2005	0.3	1.3	m
2006	0.3	1.4	m

. * Data on the share of foreign students at levels 5B and 5A ISCED are only for federal and municipal professional education institutions, at level 6 ISCED the share of foreign students in the total number of students awarded the academic degrees of candidate and doctor of sciences by the Higher Attestation Commission of Russia.

Sources: Education at a Glance. OECD, 2008; Rosstat.

4.2. Structural specific features of tertiary education

After accession of Russia to the Bologna Convention in 2007 the government took a decision on transition to mostly two-level system (bachelor-master) of training specialists with higher education (except some specialities requiring longer education). Some higher educational institutions have already adopted this system. So far the greater part of graduates has been awarded the diploma of specialists (see Table 4.7). As concerns the secondary vocational education (5B ISCED) there are two types of programs – basic (2-3 years of study) and advanced (3-4 years of study). The recent years have seen a relative reduction of specialists educated in ISVE by the basic program and the growing number of

specialists with the advanced level of education that approximately corresponds to the level of applied bachelor.

Table 4.7. Number of graduates of the tertiary education per 10,000 employed in economics, 2002-2006

Years	Secondary vocations education (5B ISCED)			Higher professional education (5A ISCED)				Postgraduate professional education (6 ISCED)*		
	Total	Basic level	Advanced level	Total	Bachelors	Specialists	Masters	Total	Candidates of science	Doctors of science
2002	...	...	...	127.7	11.7	114.6	1.4	4.1	3.4	0.7
2003	...	...	...	147.5	12.2	133.8	1.5	4.3	3.8	0.5
2004	...	...	...	161.5	11.7	148.2	1.6	4.5	3.9	0.6
2005	102.0	89.7	12.3	171.9	12.7	157.5	1.7	5.1	4.5	0.6
2006	103.7	88.7	15.0	186.0	13.0	171.1	1.9	5.2	4.6	0.6

* Awarded the academic degrees by the High Attestation Commission.

At the postgraduate education level (level 6 ISCED) the number of persons who were awarded the academic degree of the first level (candidate of sciences) is growing relatively, while the relative number of persons who were awarded the academic degree of the second level (doctor of sciences) remains rather stable. Such tendencies are observed because the persons with the first academic degree go to work to different industries. The second academic degree (doctor of sciences) is usually awarded to the persons who are involved in researches in research organizations or higher educational institutions.

At present the structure of education to some specialities in Russia is shaped with regard to two factors – a traditional structure inherited from the Soviet time and new tendencies related to development of the market economy in the recent 15-20 years. At present the share of specialists receiving higher and postgraduate education in mathematics, natural and agricultural sciences in Russia corresponds approximately to the median indicator for the OSCE countries, while the share of engineers exceeds slightly the median level (Table 4.8). Other areas reveal clear disproportions.

Table 4.8. Structure of graduates with the higher and postgraduate education (levels 5A/6 ISCED) by areas of knowledge in the OSCE countries and in Russia, 2006, %

	Mathematics, natural and agricultural sciences	Engineering disciplines	Healthcare and social security	Social sciences, business, law and services	Humanities, art and education
OECD (maximum)	17.9 Austria	26.0 Korea	27.7 Denmark	48.5 Hungary	35.3 Iceland
OECD (median)	11.8	11.5	12.0	37.4	24.8
OECD (minimum)	7.9 Japan	5.3 New Zealand	5.9 Turkey	24.6 Sweden	18.1 Mexico
Russia	9.8	18.3	4.3	51.3	16.3

Source: *Education at a Glance. OECD, 2008.*

On the one hand, the share of specialists in Russia educated in social sciences, business, law and services exceeds the maximum indicator for the OECD countries, while, on the other hand, the share of

specialists in healthcare and social security as well as humanities, art and education is lower than the minimum for the OECD countries.

The disciplinary-based structure of education of specialists that has been established in Russia in the recent years is the subject of active discussions by the expert community and federal bodies. Thus, much attention is focused on “excessive” number of specialist training in business and law, although it’s quite obvious that the demand for education in this sphere is dictated by the labor market. And in some time after saturation occurs, it will automatically decrease. At the same time the obviously insufficient number of specialists in such socially significant fields as healthcare and social security, on the one side, and humanities and education, on the other, should be in the focus of most close attention and requires interference of the state.

Table 4.9. Educational level of the personnel in research and development field, 2006*

	Total	6 ISCED			5 ISCED			4 ISCED and lower
		Total	Doctors of sciences	Candidates of sciences	Total	5A ISCED	5B ISCED	
Whole personnel	100.0	12.5	3.0	9.5	66.3	49.8	16.5	21.2
Researchers	100.0	25.6	6.1	19.4	74.4	74.4	–	–
Other personnel	100.0	0.3	0.0	0.3	58.8	26.9	31.9	40.9

* Data are only for the full-time employees (without pluralists and those employed under contract).

In theory the system of tertiary education should play a key role in education of the scientific and research specialists. Indeed, in 2006 the R&D sector included 79% of the personnel with the tertiary education (Table 4.9), of which 13% with the postgraduate education (level 6 ISCED), 50% with higher education (level 5A ISCED) and 18% with secondary vocational education (level 5B ISCED).

Table 4.10. Number of persons awarded the academic degree by the Higher Attestation Commission and growth of the researchers with academic degree in the research and development sector, 2002-2006, thou people

Sciences	Candidates of sciences		Doctors of sciences	
	Awarded the academic degree 2002-2005	Growth of researchers number 2003-2006	Awarded the academic degree 2002-2005	Growth of researchers number* 2003-2006
Total	103.3	–4.1	15.6	1.3
Natural and engineering sciences	53.0	–4.9	10.0	0.9
Natural sciences	14.1	–2.1	3.1	0.5
Engineering	17.8	–2.8	3.3	–0.2
Medicine	17.3	–0.1	3.1	0.4
Agriculture	3.8	0.1	0.6	0.2
Public and humanity sciences	50.3	0.8	5.6	0.4
Public sciences	38.0	0.5	3.6	0.2
Humanities	12.3	0.2	2.0	0.2

* Data are only for the full-time employees (without pluralists and those employed under contract).

Even taking into consideration the outflow of researchers – candidates of sciences (pension by age, transfer to other work, awarding the doctoral degree) it is clear that only a few with the degree of the candidate of sciences stayed to work in the research and development sector. The situation is better

with the doctors of sciences – during five years this degree was awarded to 15,600 people, while the number of researchers with the doctoral degree increased by 1,300 people.

Beginning from 2009 the Federal Target Program “Research and Research-Pedagogical Personnel of Innovation Russia” for 2009-2013 is being implemented in Russia. The purpose of this Program is to create conditions for efficient reproduction of the research and research-pedagogical personnel and keeping of young specialists in the sphere of science, education and high technologies, maintaining the generation continuity in science and education. The tasks addressed by this Program are as follows:

- creation of conditions for the improved qualitative composition of research and research-pedagogical personnel, effective system of motivation for research activity;
- creation of a system of incentives stimulating the inflow of young specialists into science, education and high technologies (defense-industrial complex, power generation, aerospace, nuclear industries and other priority high-technology industries of Russia) as well as keeping of young specialists in these spheres;
- creation of mechanisms for renovation of research and research-pedagogical specialists.

There is one more problem – matching of the demand for education services to the market demand for labor. In the recent decades the Russian economics experienced quick structural changes that involve equally quick and essential changes in the structure of labor demand. We should add here the inadequate information support of the labor market, i.e. inadequate awareness of the population about the needs of labor market with regard to the level of the required qualifications and specialist areas. This problem is resolved rather spontaneously simply by increasing the number of the people who continue their education after graduation from the first institutes.

For example, in 2006 32% of those enrolled into higher educational institutions already had tertiary education. As a result, Russia has rather large share of the persons aged 25-64 who continue their education, both formal and supplementary. According to the interviews conducted by the State University Higher School of Economics (Moscow) in 2006 applying the Eurostat practices (Table 4.11), 4.5% of Russian respondents at the age of 25-64 received in the past year the formal education, which is higher than the median indicator for 29 other European countries (the interviews were conducted in 2003). Supplementary education (various courses, trainings, etc.) in a year preceding the interview year was received by 8% of Russian respondents, which is slightly inferior to the median indicator for 29 European countries.

Table 4.11. Involvement of the population in continuous education in 29 European countries (2003) and in Russia (2006), % of the interviewed persons aged 25-64

	Integral indicator of continuous education	Including		
		Formal education	Supplementary education	Self-education
Europe-29 (maximum)	89.2	13.3	53.3	85.6
	Austria	Sweden	Switzerland	Austria
Europe-29 (median)	44.1	3.9	14.0	42.1
Europe-29 (minimum)	10.0	0.9	0.6	6.0
	Rumania	France	Rumania	Hungary
Russia	22.4	4.5	8.0	17.4

Sources: EU project “Lifelong learning”, 2003 (<http://epp.eurostat.europa.eu>); Interviews of State University Higher School of Economics, 2006 (N = 1138) (Education in the Russian Federation, 2007. Statistical Yearbook. M.: GU-VShE, 2007. P. 455-460).

Continuous education in Russia is developing not only because of the initiative of the people, but rather active efforts of the state that supports and implements a number of programs on supplementary

education that annually involves 1.5-1.6 mln people or over 2% of the population aged 25-64. The programs of supplementary education (qualification advancement, re-training, etc.) supported and financed by the government cover the following categories of the population:

- state and municipal employees;
- personnel of organizations funded from the state budget (primarily the personnel of state medical and educational institutions);
- idling persons registered with the Employment Service;
- reservists dismissed from the military service.

Although the state programs of supplementary education cover a limited number of the population they still are very important for development of the continuous education system and provide an essential support to the individual educational activity of the people. Of special significance is organization of the professional re-training in the face of the evolving financial and economic crisis. The Program of Anti-Crisis Actions of the Government of the Russian Federation for 2009 plans to allocate funds to priority education, professional training, re-training and qualification advancement of 173,000 people.

4.3. Science in the higher school

The higher school sector includes two types of research organizations: research units in higher educational institutions – universities, educational academies and institutes and research organizations in the system of the Federal Agency for Education (“Rosobrazovanie”). The greater part of the latter is not directly related to the system of higher education and the Government takes active efforts on their restructuring.

In 2002-2005 the Government adopted and implemented some programs aimed at activation of R&S in the higher education sector, such as:

- Federal Target Program “Integration of Science and Higher Education in Russia” (2002-2006);
- Research Program of the Ministry for Education of Russia (Minobrazovaniya of Russia) “Universities of Russia” (Fundamental Research of the Higher School in Natural and Humanity Sciences) (2000-2001, 2002-2003, 2004-2005);

Table 4.12. Structure of R&S in the higher education sector by type of organizations, 2002-2008

Years	Number of organizations	Number of the personnel involved in R&D (in equivalent of full-time occupation, thou people-year)			Intramural expenditure on R&D (mln Rbls.)	
		Total personnel	Researchers	Technicians, supporting and other staff	In current prices	In permanent prices, 2002
Higher professional education sector, total						
2002	531	98.2	69.4	28.8	7.3	7.3
2003	526	99.3	71.2	28.1	10.3	9.0
2004	533	99.4	70.8	28.6	10.7	7.9
2005	539	97.7	70.5	27.2	13.3	8.2
2006	540	101.0	72.3	28.7	17.6	9.3
2007	616	111.7	80.0	31.7	23.5	10.9
2008*	631	112.7	80.7	32.0	33.3	12.5
Universities and other higher educational institutions						
2002	390	77.3	56.8	20.5	5.4	5.4
2003	393	81.9	60.5	21.4	8.3	7.3
2004	402	81.6	60.2	21.4	8.5	6.2
2005	406	81.1	60.2	20.9	11.0	6.7
2006	417	85.6	62.7	22.9	14.7	7.8
2007	500	97.1	70.9	26.4	20.1	9.4
2008*	530	100.9	73.6	27.8	29.3	11.0
Research institutes (centers), design and other organizations						
2002	141	20.9	12.6	8.3	1.9	1.9
2003	133	17.4	10.6	6.8	2.0	1.7
2004	131	17.8	10.7	7.2	2.2	1.6
2005	133	16.5	10.3	6.3	2.4	1.5
2006	123	15.4	9.6	5.8	3.0	1.6
2007	116	14.6	9.1	5.3	3.4	1.5
2008*	101	11.8	7.1	4.2	3.4	1.5

* estimates

- Research Engineering Program of Minobrazovania of Russia "Innovation Activity of the Higher School" (2003-2004);

- Analytical Departmental Target Program of the Ministry for Education and Science of Russia and Rosobrazovanie "Development of the Research Potential of the Higher School" (2006-2008).

As a result, the number of the employed personnel and appropriations on research and developments in higher educational institutions, in particular in universities have increased (see Table 4.12).

Regardless of the tendency to the increase of a share of education that has been taking shape recently the specific share of this sector in internal research and developments is still much lower than in the OECD countries (see Table 4.13). The higher education sector in Russia is allotted only 6% of the total intramural expenditure on research and developments and involves only 11% of the total personnel in equivalent of full-time occupation), including 16% of researchers (in equivalent of full-time occupation).

Table 4.13. Share of the higher education sector in R&D in the OECD countries (2007) and in Russia, %

Countries	Intramural expenditure on R&D	Number of the personnel involved in R&D (EPZ)	Researchers, total (EPZ)	Number of researchers (headcount)
OECD max.	51.3 Turkey	60.0 New Zealand	68.1 New Zealand	78.8 Turkey
OECD median	26.0	31.4	34.5	51.2
OECD min.	2.4 Luxembourg	5.4 Luxembourg	9.6 Luxembourg	8.4 Luxembourg
Russia				
2002	5.4	10.0	14.1	7.1
2003	6.1	10.2	14.6	7.2
2004	5.5	10.4	14.8	7.4
2005	5.8	10.6	15.2	7.7
2006	6.1	11.0	15.6	7.9
2007	6.3	10.4	14.9	8.7
2008*	6.6	12.6	17.5	12.9

Source: OECD Main Science and Technology Indicators 2008-1.

* estimates

In social, humanity and natural sciences the share of the higher education sector is the greatest (Table 4.14). It is essentially lower in engineering, medicine and agriculture.

Table 4.14. Share of the higher education sector in intramural current expenditure on R&D by science areas, 2002-2008, %

Years	All areas	Natural sciences	Engineering	Medicine	Agriculture	Public sciences	Humanities
2002	5.4	10.0	3.7	6.9	4.5	32.5	15.5
2003	6.1	11.8	4.0	8.2	5.4	33.2	18.6
2004	5.5	9.7	3.8	6.2	5.1	31.9	17.8
2005	5.8	10.6	3.9	8.1	4.6	30.9	18.4
2006	6.1	11.3	3.8	8.3	6.0	36.8	18.2
2007	6.3	9.7	4.1	7.4	6.9	36.5	25.5
2008*	6.6	12.1	4.1	7.8	5.5	34.1	19.3

* estimates

The tendency to the growing role of the higher education sector in R&D that has been shaping recently was accompanied by changes in the structure of researchers conducted in this sector by science areas (Table 4.15). This is the growing specific share of social and humanity sciences as well as R&D in medicine. In its turn, recently the specific share of researches and developments in engineering has shrunk significantly. Less obvious are the tendencies in natural sciences: their share in funding was growing, but the relative number of researchers in this field goes on shrinking as yet.

Table 4.15. Structure of R&D in the higher education sector by science areas, 2002-2008, %

Years	All areas	Natural	Engineering	Medicine	Agriculture	Social	Humanities
Intramural expenditure on R&D							
2002	100.0	30.0	52.5	2.8	1.7	10.3	2.7
2003	100.0	32.9	50.4	2.8	1.5	9.4	2.8
2004	100.0	28.5	54.3	2.5	1.7	10.1	2.9
2005	100.0	29.5	52.1	2.9	1.5	11.0	3.0
2006	100.0	31.7	46.4	3.2	1.8	13.9	2.9
2007	100.0	29.4	46.8	3.0	2.2	13.5	5.1
2008*	100.0	29.0	46.0	3.0	2.0	14.0	6.0
Researchers (staff employees)							
2002	100.0	46.0	36.9	5.2	2.3	6.6	3.1
2003	100.0	44.4	36.8	6.0	2.2	6.5	4.1
2004	100.0	43.2	37.3	4.9	2.4	7.9	4.2
2005	100.0	42.9	36.3	5.0	2.6	8.5	4.7
2006	100.0	42.4	34.5	5.2	2.0	10.6	5.4
2007	100.0	39.1	34.8	6.4	1.9	13.0	4.9
2008*	100.0	37.6	33.7	6.9	2.0	14.9	5.0

* estimates

The structure of R&S funding in the higher education sector by sources of funds is rather steady. Approximately 6% of the total funds are own finance, about 54% - funds from consolidated budget²⁶, about 36% - funds of enterprises and organizations and 4% - funds from foreign sources (Table 4.16).

The specific share of own funds is the greatest in agriculture (25% of total funding) and in medicine and humanities (10-12%). The role of budget appropriations is especially great in natural sciences and medicine (72-74% of total funds) as well as in social and humanity sciences (67-68% of funding). Of course, organizations play a key role in funding the applied researches – in engineering (54% of funds) and in agriculture (26% of total funds).

In the structure of fund management the share of labor expenses (wages and social allowances) increased from 60% of current expenses in 2003 to approximately 65% in 2005-2006. At the same time the share of expenditure on equipment and materials decreased from 14% of intramural expenses in 2003 to 8% in 2006.

Regardless of obvious differences in demand for equipment and materials observed in separate areas the structure of expenditure in all areas is approximately the same. Thus, the share of expenses on equipment and materials in the expenditure on research in engineering is only 6% greater than in humanities (19% against 13% in 2006).

At the same time the increase of funding of researches in the higher school is not the only factor responsible for the growing efficiency of R&D in the education sector. The important direction of the federal policy is integration of higher education, science and science-intensive industries.

Table 4.16. Structure of intramural expenditure on R&D in the higher education sectors by sources of funds, 2002-2008, %

²⁶ Estimated as a sum of R&D funds, budget appropriations on higher educational institute maintenance and finance from extra-budget funds.

	Intramural expenditure, total	Own funds	Budget funds	Funds of enterprises and organizations					Foreign sources
				Total	Business enterprise sector	Government sector	Higher education sector	NKO sector	
2002	100.0	3.5	50.6	39.4	20.3	17.2	1.7	0.2	6.6
2003	100.0	5.9	54.1	35.9	21.9	12.9	0.9	0.1	4.0
2004	100.0	4.7	52.9	39.3	25.0	13.3	0.9	0.1	3.1
2005	100.0	6.0	54.6	35.4	22.9	11.6	0.7	0.2	4.0
2006	100.0	6.0	53.8	36.9	24.5	9.7	2.5	0.1	3.3
2007	100.0	5.9	51.2	40.2	26.8	12.3	0.8	0.3	2.7
2008*	100.0	6.0	51.0	43.0	28.0	12.0	1.0	0.0	2.0
By science areas (average indicators for 2005-2008)									
All areas	100.0	6.2	52.7	38.1	25.6	11.0	1.4	0.1	3.0
Natural	100.0	3.5	71.7	18.7	13.8	4.4	0.5	0.0	6.1
Engineering	100.0	6.0	37.6	54.1	35.7	16.0	2.2	0.1	2.4
Medicine	100.0	11.5	73.3	12.6	9.3	2.9	0.4	0.0	2.5
Agriculture	100.0	24.0	48.5	26.4	19.9	6.2	0.2	0.2	1.0
Social	100.0	7.6	68.4	19.5	8.5	8.4	2.1	0.6	4.5
Humanities	100.0	10.2	66.6	15.8	8.2	5.8	1.2	0.6	7.3

* estimates

The relevant amendments to the legislation²⁷ adopted in 2007 widened the possibilities for interaction of research and educational organizations. For example, now the research institutes and higher schools have the right to provide to each other on the non-refundable basis their movable and real estate belonging to them on the right of ownership or operative management.

Beginning from 2006 the new organizational forms of combining the research and educational processes started developing. There were established the federal universities (two of which – Siberian and Southern Federal Universities are already operating) and national research universities (two of which – nuclear and technological national research universities were set up within the framework of the pilot project on the basis of the Moscow Engineering & Physical Institute and Moscow Institute of Steels and Alloys, respectively). And while the first two are called to ensure quality education being competitive at the world level and in Russian regions, then the latter two are called to take the main burden on formation of the personnel and research support of demands from high technology sectors of the Russian economics.

4.4. Participation of higher educational institutes in innovation activity

By estimates of the Russian experts, only 15-20% of federal higher educational institutes are involved in innovation activities. Such low innovation activity of the Russian universities may be explained by various reasons, among which there are finance deficit, difficulties in development of partnership relations with regional business, contradictions in legal aspects related to this process.

Within the framework of the federal policy aimed at stimulation of the innovation activity in the higher education sector in the 2000s the special programs were implemented.

²⁷ Federal Law No. 308-FZ of 1 December 2007 “On Amending Some Legislative Acts of the Russian Federation Regarding Integration of Science and Education”.

Thus, a serious stimulus for development of innovation activity in the higher education sector became implementation of innovation programs within the priority national project "Education". Regardless of the fact that the focus of attention was on the education component many winning educational institutions thanks to considerable budget funds could enhance essentially their innovation component related to development and commercialization of the research and technological novelties.

In 2007 there were 57 educational institutions – winners of the project, of which 17 universities received outlays for 2006-2007 and 40 universities – for 2007-2008. The funds allotted from the federal budget per one educational institution amounted from 200 mln to nearly 1 bill Rbls. for two years (from nearly 6 mln EUR to 27 mln EUR). And the educational institutions had to guarantee availability of extra-budget funds for the project implementation amounting to at least 20% of the budget appropriations.

The winning higher educational institutions were allotted additional outlays and raised funds depending on the already available potential and activity profile. Engineering and classical universities invested much into updating of the instrument base for research and education, the humanity-social universities – into development of new education methodologies and training of specialists, including for innovation business enterprise.

Implementation of the innovation educational programs permitted to strengthen such elements of the innovation infrastructure of institutes as student business incubators, Technology Transfer Centers, study-research-innovation complexes (SRIC).

The advantage of SRIC is that by uniting the research, study and production capacities it becomes possible to provide a new quality of education, development of researches and commercialization of the research results. In practice several forms of SRIC organization²⁸ were tested:

1. Faculty (chair) of an institute – research laboratory of the institute or RAS – trial production of a research unit of the institute or RAS;
2. Faculty (chair) of an institute – RAS laboratory – small enterprise
3. Faculty (chair) of an institute – RAS laboratory – innovation technological center
4. Faculty (chair) of an institute – RAS laboratory – regional innovation fund
5. Faculty (chair) of an institute – research laboratory of the institute or RAS – large industrial enterprise.

Implementation of the innovation educational program in some higher educational institutes resulted in better partnership relations between educational institutes and RAS institutions, while SRIC started execution of the projects covering all stages of the innovation cycle – from fundamental research to development of technologies and their transfer to production.

Nevertheless there are some constraints (internal and external) curbing the pace of innovation development in the higher education system.

Among the internal factors being an obstacle for innovation activity there are, primarily, the following:

- Low innovation activity of lecturers and research workers and insufficiency of specialists on innovation management;
- Lack of the full cycle of creation of innovation products due to generally outdated fixed assets of educational institutes, degradation of trial and experimental productions;

²⁸ Mayer G.V., Dunaevsky G.Ye., Revushkin A.S., Maslovsky V.I., Astafurova T.P., Krasnova T.S. Implementation of the Project "Academic University" by the Tomsk State University and the Institutes of RAS Siberian Branch in 1997-2003 and Prospects of Its Development // Research University. Tomsk: TGU, 2005, p. 49.

- Holdback of the innovation infrastructure development in educational institutes due to shortage of space (the incubators existing at educational institutes and technoparks often face this problem);
- Weak relationships of universities with the industry, economics and social sphere of the regions and, as a result, insufficiency of information about market requirements.

Among the external factors being an obstacle for innovation activity there are:

- Insufficient development of mechanisms for state support of smaller innovation establishments of educational institutes;
- Lack of the systems and long-term state support of innovation infrastructure facilities (first of all, CPT and technoparks).

The latest government initiative aimed at elimination of obstacles for innovation development in educational institutes is passing the federal law on setup of economic entities at educational institutes and research organizations. This law fills the gaps in the legal regulation of the relationships regarding establishment of economic entities by budget-supported research and educational organizations, by research and educational organizations of academies of sciences and vesting them the exclusive rights to the results of intellectual activity and receipts from their realization. Its main purport is to put into practice the research products created on the basis of outlays from the budget the rights to which belong to the budget-supported research and educational organizations. At present the greater part of intellectual products (IP) is created from budget outlays to research and educational organizations with the legal status of a budget-supported organization or an organization of the state academy of sciences. Due to a strictly targeted form of funding and restricted legal capacity, these research and educational organizations are unable, of their own, to realize in practice (introduce) their intellectual products. Moreover, they are unable to create the operating economic entity that could put into practice the respective intellectual product. For addressing these problems the mentioned Federal Law provides to the budget research organizations (including established by state academies of sciences) and to higher educational institutes, being budget organizations, the right to be founders (including together with other entities), without consent of the owner of their assets, of economic entities designed to introduce into practice the results of intellectual activity of which these research organizations are the exclusive owners.

5. Research and Development sector

5.1. Specific features of the organizational structure

One of the most important and historically established specifics of R&S in Russia is functioning of independent research organizations and institutes not integrated into other segments of the innovation system.

In the 1990s as a result of political and market reforms the organization of researches was changed, but, in general, it happened to be rather conservative. Regardless of some principal changes it retained many “inherent features”. First, unlike many developed countries the fundamental science is concentrated only in the Academy of Sciences that was formed in isolation from the education system. Second, the greater part of R&D oriented to solution of problems of individual industries is conducted in large state research centers created in some industries still in the Soviet time and retained after privatization. Third, the R&D organizations established as rather large institutions still belong to the state by the form of ownership and sources of funds (including institutes formally assigned to the business enterprise sector). Because of these circumstances certain difficulties remain in interaction of research organizations with the new market environment that creates barriers for innovation activities.

In Russia nearly 4000 organizations (3957 in 2007) are involved in R&D. According to the OECD Indicators, more than 40% of them refer to the business enterprise sector, i.e. they are functionally connected with different industries (Table 5.1). They take 64.2% of the expenditure and more than 50% of the employed in R&D. The government sector takes about 30% of expenditure on R&D and 34% of the employed. The research organizations in the higher education sector make 15.6% of the total number of organizations, but their share in R&D expenditure is only 6.3%. The non-commercial sector including private non-profit organizations had in 2008 about 3% of the total number of research organizations and used about 0.4% of the intramural expenditure on R&D.

Table 5.1. Organizations performing R&S by sectors, 2006-2008

	Number of organizations			Number of R&D personnel, headcount			Share of R&D in intramural expenditure (%)		
	2006	2007	2008*	2006	2007	2008*	2006	2007	2008*
Government sector	1341	1483	1480	274802	272255	274515	27.0	29.2	29.8
Business enterprise sector	1682	1742	1663	486613	478401	467144	66.6	64.2	63.2
Higher professional education sector	540	616	621	44473	49059	49363	6.1	6.3	6.6
Private non-profit sector	59	116	138	1178	1420	1741	0.3	0.3	0.4
Total	3622	3957	3902	807066	801135	792763	100.0	100.0	100.0

Source: *Russian Science and Technology at a Glance 2007.M. CISN, pp. 16, 55, 93.*

* estimates

The data in Table 5.1 are based on statistical groups complying with the international practice. However, such approach fails to reflect in full the specificity of the organizational structure of the Russian science.

Analysis of the structure of the R&D sector by forms of ownership indicates, in particular, that the number of public-owned research organizations (the so-called public sector of science) is much more than the number of organizations in the government sector.

According to Resolution of the RF Government No. 1 of 4 January 2009, the economic entities of the public sector include:

- public unitary enterprises, including public ones;
- public enterprises;
- economic entities which stock capital contains over 50 percent of publicly owned shares;
- economic entities which stock capital contains over 50 percent of shares of economic entities belonging to the public sector of economics.

Analysis of the R&D sector by forms of ownership indicates that the public sector of R&S (as it is defined in the government's resolution) includes additionally 1204 organizations, 437 thou of the employed and 133870 bill Rbls. of funding (2007). Therefore, the specific share of the public sector by all R&D indicators is much higher than of the government sector.

Among the economic entities of the public sector implementing R&D the leading positions are taken by public organizations. In 2006 the share of such organizations was 59.9% of the total research organizations in the public sector. The share of unitary organizations, including public ones, was 23.2%. Compared to 2005, in 2006 the number of public organizations had grown by 3.3%, while the number of unitary enterprises, including public ones, decreased by 12.9%. And the number of economic entities which stock capital by over 50 percent is in public ownership increased nearly 1.5-fold.

Below you will find analysis of the situation in public academies of sciences and public research centers as most scientifically significant research organizations of Russia as well as a brief analysis of the organizations in the private non-profit sector being a new sector for the Russian research system.

5.1.1. Public academies of sciences

The academic science that in many countries is developing in the higher education sector develops in Russia largely within the framework of the Russian Academy of Sciences and industry academies (medicine, agriculture and education), but not in higher educational institutes.

The academic sector oriented to fundamental research comprises about 850 organizations subordinated to public academies of sciences. The Russian Academy of Sciences incorporates 433 research organizations, the Russian Academy of Agricultural Sciences – 205, the Russian Academy of Medical Sciences – 69, the Russian Academy of Education – 22, the Russian Academy of Architecture and Civil Engineering – 5, the Russian Academy of Arts – 3.

Russian Academy of Sciences (RAS) was founded by Peter I pursuant to Decree of the Ruling Senate of 28 January (8 February) 1724. It was re-established by Decree of the President of the Russian Federation of 21 November 1991 as a higher research institution in Russia. On the territory of the Russian Federation the Russian Academy of Sciences became a legal successor of the USSR Academy of Sciences. RAS is a self-governing non-profit organization having the public status.

At present RAS is the major research organization in the country. The main function of RAS is to conduct fundamental and applied research in all areas of knowledge (Table 5.2).

Table 5.2. Structure of intramural current expenditure of RAS on R&S by areas of science, mln Rbls.

	2007	Structure, as % to total
Total	41308.6	100.0
Natural	31520.2	76.3
Engineering	5069.5	12.3

Medicine	256.5	0.6
Agriculture	90.3	0.2
Social	2127.9	5.2
humanities	2244.2	5.4

Estimated by the data of "Russian Academy of Sciences in Figures", 2007. M. CISN. 2008. P.130

RAS performs more than the half of all fundamental research and about 10% of the applied research in the country (Table 5.3).

Table 5.3. Share of RAS in R&D indicators for Russia

	2000	2001	2002	2003	2004	2005	2006	2007	2008*
Research organizations	11.1	11.2	11.6	12.2	12.4	12.6	12.8	12.1	12.2
Implementing R&D	11.9	12.0	12.2	12.4	12.5	12.7	12.4	12.1	13.9
Including doctors of sciences	42.8	43.2	43.2	43.5	43.4	43.5	43.2	41.4	50.7
Candidates of sciences	30.8	31.4	31.9	32.9	32.8	33.1	32.6	30.8	38.4
Intramural expenditure on R&D	9.7	10.1	10.3	11.0	11.1	11.2	11.8	11.9	12.3
Fixed assets	12.5	12.2	11.1	19.6	20.3	19.2	16.4	20.2	22.4

Source: Russian Academy of Sciences in Figures, 2007. M.2008, pp. 13-37.

* estimates

In 2004-2005 the RF government initiated reforming of the system of R&D organizations, including RAS. It was proposed by 2008 to liquidate or reorganize dozens of research institutions and to cut by 25% the employed personnel and after this to increase by 150% the budget outlays. As a result, it will be possible to raise the monthly salary from 7324 Rbls. (240 USD) to 30,000 Rbls (1050 USD) in the current prices and the annual expenditure (per one researcher) on laboratory and research equipment to 700,000-750,000 Rbls. (26,000 USD)²⁹. By now the reform is accomplished. The number of the personnel is cut by 20%, the salaries are raised and now they depend on the input of each researcher, but still they do not make the research field more attractive for the young specialists, in particular in large cities.

Table 5.4. Number of the members of the Russian Academy of Sciences (headcount)

	2000	2001	2002	2003	2004	2005	2006	2007	2008*
<i>Total</i>									
Members	494	473	458	505	493	467	496	478	476
Corresponding members	713	697	686	731	718	697	729	710	710
<i>Including employed in research organizations</i>									
Members	363	356	350	373	374	347	359	341	338
Corresponding members	459	453	448	488	470	458	467	454	454

Source: Russian Academy of Sciences in Figures, 2007. M.2008, p. 169.

²⁹ Proposals on RAS restructuring «Program of Updating the Structure, Functions and Mechanisms of Financing of RAS, Russian Academy of Education, Russian Academy of Medical Sciences, Russian Academy of Agricultural Sciences, Russian Academy of Architecture and Construction, Russian Academy of Arts.» Source: Minobrnauka www.mon.gov.ru

* estimates

In 2008 the government took a decision on increasing the additional payments for the academic degree to the RAS Members and Corresponding members to 50,000 Rbls. and 25,000 Rbls a month, respectively.

Russian Academy of Medical Sciences (RAMS) was founded in 1944 as the USSR Academy of Medical Sciences. That time the Statutes of the Academy and the first list of subordinated institutions comprising 25 names were adopted. In 1992 the USSR Academy of Medical Sciences was transformed into the Russian Academy of Medical Sciences (RAS).

The main objectives of the Academy are:

- Science-based addressing of the issues of theory and practice in medicine, further development of the medical science with regard to the public healthcare needs and tasks of the medical-sanitary support of the country defense;
- Science-based testing of the most important discoveries and proposals in medicine and revealing the possibilities for practical application of new treatment methods;
- Training the professional researchers in medicine;
- Defining every year the priority problems of research to be coped with by medical research institutions, consideration and approval of the plans and reports on research activities of these organizations, formation of permanent and ad hoc commissions for testing the discoveries and proposals in medicine and for expertise of problems existing in medical science and public healthcare.

Among other public academies RAMS possesses the highest share of the highly qualified personnel. In RAMS the academic degree of the doctor and candidate of sciences is awarded to 71.4% of researchers, while in RAS – 61% and in the Russian Academy of Agricultural Sciences (RAAS) – 49%.

Moreover RAMS makes also an exception regarding the composition of fixed assets. Unlike other federal academies of sciences where the liabilities of fixed assets – buildings and structures are prevailing, in RAMS 66% are taken by machinery and equipment.

In 2007 by its provision with equipment RAMS exceeded RAS 2.7 times and RAAS 7.5 times.

Russian Academy of Agricultural Sciences (RAAS) was founded in 1929 as the All-Union Academy of Agricultural Sciences named after V.I. Lenin (VASHNIL). Pursuant to Decree of the RF President of 30 January 1992 the Russian Academy of Agricultural Sciences (RAAS) was established that became a legal successor of VASHNIL.

The RAAS system concentrates the key scientific potential of the agro-industrial complex of the Russian Federation.³⁰ RAAS has on its staff 150 academicians and 145 corresponding members being the renowned scientists of Russia and 186 foreign members of the Academy.

5.1.2. Science centers and science cities

More than 100 organizations in this sector of applied science in Russia have different statuses: public science center (50), federal science and production center (53) and national research center (1 – within the framework of a pilot project). A special status of an organization does involve change of its legal form, but makes it the recipient of a special state support.

³⁰ According to the RAAS official site <http://www.agroacadem.ru/science/> application on 19.03.2009

Public science centers. In 1993 a small part of large industrial research institutes was awarded the status of public science centers (PSC). Establishment of PSC was connected with the radical economic reforms being conducted in the country and the need to maintain the scientific potential, including through priority support of viable organizations possessing widely recognized science schools and unique research equipment. The status of PSC ensured to a scientific organization the additional outlays from the budget and some tax privileges, in particular regarding property and land. At present the PSC system includes 50 organizations operating in priority areas of science and technology (nuclear physics, power generation, chemistry and new materials, aircraft construction, machine-building, medicine, biology and biotechnology, informatics, optics, electronic, robotics and others. Many PSCs conduct researches for the Russian defense complex.

The confirmation of the PSC status is conducted once in two years on the basis of expertise of activity of a particular PSC in comparison to the respective average indicators for publicly-owned science organizations. In 2008 the Interdepartmental Commission on Innovation Policy approved the basic target indicators for awarding the PSC status. At present PSCs are organized in eight regions of the Russian Federation: in Moscow – 32, Moscow Region – 5, Saint-Petersburg – 10, Ulyanov Region – 1, Kaluga Region – 2, Novosibirsk Region – 1, and Krasnodar Territory – 1.

The total number of the PSC employees is about 70,000, including 42% of researchers. About 100 members and corresponding members of public academies of sciences, over 7500 doctors and candidates of sciences are working in the PSC system. In 2008 the volume of fixed assets, including unique research installations and test stands, made about 42 bill Rubles with the specific share of machines and equipment being 37% of the mentioned total amount (Table 5.5).

Table 5.5. Indicators of the PSC activity in the Russian Federation

	2000	2001	2002	2003	2004	2005	2006	2007	2008*
Number of centers	58	58	58	58	61	58	58	52	52
Number of R&S personnel	73348	69474	68062	66620	64543	60440	56337	52234	48130
Funding (mln Rbls.)	940.0	940.0	938.4	1049.7	1120.3	1119.6	1118.8	1118.1	1117.3

Source: Data of Minobrnauka of Russia, 2007.

* estimates

PSC took part in international projects and the quantity of such projects is constantly growing: 486 in 2006, 526 in 2007 and 542 in 2008. The volume of works performed by PSC by international contracts is also growing: 3.9 bill Rbls. in 2006, 5.2 bill Rbls. in 2007 and 8.1 bill Rbls. in 2008.

Every year about 6,000 papers are published in scientific journals. The quantity of application submitted for patenting (certification) is growing: 491 in 2006, 545 in 2007 and 650 in 2008 as well as the total quantity of supported patents (certificates): 3113 in 2006, 3403 in 2007 and 3630 in 2008.

PSCs are also involved in training of professional research personnel. Practically all PSC has the basic chairs of the leading public universities. For many higher educational institutes PSC is the base for pre-diploma and diploma practice.

Federal science and production centers. The procedure of awarding the status of a federal science and production center is approved by Resolution of the Government of the Russian Federation No. 983 of 9 October 1995.

The status of a federal science and production center may be awarded to enterprises and organizations in the defense, aerospace and nuclear industries implementing development, manufacturing, testing, repair and utilization of the most important types of armament, military and space facilities as well as

basic completing parts to them on the basis of the federal defense order and having the legal status of a federal public unitary enterprise or a joint stock company with the shares in federal ownership.

The Ministry of Industry and Trade of the Russian Federation, the Federal Space Agency and the Federal Corporation on Nuclear Energy “Rosatom” together with the Ministry of Education and Science of the Russian Federation evaluate the activity of each center once in five years. In cooperation with the Ministry of Defense of the Russian Federation and the Ministry of Economic Development of the Russian Federation they take decision on advisability of further keeping of the center status by a particular enterprise or organization and submit respective proposals to the Government of the Russian Federation.

National research centers (NRC RF). This is a new status of a research organization called to ensure a breakthrough in science and technology on the priority directions of development of science, technology and techniques in the Russian Federation and/or implementation of programs (projects) of state significance. NRCs are financed on the basis of the activity program approved by the Government of the Russian Federation for 5 years and envisaging performance of fundamental and applied research, the full innovation cycle of development of technologies (from R&D to trial and trial and full-scale specimens) as well as development and maintenance of the research, technological and engineering infrastructure of NRC RF. As a pilot project there was established the first national research center on the basis of Federal State Establishment Russian Research Center “Kurchatov Institute” pursuant to Decree of the President of the Russian Federation No. 603 of 28 April 2008.

In the Russian legislation there is one more special status possessing some features of a research center – **science city**.

A science city is a municipal formation with the status of a city district possessing a high research potential, with a city-forming research and production complex representing a unity of organizations implementing research, research-engineering, innovation activities, experimental development, tests, personnel training in accordance with the state priority directions of development of science, technologies and techniques of the Russian Federation.³¹

Therefore, a science city is not so much a kind of a research organization as a certain cluster of organizations united by the territorial principle.

The state support of science cities is realized, primarily, through programs – an integrated program of development of each municipal formation that was awarded the respective status is being elaborated and approved.

At present the science city status is awarded to 12 municipal formations. About 40 more municipal formations possess sufficient prerequisites for receiving such status.

5.1.3. Private non-profit research organizations

This segment of R&D in Russia started its shaping in 1996 after enforcement of Federal Law No. 7-FZ “On Private Non-Profit Organizations” (as amended in 1998-2000). The Law defined the legal status, procedure of establishment, activity, reorganization and liquidation of private non-profit organizations, the rights and obligations of their founders (participants), the fundamentals of management and possible forms of support by federal powers and foreign organizations.

Table 5.6. Main indicators of activity of private non-profit research organizations

³¹ Federal Law “On Status of Science City of the Russian Federation” No. 70-FZ of 7 April 1999.

	2000	2001	2002	2003	2004	2005	2006	2007	2008*
Number of organizations	48	47	47	48	42	42	59	116	138
Share of total number of R&D organizations, %	1.2	1.2	1.2	1.3	1.2	1.1	1.6	2.9	3.5
Personnel, headcount, total	446	552	653	584	373	283	1178	1420	1741
Expenditures on R&D, total, mln Rbls.	170.4	216.5	325.3	371.9	389.8	409.0	730.6	1237.3	1778.8
- % to intern. RF	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4

Source: *Russian Science and Technology at a Glance. 2007. M. CISN*

* estimates

The data in Table 5.6 on development of the private non-profit sector show that the situation here changed just in 2006 when the growth of a number of organizations, funding and number of the personnel, including scientists with academic degrees, was observed. Perhaps, this sector became more attractive after enforcement of the amendment to the law that extended the possibility to use this form of organization for research units at the higher educational institutions and in the public sector. But it should be remembered that the share of this sector in R&D is still rather small.

Determination of a number of private non-profit research organizations in each area of research is a no easy task and only indirect evaluations may be presented. Thus, it is known that in the 1990s – 2000s a great number of analytical centers appeared in Russia. They specialized on study of the issues of economic and social development, international and internal political processes. For support of this hypothesis we can present the comparison of a structure of research in this sector with the average for Russia.

Table 5.7. Comparison of a research structure in the private non-profit sector of science with the average for the R&D sector in RF, 2006-2008, %

	2006		2008*	
	R&D in RF	Private non-profit organizations	R&D in RF	Private non-profit organizations
Intramural expenditure on research by areas:	100.0	100.0	100.0	100.0
- economic research	35.6	7.2	34.2	3.9
- social research	4.2	7.0	6.0	10.6
- science development	21.1	45.6	15.8	26.1
- study of the Earth	2.6	7.2	2.8	7.6
- study of outer space	4.9	8.4	8.8	9.8

* estimates

Source: *Estimated by the data of "Science of Russia in Figures", 2007. M. CISN*

Pursuant to the federal law on private non-profit organizations, Russia may establish foreign non-profit nongovernmental organizations. They include organizations which activity is not targeted to getting profit and that are established beyond the territory of the Russian Federation under the laws of a foreign state and the founders (participants) of which are not federal bodies. In 2006 the activity of foreign non-profit organizations in some areas was restricted, primarily, due to their influence on the internal political situation.

In the field of science the foreign non-profit organizations are represented mainly by foreign nongovernmental funds providing financial support to scientists on the territory of Russia. The foreign funds started active functioning in the early 1990s. In the conditions of profound reforming of all mechanisms and institutes of socio-political development and economic crisis that affected strongly the science sphere the foreign organizations and funds initiated implementation of various programs of support and cooperation. The greater part of foreign funds and organizations operating in Russia in the field of research is of the U.S. origin (34.3%), they are followed by organizations and funds from Britain (14.7%), organizations of international associations and European Union (10.7%), Germany (10.1%), Japan (5.8%) and France (4.1%).³²

Table 5.8 reviews the objectives of activity of foreign funds in Russia.

Table 5.8. Foreign funds in Russian research

Funds	Objectives of fund activity
NWO, INTAS, Wellcome Trust, DFG, British Council, Alexander von Humboldt Foundation, Max Planck Society, Fulbright Program, IRC, CRDF	Development of mutually beneficial cooperation
NNF, IRF, NWO, Wellcome Trust, DAAD, Alexander von Humboldt Foundation, INTAS, IRC, CRDF	Support of the best scientists and viable research directions (at the initial stage – assistance to the scientists happened to be a difficult situation)
MacArthur Foundation, CRDF, Ford Foundation	Consolidation of the existing and development of a new infrastructure in research and engineering
MacArthur Foundation, IREX	Development of democracy and human rights in Russia, fostering of the pluralistic civil society
IRC, CRDF	Re-orientation of scientists from the former defense complex to civil researches
IRC, CRDF	Promotion of transition to the market economics
NSF, Wellcome Trust	Provision access for foreign scientists to the Russian research equipment and information

Source: According to the data of interviews conducted in 2005-2006 in 19 foreign organizations and foundations implementing cooperation programs in the Russian science. I. Dezhina. ME&MO. 2008, no. 2.

5.2. R&D Funding

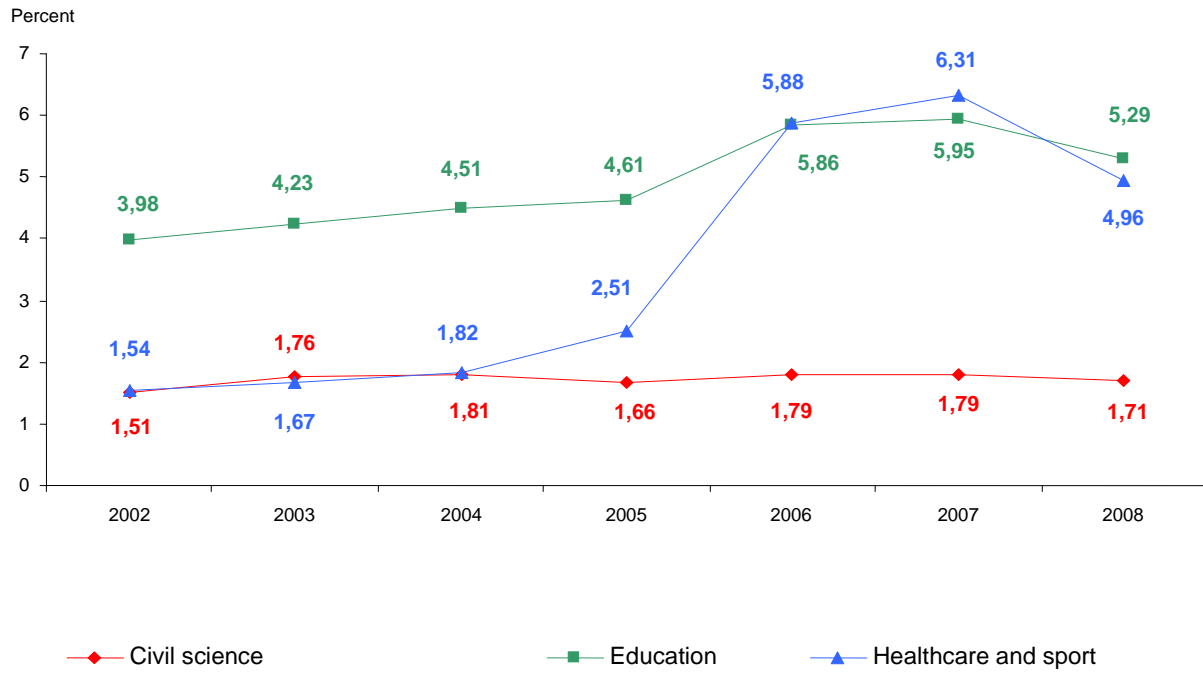
5.2.1. Public funding

In the recent decade the share of budget funds³³ in the intramural expenditure on research and development made about 60% with only slight deviations from this “averaged” indicator. This differs Russia from the developed world countries where in 2002-2007 the funding of science from the state budget was from 20% to 50% of the total expenditure to this purpose.

Appropriations to the civil science as a part of budget expenditure have been growing, but to a less degree, compared to the expenditure on education and healthcare (Fig. 5.1).

³² International, Regional and National Organizations, Foundations and Programs. Reference Book. Voronezh: VGU, 2002.

³³ Including budget outlays to maintenance of higher educational institutions and funds of organizations of the government sector.



* With regard to national projects

Figure 5.1. Appropriations to science, education and healthcare from the federal budget (as % to the expenditure)

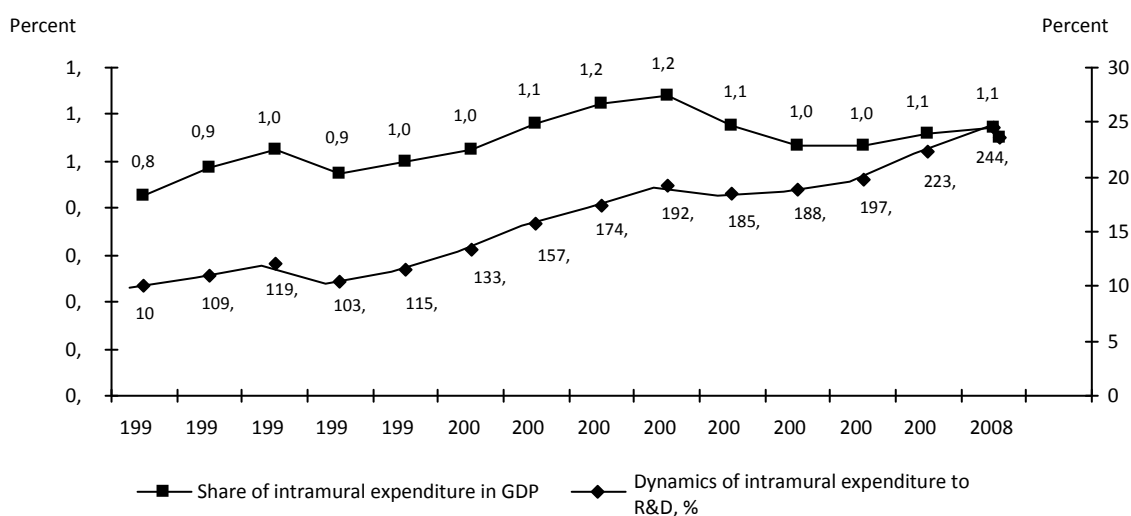
Table 5.9. Main indicators of funding R&D in Russia

	1991	2000	2001	2002	2003	2004	2005	2006	2007	2008*
Appropriations to science from the federal budget as percent to the gross domestic product	1.85	0.47	0.55	0.61	0.71	0.67	0.81	0.80	0.81	0.82
Intramural expenditure to R&D from all sources as percent to the gross domestic product	1.43	1.05	1.18	1.25	1.28	1.15	1.07	1.08	1.12	1.14
Share of the business enterprise sector in intramural expenditure on R&D, %	-	70.8	70.3	69.6	68.4	69.1	68.0	66.6	64.2	63.2
Intramural current expenditure on fundamental research, % of the current expenditure on R&D	10.0	13.4	13.9	14.6	15.1	14.2	14.0	15.4	18.0	18.2
Intramural current expenditure to applied research, % of the current expenditure on R&D	33.0	16.4	16.4	15.9	15.6	16.5	16.4	15.3	15.4	15.4

Sources: *Science of Russia in Figures: 1996. Statistical Book. M.: CISN, 1996, pp. 40, 46; Science of Russia in Figures: 2004. Statistical Book. M.: CISN, 2004, p. 71; Science of Russia in Figures: 2005. Statistical Book. M.: CISN, pp. 68, 75, 83; Science of Russia in Figures: 2006. Statistical Book. M.: CISN, 2006, p. 68; Science, Technologies and Innovations: 2007. Short Statistical Book. M.: Center for Study of Science Development Problems, RAS, 2007, pp. 24, 25, 28.*

* estimates

The share of private (by ownership) sector in support of research and development is low and tends to drop still more as the budget financing of research and development is growing rather fast. After adoption in 2002 by the government of the document "Foundations of the Russian Federation Policy in Development of Science and Technology for the Period Till 2010 and Far Perspective" the growth of budget outlays was rather steady. In the period between 2003 and 2007 the budget appropriations to the civil science were growing 10-15% a year in real terms. The intramural expenditure on R&D as % to GDP has grown from 0.95% in 1998 to 1.07% in 2006 (Table 5.9).



* estimates

Figure 5.2. Intramural expenditure to R&D in percent to GDP

The structure of intramural expenditure on research and development by forms of ownership elucidates the role and significance of the budget funding: nearly $\frac{3}{4}$ of total expenditure is with the organizations in the public sector, and this indicator remains practically unchanged (Table 5.10). As concerns private organizations their share in the intramural expenditure on research and development increased from 5.1% in 1998 to 14.1% in 2008.

Table 5.10. Intramural expenditure on R&D by organizations by ownership, %

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008*
Total	100	100	100	100	100	100	100	100	100	100	100
Russian ownership	95.9	98.6	96.8	97.7	97.9	98.2	98.3	98.2	98.1	97.8	97.5
Including, public	68.9	74.6	73.3	71.4	72.2	72.9	73.1	74.5	74.2	72.2	71.6
Private	5.1	4.3	6.5	8.7	9.2	9.1	9.5	9.1	12.3	13.9	14.1
Mixed	21.7	19.3	16.7	17.4	16.4	16.0	15.6	14.5	11.4	11.5	11.6
Foreign ownership	0.04	0.1	0.2	0.2	0.09	0.2	0.1	0.3	0.2	0.2	0.2
Joint Russian and foreign ownership	4.0	1.3	3.0	2.1	2.0	1.7	1.6	1.5	1.7	2.1	2.3

Source: "Indicators of Science: 2008". Statistical Book. M. GU-VShE, p. 74

* estimates

In the structure by activity the expenditure on fundamental research makes 14-15%, which is not much regarding the scale of the budget appropriations on science. In many world countries that have data on the amount of financing of fundamental research this figure is greater. For example, the specific share of financing of fundamental research in total expenditure on R&D is as follows: 24% in France, 19% in USA, 18% in Denmark, 17% in Israel. In the East European countries this indicator is still higher: 26% in Czech Republic and 32% in Poland.³⁴ The ratio of expenditure by kinds of research is as follows: in the recent 15 years in the ratio of fundamental to applied research the expenditure on developments has been dominating (Fig. 5.3).

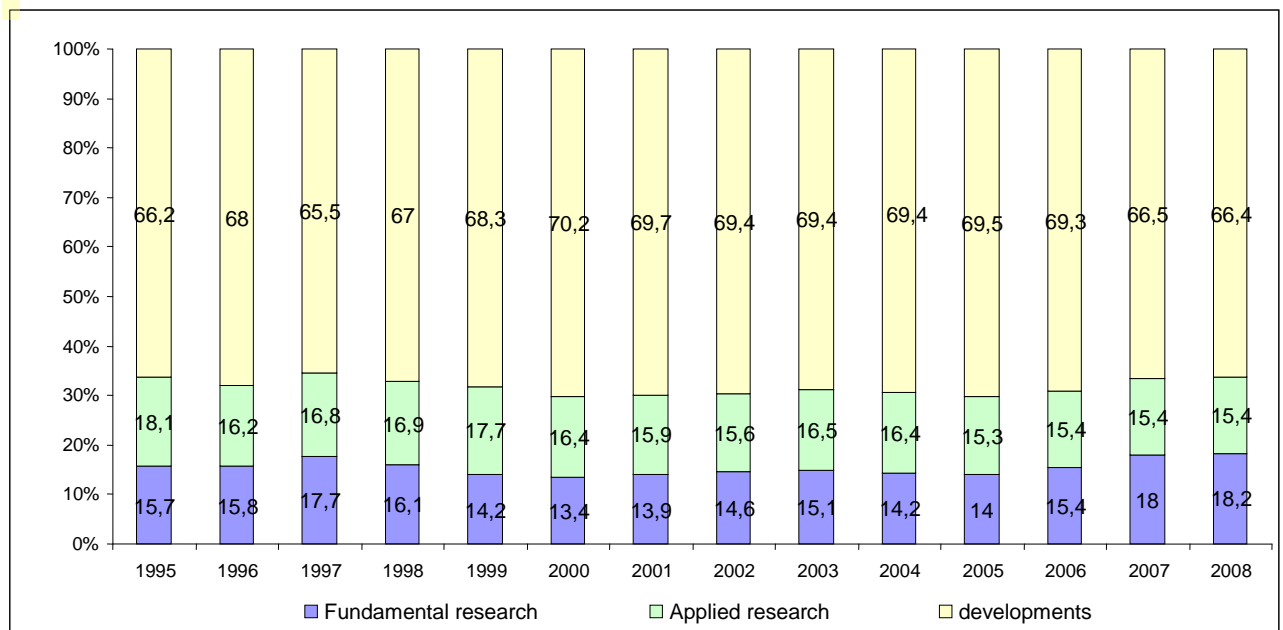


Figure 5.3. Structure of intramural current expenditure on R&D by activity, 2008 – evaluation

The share of budget appropriations to the research in the higher education sector is greater, but not significantly than to research in the business enterprise sector (Table 5.11). And in the past seven years the share of the budget appropriations to the university research has shrunk from 63.6% to 58.7% and this is mostly due to successful activity of the higher educational institutions under contracts and agreements financed from non-budget sources.

Table 5.11. Structure of intramural expenditure on R&D in research organizations by sectors of activity, %

	Specific share of budget funding, %			Specific share of funding from non-budget sources, %		
	2000	2007	2008	2000	2007	2008*
Total for the Russian Federation	53.7	61.6	60.0	46.3	38.4	40.0
Including by sectors of activity of research organizations:						
Government	75.8	75.9	75.5	24.2	24.1	24.5

³⁴ Science and Engineering Indicators – 2008. National Science Board, 2008. Volume 1, pp. 4-41.

Business enterprise	45.5	55.3	56.8	54.5	44.7	43.2
Higher education	63.6	59.4	58.9	36.4	40.6	41.1
Private non-profit organizations	46.8	62.2	60.6	53.2	37.8	39.4

Source: Sources of funding the intramural expenditure on research and development. M., CISN, 2008, p. 7
* estimates

For comparison purposes no less important is the per capita expenditure on R&D (in US dollars). By this indicator the position of Russia has been sustainably improving (Table 5.12). In the early 2000s Russia lagged significantly behind all developed countries and many East European countries, while by 2006 this gap became narrower: for example, if compared with Czech Republic it was nearly three-fold, in 2006 it was practically two-fold; with the USA it was 13-fold in 2000 and 9-fold in 2005; the gap with Finland was also reduced. At the same time at the beginning of the considered period Russia was somewhat ahead of Poland and by the end of the period the excess was more than 1.6-fold.

Table 5.12. Intramural expenditure on research and development in some world countries in per capita figures (US dollars by purchasing power parity)

Country	2000	2001	2002	2003	2004	2005	2006
OECD in general	537.1	564	573.6	591.1	615.1	655	694.1
Russia	80.6	98.3	109.9	124.4	123.5	126.3	141.2
USA	948	974.6	960.5	994.5	1023.5	1092.6	1146.5
China	21.3	24.7	30.7	36.3	44.4	54.3	66
Finland	857.8	880.5	925.7	950.8	1031.9	1061.2	1128.9
Japan	778.7	818	848.7	879.1	919.6	1007.2	1086.3
Israel	892.2	951.1	934.6	891.7	944.3	1031.5	1132.6
Germany	636.1	661.3	686.9	720.8	744.1	757.3	809.7
France	541.9	585.5	619.2	594.5	608.9	630.3	655.7
Great Britain	472.5	493.8	516.4	521.7	535.8	554.9	588
South Korea	393.4	449.3	472.6	500.8	581.5	636.1	743
Czechia	181.2	195	202.3	225.4	240.9	286.4	339.9
Hungary	95.5	124.8	146.9	144.1	142.4	160.3	181.8
Poland	68	68.3	64.7	64.9	72.6	76.9	81.6

Source: OECD, *Main Science and Technology Indicators*, April 2008.

Until 2005 R&D activity was supported by the basic budget financing when the funds were appropriated to a research organization as a whole depending on the number of the personnel and the level of the last-year expenditure. The volume of these funds did not depend on the results of activity of a research organization or a higher educational institution. The share of program-based financing assigned via federal target programs (FTP) was no more than the quarter of the budget outlays to science. Universities, research organizations and private companies could seek for budget funds via these programs on a competitive basis. The customers of FTP are federal ministries, federal services, federal agencies and academies of sciences.

The recent years has witnessed the growth of appropriations to implementation of R&D within the framework of the federal target programs.

In 2008 in the Russian Federation there were 46 **Federal Target Programs** (FTP) that may be arranged by the following 7 directions:

- Development of the social infrastructure (7);
- Development of the transport infrastructure (2);
- New generation (5);

- Safety and ecology (12);
- Development of science and technologies (11);
- Development of regions (6);
- Development of federal institutions (3).

In 2008 the volume of expenditure of all FTP on research and development was 61.1 bill Rbls. (in 2007 – 49.2 bill Rbls.).

According to the Federal Law “On Federal Budget for 2009 and for the Planned Period of 2010 and 2011”, among the federal target programs envisaging the maximum investments into R&D activity there are four programs, including a new one aimed at adjustment of the personnel situation in science:

- Research and research-pedagogical personnel of innovation Russia for 2009-2013
- Federal space program of Russia for 2006-2015
- Research and developments in priority areas of improvement of the research and technological complex of Russia for 2007-2012
- Development of civil aviation engineering of Russia for 2002-2010 and for the period till 2015.

Within the framework of the federal target programs the Government started focusing more attention on the actions addressing the development of innovation infrastructure, improvement of mechanisms of commercialization of the R&D results, support of the leading scientific schools. In addition, FTPs are called to attract more non-budget funds. Thus, FTP “Research and Development on Priority Directions of Improving the Research and Technology Complex of Russia for 2007-2012” is aimed at simultaneous support of the fundamental and applied research, developments, cooperation with industry, and creation of the research infrastructure and solution of the personnel issues in the science area. In particular, various measures are envisaged for involvement of the business community in financing R&D, including through co-financing of activities on the topics proposed by the companies proper, but within the framework of the federal priority directions. The Program also combines the thematic (by priority directions) and structural (by the addressed problems regarding updating the research complex) approaches.

Beginning from 2009 the Russian Academy of Sciences changed over to the new principles of financing on the basis of the Program of Fundamental Researches of the Government Academies of Sciences for 2008-2012³⁵. This program states the following principles of financing: stability, concentration of resources in scientific areas defined by the scientific community proper, widening of the competitive environment, creation of a system of objective scientific expertise. The accomplishment of this program is supervised by the coordination board that comprises representatives of the government and federal academies of sciences. It is planned that by the time of accomplishment of this program, i.e. by 2012, the specific share of the competition-based financing in the RAS appropriations to R&D will grow from 15% at present to 25%.

It should be noted that requirements to assignment of the competition-based budget funds via the mechanisms of FTP and RAS Program are not well developed as yet. Thus, the funds for project implementation are allotted not at the beginning of a year, but somewhere in its middle and they are transferred on a stage-by-stage basis not taking into consideration the specific features of a production cycle in the R&D sector. At the same the revision of the general plan of works, which should be a natural practice in the course of researches, is, in fact, prohibited. And, finally, the financing cycle is usually annual, even for many-year projects, which hampers planning of the whole work.

The growth of budget financing was not accompanied by any institutional changes, thus, the structure of government outlays to R&D remained unchanged in terms of assignment of funds by activity areas. The

³⁵ Approved by Resolution of the RF Government No. 233-p of 27 February 2008.

main recipients of budget funds for civil R&D activity are, as before (in a decreasing order of budget appropriations), the Federal Space Agency, RAS and its regional branches, the Federal Agency on Science and Innovations, the Russian Academy of Medical Sciences (RAMS) and the Russian Foundation for Basic Research. Regardless of some increase of budget appropriations on R&D to higher educational institutions the budget of “Rosobrazovanie” for the science activity remains not large.

Today for improving the efficiency of budget expenditure in the science area and for formation of a balanced and sustainably developing complex of research organizations in the government sector and improvement of the quality and mechanisms of strategic and operative management of the science area the Government of Russia approved the Rules for Evaluation of the Output of Research Organizations Implementing Civil Research, Trial, Design and Technological Activities.³⁶

5.2.2. Role of research foundations

The practice of financial support of researches through foundations appeared in the early 1990s when two federal research foundations were established – the Russian Foundation for Basic Research (RFBR) and the Russian Foundation for Research in Humanities (RFRH). Both foundations award funds on a competitive basis in the form of grants for implementation of small projects of fundamental research. The budgets of two foundations – RFBR and RFRH represent a fixed share of outlays from the total federal expenditure on the civil science.

The main principles of activity of federal research foundations in Russia are the following:

- higher wages;
- selection of projects on the principle “from bottom to top”, own initiative on application submission;
- independent expertise of projects;
- financing of concrete projects and not organizations;
- control of project implementation;
- compulsory presentation of the report on performed works and utilization of the assigned money.

The effective Statutes of RFBR and RFRH define the basic principles of research support:

- Targeted support: grants are allotted mostly to small teams of researchers (or individual scientists) regardless of their age, academic degree, position taken by a scientist in a research organization and departmental subordination of organizations in which scientists are working. The main criteria for appropriation of funds are the quality of the submitted proposal and capacity of the team-applicant to realize it. The organization in which the winners are working receives 15% of the grant amount for support and improvement of infrastructure.
- Competitiveness: grants are awarded only on a competitive basis as a result of multi-staged independent expertise of projects.
- Non-refundable and irrevocable financial support for targeted use of the allotted funds and obliging of researchers to make the research results publicly known (published in press).

Therefore, among the advantages of foundations are the following:

- They have the effective mechanism for overcoming the departmental barriers, regional dissociation and disciplinary isolation in science.
- They facilitate interdisciplinary, interdepartmental and interregional cooperation.
- They increase awareness of the public about the obtained results.

³⁶ Resolution of the Government of the Russian Federation No. 312 of 08 April 2009.

- They represent a form for recognition of achievements of researchers and research teams.

At the same time, the foundations are not a universal mechanism of financing R&D and, of course, they have certain limits of their efficiency as they:

- 1) are not intended for systems support of the science infrastructure, including its information component;
- 2) do not resolve in full the task of restoration of the personnel structure and succession issues, although they play a role in their improvement;
- 3) the financing mechanisms realized by the foundations possess certain predetermined limits of support of the innovation projects as the applications are selected on the basis of the existing reserves and past publications of the author on the subject of research.

The main direction of the foundations activity is support of the initiative research projects in the fundamental research area. At least 60% of the RFBR funds and more than the half of the RFRH funds are appropriated to these projects. The amounts of initiative grants are not large: in RFBR the average amount of a grant in 2006 was some 300 thou Rbls. (for a team of up to 10 members) and in 2007 – 400 thou Rbls. The initiative grant is usually spent on renovation of the computer and office equipment, purchase of materials and completing parts, wages, and travel expenses to conferences. To purchase costly equipment on such initiative grants is impossible.

The foundations are capable, on the average, to render support to about 40% of all submitted applications. Therefore, the competition level is practically optimal: it is believed that the objective selection of projects is possible when 20 to 35% of applications are supported. In the recent 2-3 years the competition level has been gradually lowering in view of the growth of FTP budget support, on the one hand, and maintaining the small size of grants, on the other.

5.2.3. Financing of the business enterprise sector

In Russia the R&D activity is financed not only from the budget, but by the business enterprise sector and foreign organizations (Fig. 5.4).

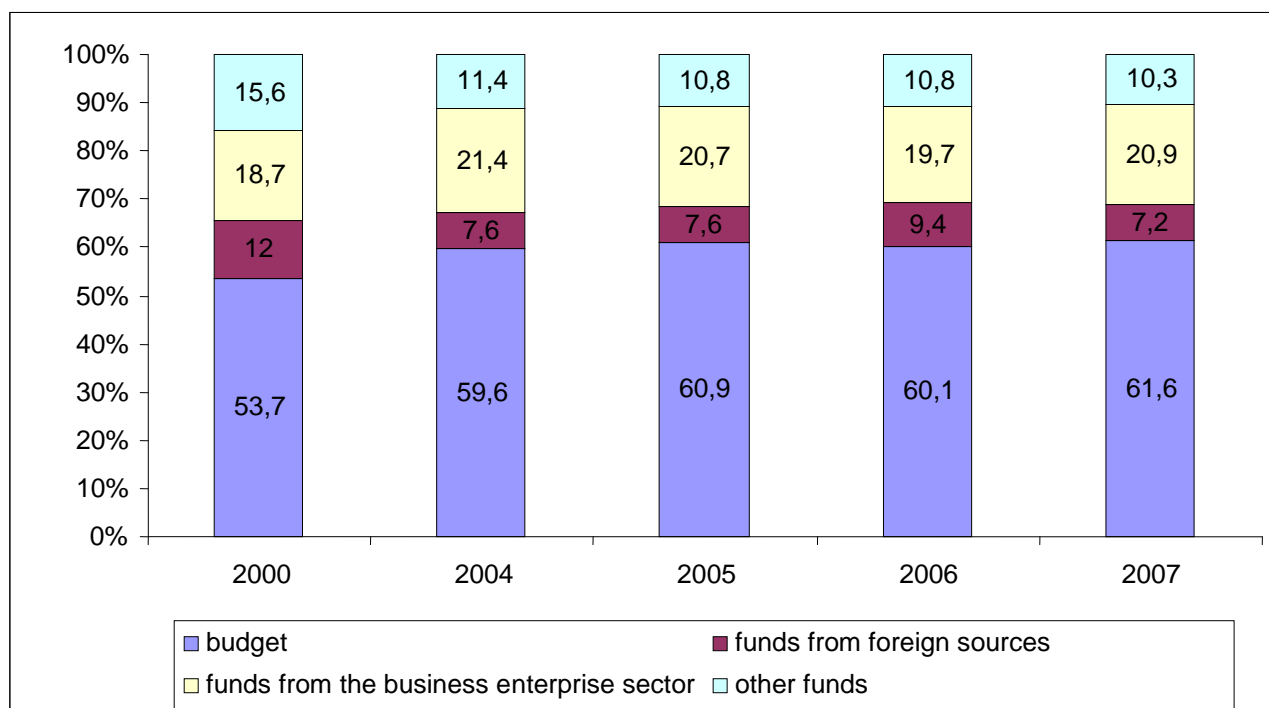


Figure 5.4. Structure of intramural expenditure on R&D by sources of funds

According to the Russian Committee for Statistics, R&D financed only 30-35% of industrial enterprises and for this purpose 13.5-17% of the total innovation outlays were spent.³⁷

For the business it was also typical not to finance in full those R&D that it was obliged to support in joint projects with the government within the framework of FTP.³⁸ Such situation may be partially explained by the condition of the legal regulation. The business is not provided with stimuli to fulfill its obligations on co-financing of R&D.

Recent interviews conducted at industrial enterprises have shown that the R&D outsourcing is mostly practiced by enterprises in “non-science-intensive”, but economically successful industries, such as metallurgy, building material industry, food industry. And here the average demand for R&D conducted on the basis of outsourcing is not high: the share of expenditure of outsourcing organizations does not exceed 0.7% of the receipts.³⁹ The most often mentioned obstacles to development of R&D outsourcing were information vacuum (demonstrating a weak science – industry relationship) and lack of stimuli to ordering R&D in the government sector of science.

A rather recent tendency revealed in the past 2-3 years was the growth of expenditure on R&D by *large business*. Companies either create their own research divisions or institutes, including by purchase of the former departmental research institutions,⁴⁰ or increase expenses on research projects implemented by organizations of the government sector of science and higher education institutions. We can find out about such processes by fragmentary information about activities of various large companies. Sometimes these are companies that operate on the international markets: their reporting is more comprehensive. The official data of “Rosstat” provide data on R&D financing by three large companies: OJSC “Gazprom”, RAO “EES of Russia” (before reorganization) and OJSC “LUKOIL”. In 2006 these companies invested into R&D 1.6% of the intramural expenditure on research and development or 5.7%⁴¹ of the total expenditure on R&D in the business enterprise sector⁴².

5.2.4. Funding from abroad

Financing of the Russian science from abroad appeared and started expanding in the post-Soviet period. And its peak was in 1999 when the share of foreign funds in the intramural expenditure on R&D reached 16.9%. Later the specific share of foreign financing sources started shrinking, although in 2006 it slightly increased. Reduction of the specific share of foreign financing of the Russian science occurred, primarily, because of the advanced growth of budget appropriations to R&D. If in the past the Russian side either did not take part in co-financing of the initiative or allotted small funds (except some initiatives), then now the parity financing of international projects became gradually dominating.

³⁷ Indicators of Innovation Activity: 2007. Statistical Book. M.: GU-VShE, 2007, pp. 16, 30.

³⁸ Business Will Lose Appropriations to Science // Kommersant, 20.11.2007, No. 213.

³⁹ Problems of Industry Transfer to the Road of Innovation Development: Microeconomic Analysis of Specific Behavior of Firms, Dynamics and Structure of Demand for Technology Innovations. Team of authors: L.S. Zasimova, B.V. Kuznetsov, M.G. Kuzyk, Yu.V. Simachev, A.A. Chulok / Series “Research Reports: Independent Economic Analysis”, No. 201. M.: MONF, 2008, p. 125.

⁴⁰ Such policy is pursued by the companies “Russian Aluminum”, “Power Machines”, “Norilsk Nickel”. Source: I. Imamutdinov, D. Medovnikov. Overboard Noah’s Ark // Expert, No. 1-2, 16.01.2006.

⁴¹ Without OJSC “LUKOIL” as there are no data on this indicator for this company.

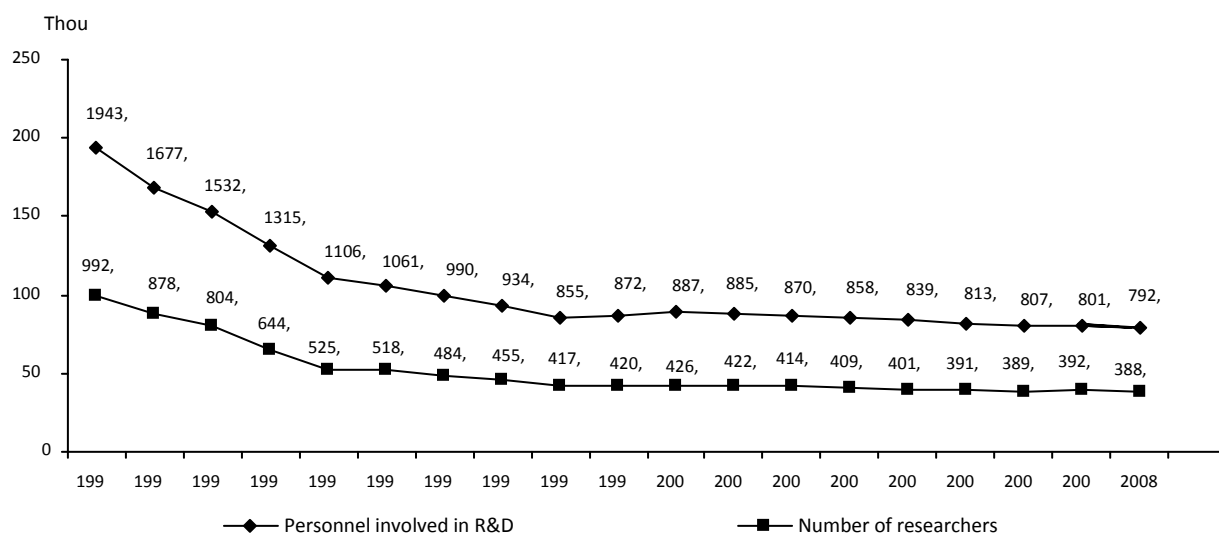
⁴² Source: Sources of Financing the Intramural Expenditure on Research and Development. M.: CISN, 2008, pp. 62-70.

This tendency may be illustrated on the example of joint RFBR programs. While in 2004 RFBR allotted 66.4 mln Rbls. to financing the international projects, then in 2007 it was already 197.0 mln Rbls.⁴³ In 2005 2.2% of the RFBR budget was appropriated to international projects, in 2007 – this figure nearly doubled (3.9%). This process was accompanied by the growing number of competitions: in 1998 there were two joint competitions, but in 2005 their number reached 13.⁴⁴

In the regional terms the share of financing of research and development from abroad in the structure of total expenditure on R&D is rather uneven. In 2006 with the average indicator being 9.4% the foreign financing of R&S in the Moscow Region was 18.6%, in Moscow – 13.2%. In 2006 the new leaders by the share of foreign financing were Samara Region (17.3%), Rostov Region (17.0%) and Ulyanov Region (16.3%).⁴⁵

5.3. Personnel potential of the research and development sector

The general downward tendency in scientific activity observed in the 1990s was revealed in the sharp reduction of the personnel involved in research and development (Fig. 5.6).



Estimated by: Science in Russian in Figures. Short Statistical Book. M.: CISN, 1997, p. 16; Science Indicators. Statistical Book. M.: 2008, p. 27.

* estimates

Figure 5.6. Indicators of dynamics of the research personnel number in RF in 1990-2008 (thou people)

The dynamics of the personnel number reflects two major periods in the science transformation. The first period is characterized by deep crisis (1990-1998), while the second (from 1999 to the present) may be referred to provisionally as a stabilization period. In the first period the number of the research personnel reduced every year by nearly 10%, on the average, while in the second the average reduction rate was 0.7% with only accidental deviations.

⁴³ Resolution of RFBR Board of 20 December 2007. Source: http://www.ru/default.asp?doc_id=22509

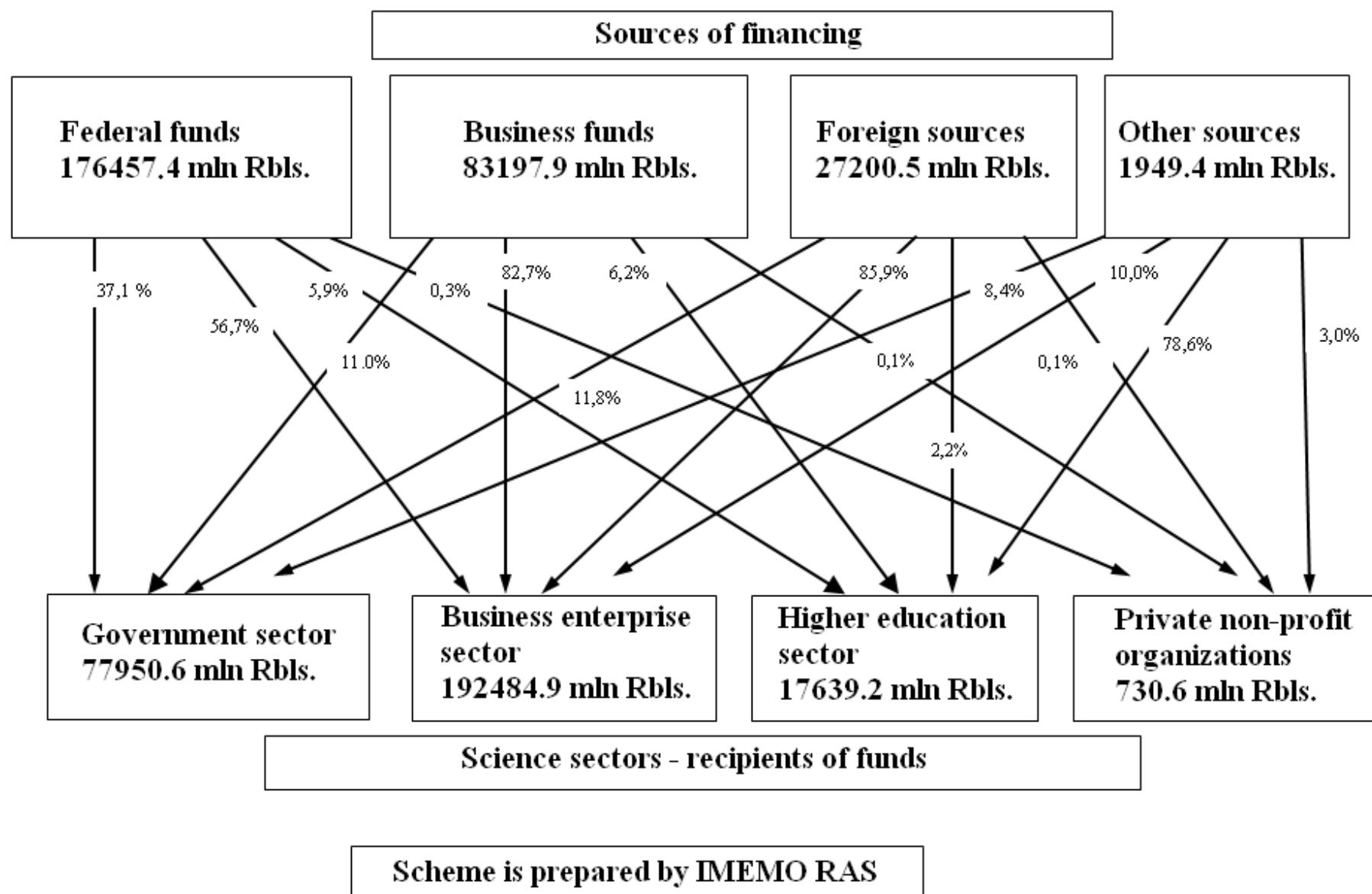
⁴⁴ V. Konov, N. Lyalyushko, A. Blinov. Russian Foundation for Basic Research: 14 Years of Service to the Russian Science // Transactions of the international conference. K.: Phoenix, 2006, p. 156.

⁴⁵ Research Potential of the Regions in Russia (Analytical and Statistical Book): 2008. M.: CISN, 2008, pp. 108-111.

In the 2000s in the face of high economic growth rates and more active policy of the state on support of the innovation activity the growth of employment, say, in the research field of the business enterprise sector could be expected. However, in 2006 the number of researchers in this sector shrank by 12% compared to 2003.

The problems related to the personnel in the science field are revealed by the annual dynamics and structure of the personnel flow in scientific organizations (Table 5.13). The general tendency traced in all

Figure 5.5. Breakdown of financing of research and development by science sectors: 2006



sectors is domination of the category “Others” among the newly employed containing a rather small share of the graduates from higher education institutions or scientific workers with a certain work record. It means that more and more persons without previous experience of scientific work are employed.

Table 5.1.3. Flow of scientific personnel by sectors (2007)

	Employed				Dismissed			
	Total	including			Total	including		
		Graduates of higher education institution	From other scientific organizations	Others		At own request	Due to staff reduction	For other reasons
Government sector	11%	11%	19%	70%	12%	70%	5%	25%
Business enterprise sector	13%	14%	19%	67%	13%	67%	4%	29%
Higher education sector	22%	18%	18%	64%	15%	61%	1%	39%
Private non-profit sector	10%	14%	8%	78%	12%	78%	13%	8%

Source: data of “Rosstat”

The share of employed young people remains permanently quite meager. In the higher education sector it somewhat exceeds the average level due to specific features of this sector. Not high is also the share of people in the category “From other organizations”. It indicates that the differences in the level of salaries and labor conditions in the science sectors are minimal and, in general, such “internal” mobility is not considered by many scientists as a means for career growth and promotion in science. As regards the reasons for outflow of the scientific personnel, the researchers usually leave the science field in order to move to some other organization or to change the kind of activity. Different values of this parameter by sectors show that in the science field the possibility of changing the situation by means of changing a sector is insignificant. The decrease of the total number of scientific personnel was accompanied by structural changes being indicative of quality degradation of the personnel potential. The most importance changes in the structure of the scientific personnel in RF by the beginning of 2000 were as follows:

- 1) “ageing” of scientists, in particular of higher qualifications;
- 2) outflow of the most efficient scientists both abroad and to other fields of activity;
- 3) deformation of the age structure of the personnel and a gap between generations of scientists;
- 4) sharp differentiation of incomes (in different organizations and disciplines, low salary of young scientists).

Table 5.14. Age structure of the Russian researchers, %

Year	younger 29	30-39	40-49	50-59	60 and older	Total
------	------------	-------	-------	-------	--------------	-------

1994	9.2	24.0	31.7	26.1	9.0	100
1998	7.7	18.1	28.3	27.9	18.0	100
2000	10.6	15.6	26.1	26.9	20.8	100
2002	13.5	13.8	23.9	27.0	21.8	100
2004	15.4	13.0	21.9	27.8	22.0	100
2006	17.0	13.1	19.0	27.8	23.0	100
2008*	17.5	13.4	15.4	29.1	24.8	100
Of which doctors of sciences (2006)	0.05	1.8	11.3	29.9	57.0	100

Sources: *Science in the Russian Federation. Statistical Book. M.: GU-VShE, 2005, p. 35; Russian Science and Technology at a Glance – 2005. Data Book. M.: CISN, 2005, p. 6; Science Indicators: 2008. Statistical Book. M.: 2008, p. 35.*

* estimates

As it is seen from Table 5.14, the imbalance in the age structure of the scientific personnel is growing, in particular among the scientists with high qualifications having the doctoral degree.

Among the sectors of the scientific complex this phenomenon is most pronounced in the business enterprise and government sectors (Table 5.15).

Table 5.15. Age structure of researchers by sectors (%)

	Total			Government sector			Business enterprise sector			Higher education sector			Private non-profit sector		
	2004	2006	2008	2004	2006	2008	2004	2006	2008	2004	2006	2008	2004	2006	2008
Younger than 29 (inclusive)	15	17	17,5	14	15	16	16	18	19	18	21	22	8	8	8
30-39	13	13	13,4	14	14	14	12	12	13	18	18	18	10	10	10
40-49	22	19	15,4	22	19	17	22	19	17	22	20	19	22	19	17
50-59	28	28	29,1	26	27	28	29	29	29	24	24	23	41	35	34
60-69	17	17	17,8	18	18	18	17	17	17	14	14	15	17	20	23
70 and older	5	6	7	6	7	7	4	5	5	3	4	3	1	7	8

Estimated by: *Science Indicators. Statistical Book. M., 2008. GU-VShE, pp. 36, 133, 176, 203.*

Statistical data on the average monthly salaries (Table 5.16) show that the differences by science sectors are within the statistically admitted error and do not allow the scientists to attain the really high level of salary by moving from one sector to some other.

Table 5.16. Average monthly salary in science sectors

	2005		2006		2007		2008*	
	Rbbs.	In % to economics, in general	Rbbs.	In % to economics, in general	Rbbs.	In % to economics, in general	Rbbs.	In % to economics, in general
Government sector	7220.9	84.5	9678.8	91	14208.3	105	19820	112.7
Business enterprise sector	9599.6	112.3	11744.8	110.4	15203.6	112.4	20120	114.4
Higher education sector	7042.0	82.4	8348.7	78.5	12233.1	90.4	16790	95.4

Source: *Science Indicators: 2008. Statistical Book. M.: 2008. GU-VShE, pp. 151, 194, 222.*

* estimates

At the same time the average monthly salary does not reflect the real incomes received by researchers. The scientists in the government sector have great opportunities to work by grants, while many of the teaching staff at higher education institutions is actively involved in tutoring. And the data about

pluralism indicate that the share of researchers combining work in different organizations has not changed, in fact, since the 1990s and is equal to 25-27%. According to the interviews conducted in 2003, the salary and pension made, on the average, less than the half of incomes for 47% of scientists.³² Stimulation of the labor of scientists is arrested not so by a relatively low average salary as by its “flat profile”, which is due to the insignificant differences between the pay rates of researchers of different qualifications. Even with a new system of payment that is tested in RAS the difference between the “neighboring” levels of salary is so small that it fails to stimulate young scientists for career growth.

Therefore, the study of dynamics and structure of scientific personnel by sectors enables the following conclusion: the situation in scientific organizations in different sectors has common tendencies and directions of structural changes. In general, the situation in this sphere may be described as stable at a qualitatively low level or stagnating.

5.4. Results of research and development: publications, patents, licenses.

Publication activity

The rating of Russia in the world by such indicator as publication activity is dropping. If in 1996 the country was the 8th in the world by the number of publications registered in the database, the so-called Web of Science, then by 2006 it moved down to the 14th line. By this indicator Russia is outflanked by the countries with the less scaly scientific complexes (e.g. the Netherlands, Italy, Spain). The gap in the number of publications with China is more than five-fold. The number of publications of the Russian scientists has been decreasing in the recent six years and the specific share of Russia in the world flow of publications has been dropping at even higher rates (Fig. 5.7). According to preliminary data, the number of Russian publications continued this downward tendency in 2007, too.

By a more subtle indicator – the number of citations per one publication, Russia takes the 19th place in the Top-20 countries leaving behind only China. For the period from 1997 the growing number of citations has been observed making 28%. However, in other countries the growth rates were higher: in Spain – 88%, in China – 87%, in India – 69%, in Belgium – 68%, in Brazil – 42% and in USA – 33%.³³

³² Interviews in the RAS Institute of Natural Science and Engineering History (A. Yurevich, I. Tsapenko, A. Prikhodko. How Much and in What Way Our Scientists Earn? // *Naukovedenie*, 2004, No. 1).

³³ Russia in the Mirror of the World Scientific Publication Activity // www.opec.ru/print.aspx?ob_no=86405 14.03.2008.

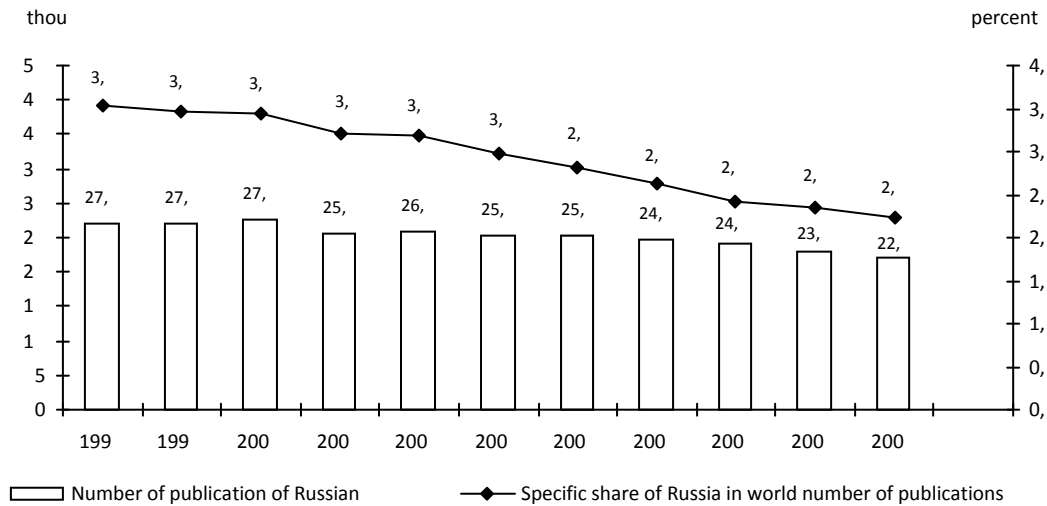


Figure 5.7. Publications of Russian authors in scientific journals indexed in Web of Science

Inside the Russian sector of research and development the scientific output is very uneven in the regional profile, which reflects the specific features of location of the research complex of the country. According to the information from database ISI for 1999-2004, by the level of article citations the leaders are Moscow and Moscow Region, Petersburg and Novosibirsk. Their share makes 81.8% of all citations. They are followed by Ekaterinburg, Nizhny Novgorod, Kazan and Tomsk. Other regions lag behind significantly.³⁴

A notion on publication activity of the Russian organizations may be provided by some investigations. In particular, the data on publication activity received in the course of implementation of Project SCOPE-EAST³⁵ permits to identify organizations with the highest publication activity and also to determine the development level of cooperation of the Russian scientists by science areas. The investigation has shown that cooperation with the foreign scientists is the highest among Russian physics – their articles take about the half of all joint publications with EU that appeared in 2001-2006. This may be explained in part by the fact that many Russian researchers work with the results of experiments received on large European installations. At the same time, the joint publications in biochemistry and molecular biology being the world's most quickly developing science areas are a few in number. They make only 4.5%, which is due to low priority of these areas in Russia in terms of their budget financing level, thus, the lagging behind the world development.

Such disciplinary structure of publications is typical of Russia, in general, and not only for the co-authored works (Table 5.17).

Table 5.17. Structure of publications of the Russian authors in scientific journals indexed in Web of Science by science areas: 2002-2006, %

	All world countries	Russia
Clinical medicine	20.6	4.9

³⁴ How Much Are Published and Cited the Scientists of Russian Cities // Troitsky variant, No. 12, 01.04.2008, p. 7.

³⁵ SCOPE-EAST – “Scenarios of Coordinated Approach to Stable Cooperation in Science and Technology with Eastern Neighbors of European Union”. <http://www.d1.hse.ru/org/hse/science/news/307376.htm1> Data as of 3 December 2007.

Chemistry	12.2	21.9
Physics	9.7	28.7
Engineering	8.2	8.3
Biology and biochemistry	5.9	4.2
Sciences on plants and animals	5.6	2.5
Material study	4.6	5.9
Social sciences	4.1	1.1
Computer sciences	3.4	1.3
Neurosciences and behavior sciences	3.1	0.8
Molecular biology and genetics	2.8	2.2
Earth sciences	2.8	6.7
Sciences on environment protection and ecology	2.6	0.9
Mathematics	2.5	4.4
Psychiatry and psychology	2.4	0.5
Agriculture	1.9	0.6
Pharmacology and toxicology	1.8	0.2
Microbiology	1.6	1.3
Economics and business	1.5	0.1
Space sciences	1.3	3.4
Immunology	1.3	0.2
Multidisciplinary research	0.2	0.1
Total	100.0	100.0

Source: "Science Indicators:2008". Statistical Book. P. 226.

The rating of the science organizations most efficient in terms of publication activity does not detail on the institutions belonging to the Russian Academy of sciences, therefore, it can be presented as follows:³⁶

- Institutions of the Russian Academy of sciences (RAS)
- Institute of High Energy Physics in Protvino (Rosatom)
- Institute of Theoretical and Experimental Physics in Moscow (Rosatom)
- Moscow State University
- United Institute of Nuclear Research in Dubna
- Saint-Petersburg State University
- Institutions of the Russian Academy of Medical Sciences (RAMS)
- Moscow Engineering and Physics Institute

Finally, the analysis of the publication activity includes the comparison of the growth rates of financing per one researcher with the growth of the number of publications per one researcher. In Russia the financing of R&D has grown at a higher pace than in many other countries, while by the growth rate of citations Russia, as it was already mentioned, lagged behind. According to the data of the other database – SCOPUS³⁷, in Russia the cost of one publication indexed in SCOPUS for 10 years nearly doubled and in 2005 it was equal to 503 thou US dollars (for comparison, in Poland – 150 thou US dollars). In 2006 "the price" of the Russian article increased to 640 thou US dollars.³⁸

³⁶ SCOPE-EAST – "Scenarios of Coordinated Approach to Stable Cooperation in Science and Technology with Eastern Neighbors of European Union". <http://www.d1.hse.ru/org/hse/science/news/307376.htm1> Data as of 3 December 2007.

³⁷ SCOPUS – citation index of Company Elsevier with the processing volume of more than 15,000 journals, mostly in English.

³⁸ Data of SciMago and OECD.

Patenting and licensing

Efficiency of the scientific activity in Russia, measured by patent statistics indicators, varied in the past decade, while at present some growth of patent applications and reduction of the number of granted patents are observed (Table 5.18). The coefficient of inventory activity has increased as well as the patenting abroad, which is a positive factor.

Therefore, the positive dynamics in patenting is obvious. At the same time a more detailed analysis of tendencies in patenting and licensing has revealed the complexity and certain contradictions in this area.

Table 5.18. Patent applications and granting of patents to inventions

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008*
Patent applications in Russia	21362	24659	28688	29989	29225	30651	30192	32254	37691	39439	40668
% to the previous year	106.9	115.4	116.3	104.5	97.5	104.9	98.5	106.8	116.9	104.6	103.1
Patents granted in Russia	23762	19508	17592	16292	18114	24726	23191	23390	23299	23028	23890
% to the previous year	51.7	82.1	90.2	92.6	111.2	136.5	93.8	100.9	99.6	98.8	103.7
Coefficient of invention activity ¹	1.13	1.37	1.61	1.72	1.63	1.73	1.60	1.66	1.96	1.94	1.91
Dependency ratio ²	0.30	0.24	0.23	0.21	0.23	0.23	0.31	0.36	0.35	0.43	0.53

¹ number of patent applications to inventions submitted in Russia per 10,000 total population.

² ratio of the number of foreign and Russian patent applications to inventions submitted in Russia.

Source: "Science Indicators:2008". Statistical Book. GU-VShE, pp. 226, 228.

* estimates of the RAS Institute of World Economics and International Relations

It follows from the above table that the number of patents granted in Russia is growing as well as the receipts from license payments. However, the license payments are much more significant. It means that Russia mostly purchase new technologies and does not sell its high technology products.

Table 5.19. Dynamics of indicators of the patent-licensing activity in Russia

Indicators	2005	2007
License payments and royalty – payments, mln US Dollars	710.66	1593.20
License payments and royalty – receipts, mln US Dollars	173.74	260.20
Patents granted by the US Office for Patents and Trademarks	173.0	194.40

Source: http://info.worldbank.org/etools/kam2/KAM_page3.asp?default=1

* estimates of the RAS Institute of World Economics and International Relations (IMEMO)

6. Business enterprise sector

6.1. General description of the business innovation activity

The innovation process underway in the Russian companies includes intensive renovation of the fixed assets and production technologies. However, the priority of technology updating moved back the innovation products.

Today the legacy of the planned economics in industry reveals itself to a much less degree than in the first years of the transitional period: industry and new service areas were subject to much greater reforming than science and education. However, different pace and efficiency of reforms in these sectors create a certain problem: the sectors being at various stages of the market evolution have been shaped inside the innovation system. It was also found that losses incurred by the transformation crisis became irreparable in some areas and industries.

Among the external risks of the present-day period we can name the growing involvement of the state in the capitals of companies operating in technologically sophisticated industries which survival is closely connected with innovations. In 2005-2008 the consolidation of assets and the increased participation of the state were observed in the automobile, aviation and shipbuilding industries. The direct result of the growing role of the state was the diminished stimulating role of competition and enhanced instability of property relations: transition of the industrial assets from hand-to-hand impeded accomplishment by a company of its long-term strategies, which is an important and compulsory condition of innovation activity.

At the same time the budget appropriations to such companies and their participation in the projects of the federal-private partnership have increased which triggered development of some major innovation projects. It should be also mentioned that the increase of the defense order animated the innovation process in some industries oriented to this activity area.

In the studied period the annulment in 2002 of the investment and innovation privileges and introduction of some stimuli in early 2008 affected significantly the innovation activity of enterprises. In 2006 it was officially permitted to include into the unit cost the expenditure on R&D for two and not three years and also to recognize the ineffective R&D in full. In 2008 the law was enforced that allowed not to estimate VAT on the cost of R&D related to new product manufacturing and the new rates of accelerated depreciation for the equipment used in the science and technology activities were introduced. There is reason to believe that the enterprises have not as yet felt in full the effect of such new regulation, while the abolishing of the investment and innovation privileges adopted in the past continues its inhibiting effect on the innovation activity of enterprises.

From August 2008 the considerable degradation of the macroeconomic conditions for innovation activity was witnessed. The real sector of economics faced the crisis of liquidity entailing the payment and general economic crisis: higher barriers for demand, deteriorated foreign economic situation and growing inflation. Taking into consideration that in 2007 about 13% of expenditure on innovations was funded from the credit and loan resources the impeded access to credit resources may affect essentially the financial support of the innovation activity.

At the same time the constraints of the macroeconomic conditions are also obvious: expectation of the degradation of the foreign economic situation, deficit of the qualified personnel, growing obstacles for further development created by the energy and transport infrastructure. The relatively high cost-push inflation inside the country and the effect of the global financial crisis also contain risks arresting the investment and innovation activity of enterprises. In the period in question the considerable lagging

behind in labor productivity was maintained. As before there were no signs for improvements in the position of the Russian companies on the world high technology markets. The niche leaders faced the toughest rivalry from manufacturers of low-cost products.

The political risks are connected with the outflow of the foreign capital and slowdown of integration of the advanced Russian companies into the global innovation value added chains. Moreover, in the period of the stock market instability the shareholders are less apt to innovation risks than it was in the more predictable times. And these risks usually demand from the owners and managers keeping profitability on the same level which often comes into conflict with the innovation projects.

Therefore, the 2000s witnessed the essential improvement of the macroeconomic and institutional conditions for innovation activity in the business enterprise sector. However, nowadays we have new risks and restrictions and the scales of the effect they may have are difficult to predict accurately.

In this section we use the federal statistical data of “Rosstat” by Form 4 “Innovation” for 2004-2007. The estimates have shown that in 2006 the statistical observations covered the enterprises concentrating 88% of the revenues in industry and employing about 92% of the average staff number. Distribution of enterprises on the basis of statistical observations by size and industry groups is presented in Figs. 6.1 and 6.2.

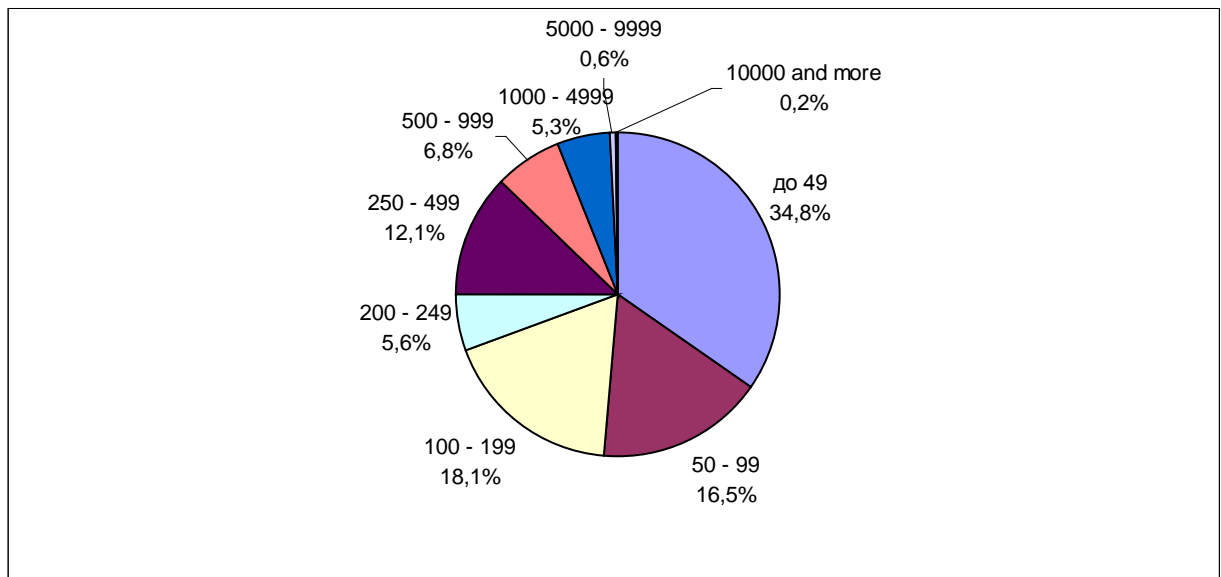


Figure 6.1. Structure of selections for statistical observations of “Rosstat” by size groups (2006)

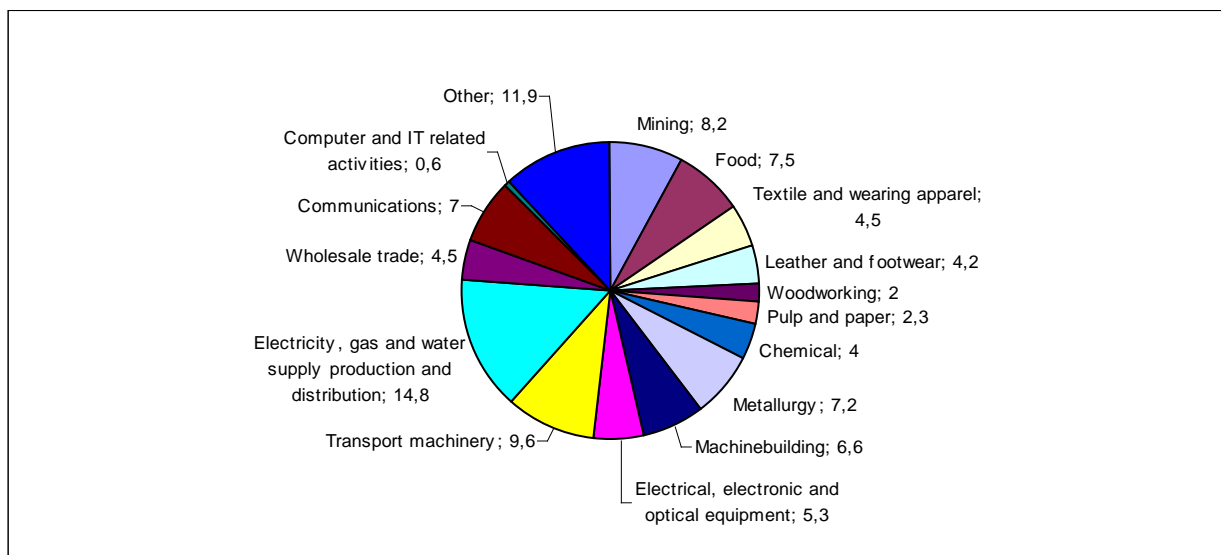


Figure 6.2. Structure of selections for statistical observations of "Rosstat" by economic activity (2006)

The statistical data show that the number of industrial companies implementing innovations is still not large. The innovation activity is concentrated in a relatively small group of large companies and small number of economic areas.

At the same time the assertion that the innovation activity in real economics is rather low needs some specification. Thus, regardless of the fact that in 2006 and 2007 the share of innovation-active enterprises in industry made only 9.4% their input into the Russian GDP was rather significant. Table 6.1 shows that the share of innovation-active industrial organizations in sales receipts varies from 40 to 48 percent, while the employment – from 37 to 38.5 percent. In other words, the economic weight of such organizations formally recognized as innovation-active in Russia is higher than it was assumed. However, the scale, depth and quality of innovation processes in organizations remain quite low. Thus, in 2004-2007 the share of innovation products in the receipts was still at a level of 5-5.4%.

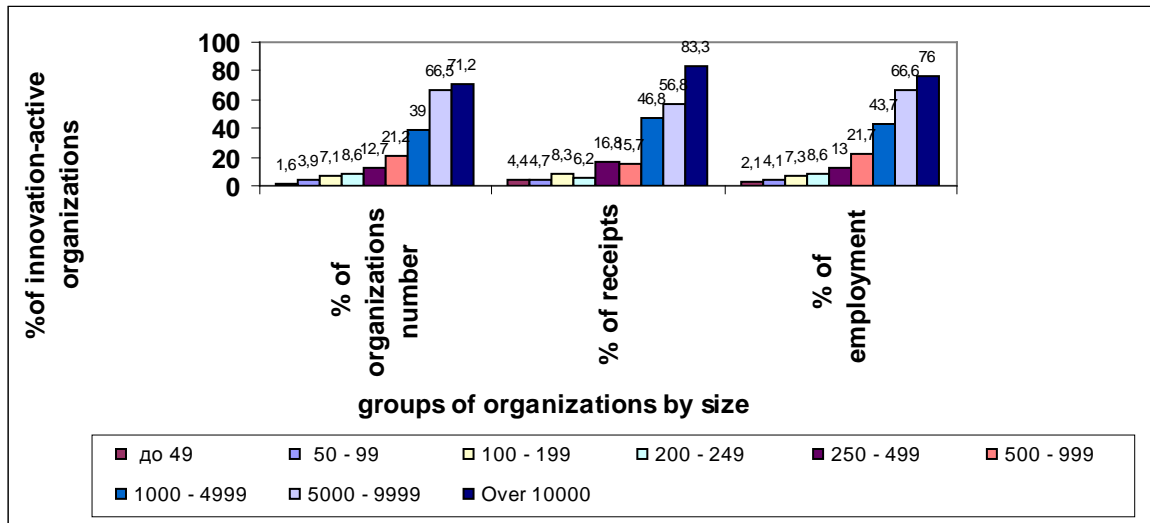
Table 6.1. Evaluation of the share and economic weight of innovation-active organizations in industry³⁹

	2004	2005	2006	2007
Innovation-active organizations as percent of the total (%)	10.5	9.3	9.4	9.4
Receipts of innovation-active organizations as percent of the total receipts in selection (%)	46.6	41.3	48.0	48.2
Employment of the innovation-active organizations as percent of the total employment of investigated organizations (%)	38.6	35.5	38.3	37.0
Innovation products as percent of the total receipts in selection (%)	5.4	5.0	5.2	5.0
Innovation products as percent of receipts of innovation-active organizations (%)	11.5	12.2	10.8	10.4
Number of investigated industrial organizations	20802	25805	26511	

³⁹ The term "innovation-active organization" is used in accordance with "Oslo Manual. Paris. 2005", para 215.

Source: "Rosstat" for respective years

The innovation activity is monotonously growing with the size of an organization reaching its maximum in the groups of companies with the personnel over 10,000 people. The share of the innovation-active organizations in this group exceeds 70%, while the share of the innovation-active organizations in the receipts and employment is still higher (see Fig. 6.3).



Source: estimates on the basis of "Rosstat" data for 2006

Figure 6.3. Organizations implementing innovation activity by sizes of groups in 2006

The gap between the share of innovation-active organizations and their economic weight is dependent mainly on the structural specifics of the Russian economics that is still dominated by the large companies. In some industries the concentration of the markets is so that small companies did not find their place there at all. In 2006 the share of companies with the employment over 500 people in the total volume of the manufactured innovation products made 94.7%, while by the products new for the market it made 90.9%.

However, taking the leading positions by the share of innovation-active organizations in the total number of organizations and by the absolute figures of manufacturing of the innovation products and products new for the markets the large companies lag behind significantly by intensity of innovation processes. Figure 6.4 shows that the level of innovation activity of organizations with the employment over 500 people is in any assessments 5-7 times higher than of other organizations. But already in 2006 they demonstrated worse indicators (Table 6.2): by the share of the products new for the market in the total innovation products (12 and 14%, respectively) and, which is most important, by the share of the innovation products in the receipts of innovation organizations that dropped nearly twice (10.9 and 20.8%, respectively).



Source: Estimates on the basis of official data of "Rosstat" for 2006.

Figure 6.4. Output of innovation activity in a group of organizations with the employment over 500 people compared to other selected organizations, 2006

it is known that the EU countries also demonstrates different innovation activity of large and small companies. But the gap between them is nearly an order less: at the average level of innovation activity being 42% the gap between small and large companies in this context is less than 10-20%.⁴⁰

Table 6.2. Innovation activity of large business compared to other selected organizations in 2006*

	Size group of organizations with over 500 people	Other selection
Share of innovation-active organizations in the total number of organizations	34.6	6.3
Share of receipts of innovation-active organizations in the total receipts, %	52.8	8.7
Share of employment in innovation-active organizations in the total employment, %	49.2	9.1
Share of innovation products in receipts of innovation-active organizations	10.9	20.8
Share of market-new products in the innovation products	12.3	14.4
Number of organizations used in statistical observations	4280	28805

** organizations implementing technological, marketing and organizational innovations
Source: Estimates on the basis of the "Rosstat" data for respective years

⁴⁰ Kadochnikov S., Yesin P. Product Innovations and Market Behavior of the Russian Companies: Market Segmentation and Specialization. 2007. http://www.nisse.ru/analitics.html?id=meg_kadochnikov.

Analysis of the above data shows that by the scales of innovation activity the leading positions are with the larger companies, but by the share of innovation products and the share of new products in the receipts the medium and small organizations outstrip significantly the large companies.

Study of the motivation mechanisms of the innovation activity (Table 6.3) has indicated that the stimuli for the larger organizations (compared to medium organizations in selection) include orientation to reduction of material and power costs, updating the technologies for attainment of the higher flexibility of production, compliance with the engineering and environmental regulations. The orientation of the innovation behavior of the larger companies to expansion and growth of their share on the markets is also visible.

Table 6.3. Motivation mechanisms of innovation activity among super-large organizations (employment over 10,000) compared to medium in selection indicators: share of organizations assessing the effect of results of innovation activity on production development as “high” (% of all respondents), 2006

	Group of super-large companies, % of total respondents	Average for selection, % of the total respondents
Innovation products		
Widened assortment of products, works, services	25.5	33.0
Widening of sales markets:	21.8	20.9
Improved quality of products, works, services	29.1	29.2
Improvement of employment	5.5	8.6
Innovation processes		
Improved flexibility of manufacturing	25.5	14.0
Manufacturing capacity growth	27.3	18.1
Reduced expenditure on salaries	1.8	3.7
Reduced material and energy consumption	20.0	9.7
Marketing innovations		
Widened sales markets or market share	50.9	14.4
All innovations		
Lower environment pollution	21.8	8.4
Compliance with the modern engineering regulations, rules and standards	34.5	27.6
Total of responded organizations	55	3665

Source: “Rosstat”, 2006.

As for the level of innovation activity by economic areas, the data in Table 6.4 have shown that the manufacturing, as it was expected, was more innovative, than the mining both by the level and depth of innovations. The indicators in the communication industry are close to that in the manufacturing. At the same time on a less aggregated level these results are not so unambiguous (see Figure 6.5).

For example, in manufacturing the civil machine-building lags behind significantly by the level of innovation activity from chemistry and automobile industry, which may be attributed to the generally depressive condition of this field.

Table 6.4. Innovation activity by groups of economic industries (2007)

	Total investigated organizations implementing technological, marketing and organizational innovations, units	Share of innovation-active organizations implementing technological, marketing and organizational innovations, %	Specific share of innovation products in sales of innovation-active organizations implementing technological innovations	Market-new products as % of the innovation products of innovation-active organizations implementing technological innovations
Industry	26332	10.8	10.4	8.5
Mining	1319	6.8	5.5	6.4
Manufacturing	18752	13.0	12.8	8.9
Production and distribution of electricity, gas and water supply	6261	5.1	1.5	0.5
Wholesale trade	4802	4.0	3.8	20.9
Communication	1500	15.4	8.9	9.3
Application of computers and information technologies	746	9.8	49.6	10.4

Source: *Russian Science and Technology at a Glance. 2008. CISN. 2009.*

It should be stressed that these industries are leading by such indicator as the share of the market-new products in sales of the innovation-active organizations (28.5% compared to the average level for industry 8.5%). This may be considered a proof that the leaders in the civil machine-building that managed to keep on the market are oriented to deep innovations. The transport machine-building also deserves special attention as it takes leading positions by the share of new products in the receipts of innovation-active organizations (26.6%) with the relatively average, for the medium-technology industry, indicators of the share of innovation-active organizations (26.5%). It may be assumed that this happens due to foreign investors of the automobile industry that implement large projects of assembly with a quick cycle of model line renovation.

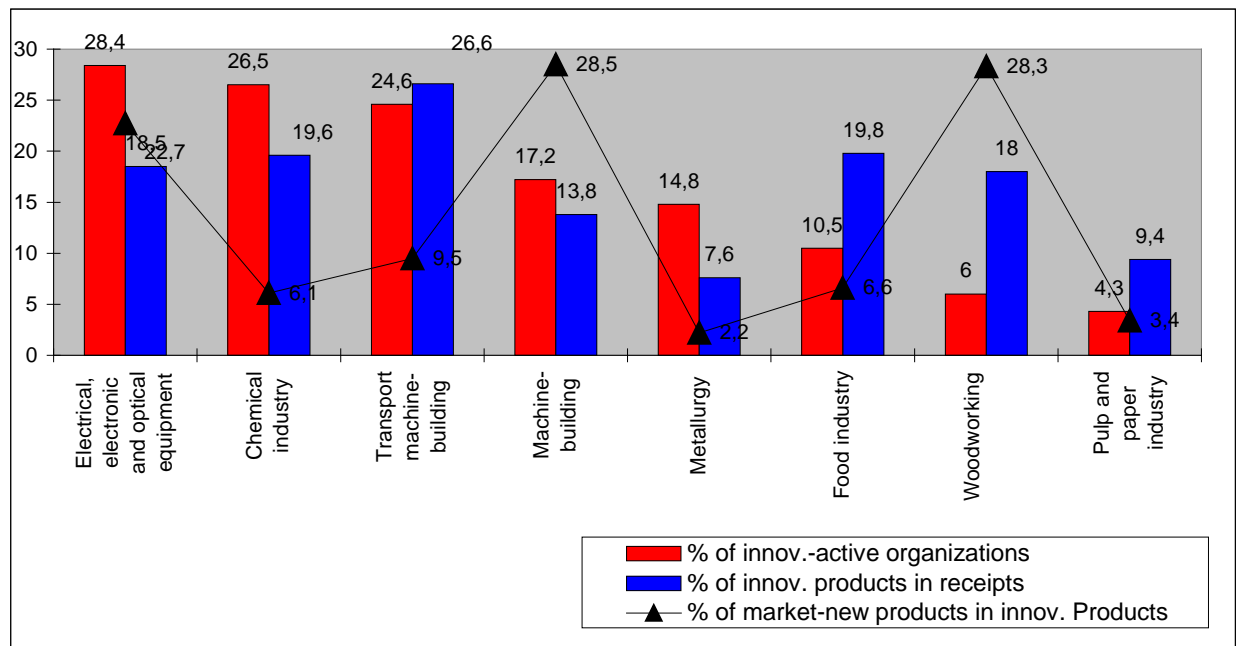


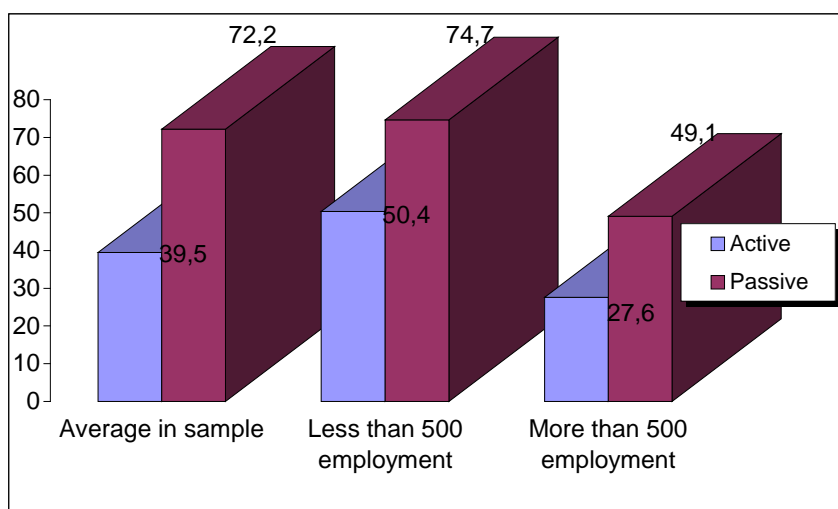
Figure 6.5. Level of innovation activity of organizations by large groups of economic areas in manufacturing, 2007

The high technology industries regardless of their leading positions compared to the middle- and low-technology ones reveal the insufficient level of innovation activity as for all organizations in these sectors the technological innovations are mandatory for maintaining and the more so for creation of competitive advantages. The most serious lagging is in the pharmaceutical industry (in 2007 only 27% of organizations reported about their innovation activity). The quality of innovation processes in pharmaceuticals is also much lower than the average: in 2007 the share of new products in the receipts of the innovation-active organizations was 7.7%, while the share of the market-new products in the innovation products is still lower – only 4.7% (the data of “Rosstat”).

6.2. Main factors and constraints of innovation activity

The main reason for insufficiently active innovation behavior of the business sector is the fact that so far on the Russian market other business models bring success to many companies, in particular those operating mostly on the domestic market. The innovation model will be demanded after renovation of the production base in industry and services is completed. And the second reason is a relatively low level of rivalry on the local and regional markets on which most respondents are operating.

As for competition and structure of the markets, the innovation investigation of “Rosstat” demonstrates that between the innovation active and passive organizations there is a significant difference in the structure of the main sales markets: the share of organizations oriented mostly to the local and regional markets, protected from competition by large distances, transportation costs and administration barriers is twice as low among the innovation-active organizations than among the technologically passive organizations: 39.5% compared to 72.2% (see Figure 6.6). Regionalization of markets inhibits essentially the innovation activity of both large and small companies and the share of innovation-active companies among the organizations operating on the regional markets is 50-60% lower in the group of the largest companies and not so large companies alike.



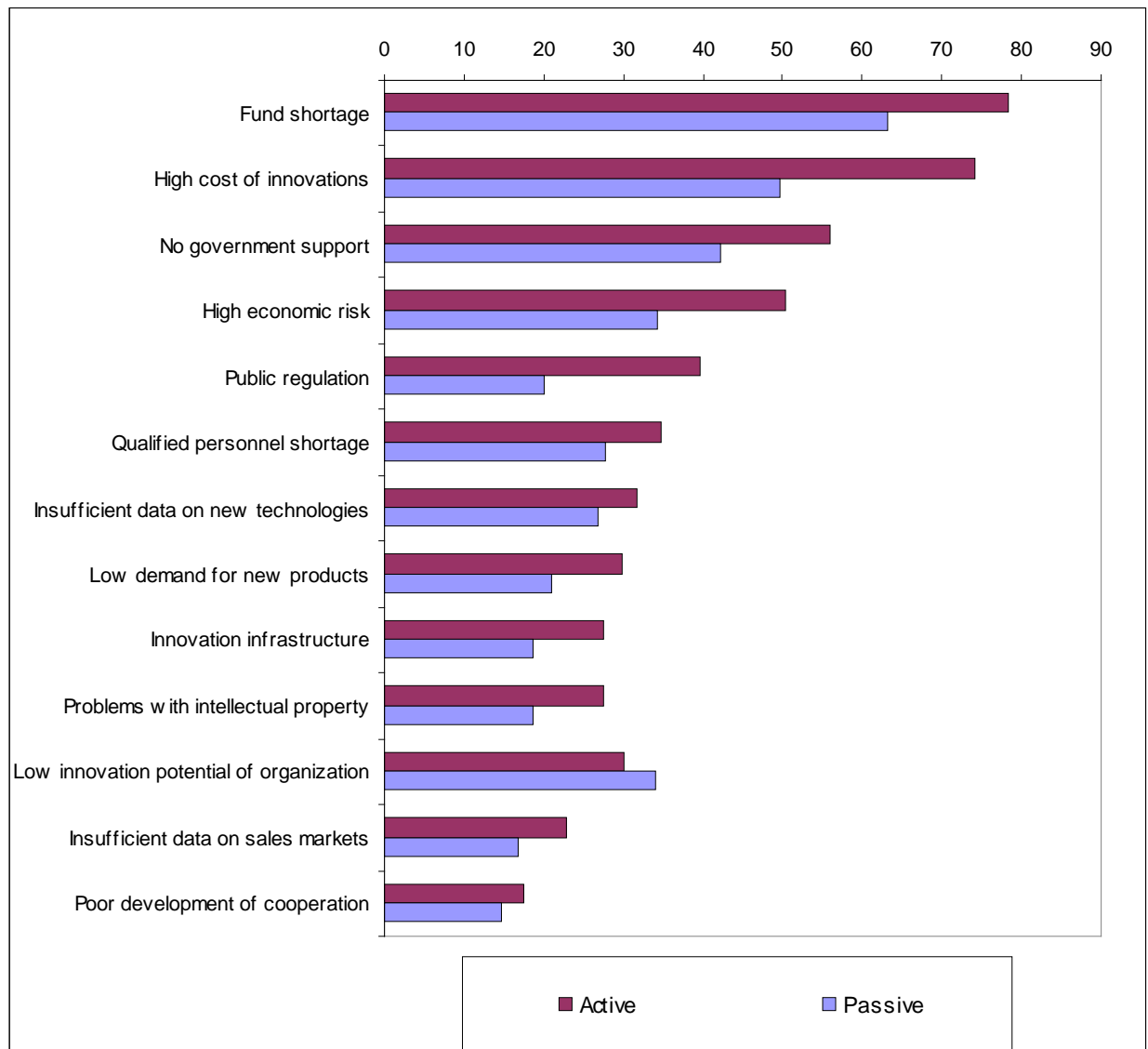
Note: only technological innovations were taken into consideration

Source: "Rosstat", 2006

Figure 6.6. Share of organizations oriented largely to local and regional markets among the innovation active and passive organizations, in 2006, %

Study of the rating of factors obstructing innovations on the basis of the official statistics provides the awaited result: no matter whether the organizations implement or not innovations their main difficulties are lack of money, high cost of innovations, lack of government support and economic risks related to innovations (see Figure 6.7). It is noteworthy that such factors as demand, infrastructure, problems with the intellectual property and cooperation are seldom considered by businessmen as important or decisive although many measures of the present-day federal innovation policy orient to these very barriers.

In Russia the break line goes most likely not by size groups, but by industries which economic situation is highly segmented. Thus, in the mining industry 58% of respondents name the insufficiency of funds as the most important and decisive obstacle for innovations, while in the manufacturing – 69%. While in the size groups the results are counter-intuitive: in the group of super-large organizations (over 10,000 people) 74% of respondents think that the funds deficit is the most significant obstacle for innovations and only 62% in the group of organizations with the personnel to 49 people. This is indicative most likely of different awareness of respondents and their different involvement in real innovation processes, than of real assessment of a problem (all data for 2006).



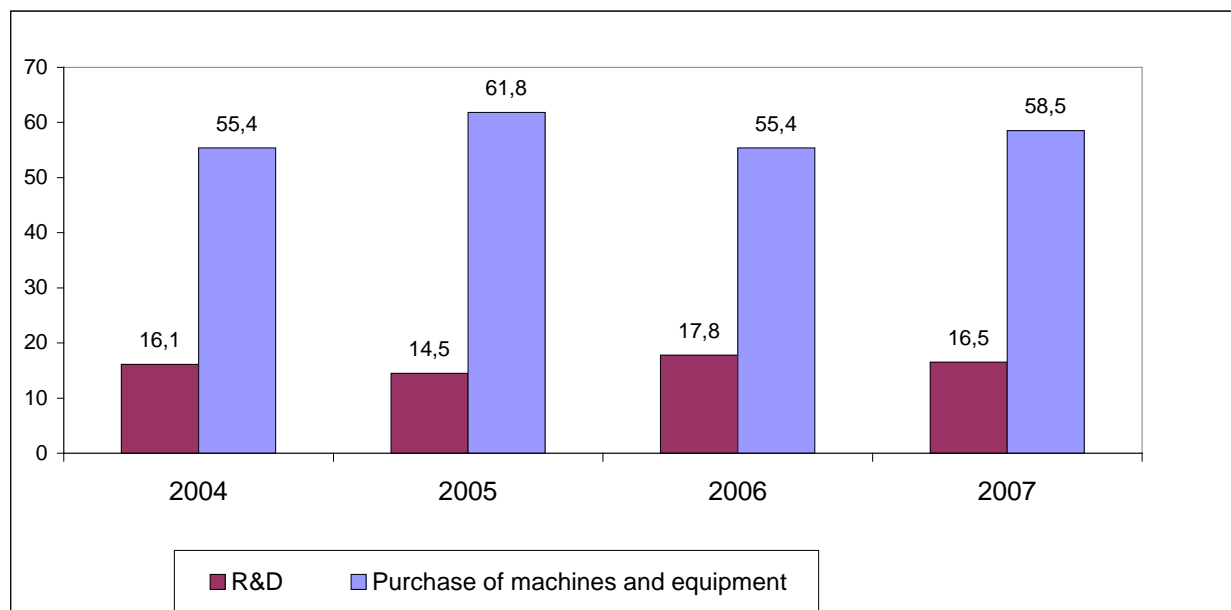
Source: "Rosstat", 2006

Figure 6.7. Assessment by organizations of the factors obstructing innovations: % of the number of respondents that assessed the factor as "significant" and "decisive" among innovation-active and innovation-passive groups of organizations

6.3. Industry

Industrial organizations are both the generators of new knowledge through R&D implemented in the corporate sector and the subject of demand for developments created in the environment being external for organizations – in the R&D sector. In both cases the role of the Russian business is not unambiguous.

In 2007 out of all organizations implemented technological innovations 33.5% were engaged in research and development in industry. In 2005 they made only 29.6% ("Rosstat" data).



Source of data: "Rosstat" for respective years

Figure 6.8. Share of expenditure on R&D and purchase of machines and equipment in the structure of organization expenditure on technological innovations in 2004-2007

In the period between 1999 and 2006 the absolute expenditure of companies on technological innovations has nearly doubled in permanent prices following the growth of production and improvement of the financial situation of organizations. However, R&D takes no more than 14-18% in the innovation expenditure. The ratio of expenditure on R&D and purchase of machines and equipment in the structure of innovation expenditure of organizations remains stable (Fig. 6.8) with the domination of purchase of ready equipment and technologies. This is the main way of technological updating.

The low absolute level and low intensity of expenditure on R&D (Table 6.5) remain the key characteristic of the Russian industry. All organizations investigated by "Rosstat" spend on R&D approximately three times less funds (38.6 bill Rbls. in 2007 by 830 companies), than the leader of the European science-intensive companies – Nokia with the annual science development budget of 5.3 bill US dollars or 10.3% of the receipts.⁴¹

Table 6.5. Intensity of expenditure on R&D and innovations in a group of innovation-active organizations in industry and services compared to the average figures in selection

	2005		2006		2007	
	All organizations	Innovation-active organizations	All organizations	Innovation-active organizations	All organizations	Innovation-active organizations
% of expenditure on innovations in receipts	1.3	3.1	1.3	3.3	1.1	2.8
% of expenditure on R&D in receipts	0.2	0.4	0.3	0.6	0.2	0.5

⁴¹ Monitoring Industrial Research: the 2008 EU R&D Industrial Investment Scoreboard. Joint Research Center. (DG RTD) Directorates General of the European Commission. October 2008 R&D Industrial Scoreboard http://epp.eurostat.ec.europa.eu/portal/page?_pageid=2993,6501530&_dad=portal&_schema=PORTAL

Source: "Rosstat" for respective years

With the growth of an organization the statistics reveals a rather large share of expenditure on R&D of external organizations (46.5% in 2007) and also the decreasing share of expenditure developed through outsourcing.

At the same time it should be acknowledged that the absolute scale of funds spent by an organization on custom R&D (about 18 bill Rbls. in 2007) do not match entirely the scale of the Russian sector of R&D: the demand for science developments and services of outside organizations is orders less than the potential supply. Here the partners of organizations implementing jointly the R&D projects are most often the suppliers of machinery and equipment, rather than research organizations and moreover higher educational institutions, which is indicative of the preference given to borrowed, with the proven efficiency technologies which application forms the demand for purely applied research on adaptation of such technologies to the particular needs of an organization.

In 2006 about 14.2% of expenditure on technological innovations was financed from borrowed funds (credits and loans). Improvement of the banking system resulted in the growing share of the loan capital in financing. At the same time the access for small companies to the credit market for financing the innovation projects remains a great problem and the situation becomes more aggravated with the growth of inflation and expenditure on debt service. Therefore, a relatively high share of the loaned funds may be explained by concentration of innovation activity in large organizations.

Therefore, only a small part of the business sector is engaged in researches and the spendings on them are small both in absolute figures and by the intensity level. The greater part of expenditure is with the largest companies, but its absolute level is lower than any international norms, as a result no one of the Russian companies may become, in fact, a global innovation leader. Regardless of the fact that nearly the half of the research budget of organizations is spent on ordering R&D to outside organizations the problems existing in the relationships between business and science in the recent years has become more acute, in particular as concerns the quality and complexity of developments.

6.3.1. Branch and corporate research organizations

Branch and corporate research organizations are mostly implementing applied research and development.

In 2006 the applied research made 11.9% of the intramural current expenditure on R&D implemented by research organizations of the business enterprise sector. Much greater share in the intramural current expenditure on R&D was taken by developments – 85.8%.

Reduction of the number of organizations implementing research and development was observed, in fact, in all types of organizations. In the period from 2005 to 2006 the number of research organizations reduced by 5.8%, design, project-design and technological organizations – by 2.9% and design and design-survey construction organizations – by 7.3%.

Table 6.6. Organizations of the business enterprise sector implementing research and development by types

Types of organizations	Number and structure of organizations in 2007	
	Units	%

Business enterprise sector – total	1742	100.0
Research institutes	765	43.9
Design, project-design, technological organizations	391	22.4
Design and design-survey construction organizations	45	2.6
Industrial organizations	265	15.2
Experimental base	19	1.1
Other	257	14.8

Source: Data of statistical reports by Form 2 - Science

The growing number of research units in industrial enterprises (by 10.4%), i.e. the widening of their network directly in industry may be considered a positive shift in the structure of organizations in the business enterprise sector implementing research and development.

In the Soviet time each industry ministry had special research institutions servicing the industry or sub-industry or a group of enterprises, but not individual organizations. In the transitional period many enterprises stopped using the services of industry research institutions for various reasons: a) low competitiveness of technological developments made by industry organizations compared to the foreign analogs available on the market; b) wide “pirate” use of the intellectual property of research organizations by private enterprises; c) insufficiency of funds at enterprises for support of long-term projects. As a result, the system of supply and demand for the results of R&D in different industries was largely destroyed.

Other specific feature of the industry research was the historically established domination of public organizations. Notwithstanding privatization of the public enterprises in the 1990s the public property is and will be maintained in some industries, such as defense machine-building, aerospace and nuclear power engineering. The control of the property in these industries by the government is justified by such reasoning that the government is the main user because the products are manufacture on the basis of the government order. Research and innovation in these industries depend largely, if not completely, of R&D implemented in the government sector. For example, the ministry of industry coordinates its sectors by including them into the policy on development of science and technology. The Russian Space Agency “Roscosmos” (formerly Russian Space and Aviation Agency) and the State Atomic Energy Corporation “Rosatom” address similar issues in the aerospace and atomic industry.

In 2006 the share of receipts of the industry research organizations from production enterprises was only 23.9%. They receive much more funds from participation in implementation of R&D in priority areas of development of science, technologies and machinery financed from the federal budget. In the structure of intramural expenditure on R&D implemented by research organizations in the business enterprise sector the budget appropriations in 2005-2006 varied from 38.5% to 40.0%. The industry research organizations possess their own funds, but they are quite insignificant in volume (11% in 2006-2006) (Table 6.7).

In 2006 of funds from foreign sources increased 1.5-fold, that may be indicative of relative competitiveness of the industry research organizations.

Table 6.7. Structure of fund sources of research organizations in the business enterprise sector in 2007

	2007 (%)
Total	100.0
Internal funds	10.5
Budget funds	55.3
Non-budget funds	1.0

Funds of Russian organizations of the business enterprise sector	25.1
Funds of higher education institutions	0.3
Funds of private non-profit organizations	0.1
Funds from foreign sources	7.8

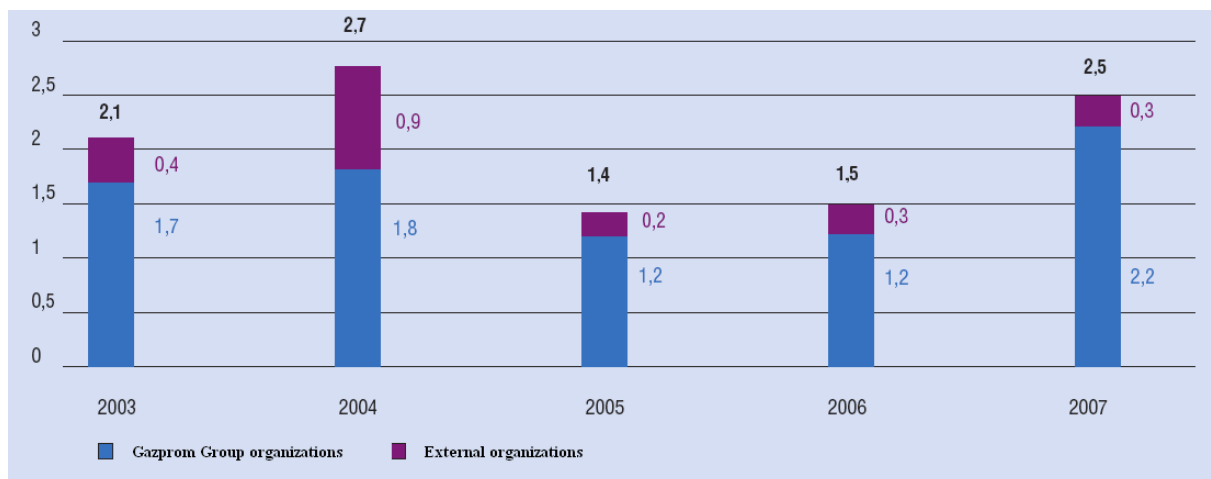
Source: Data of statistical reports by Form 2 – Science for 2006-2007

* estimates

The greater part of the Russian influential business leaders and corporations is connected with oil, gas, metals and other mineral resources (14 out of 20 top Russian companies in 2004 and already 18 out of 20 in 2008, according to the Rating Agency “Expert-400”). The companies in these industries due to certain specifics of their business are usually characterized by low innovation activity, restricted demand for R&D and innovation ideas in Russia. They chose to purchase new technologies and equipment from foreign companies. They may be called “technological adapters” as their innovation activity is aimed at adaptation of innovations developed by other organizations. And only a few of them may be referred to as the “technological modifiers” using external sources of R&D for modification of their products and processes. Nevertheless, getting large profits from the use of natural resources the Russian metallurgical, oil and gas corporations may and do have quick access to the most advanced technologies available on the global market.

In **power generation** the most important is the research complex of Gazprom⁴² uniting 10 subsidiary organizations implementing R&D. The personnel of these organizations numbers about 6,000, including about 100 doctors of sciences and about 500 candidates of sciences. Accomplishment of the concept on restructuring the research complex of Gazprom developed in the early 2000s resulted in formation of the following structure that has united:

- head research centers coordinating researches on the problems being critical for the industry;
- regional research organizations directly connected with the manufacturing activity of enterprises;
- research centers being a part of the subsidiary companies and organizations.



Source: “Gazprom” in Figures. 2003-2007. www.gazprom.ru

Figure 6.9. Budget of Gazprom on R&D in 2003-2007

⁴² <http://www.gazprom.ru/press/news/2006/november/articles55920>

In 2007 the total budget for R&D was equal to 2.5 bill Rbls., or approximately 100 mln US dollars, of which 2.2 bill Rbls. were allotted to internal company R&D (Figure 6.9). In the recent three years the indicator of science intensity (R&D / sales) varied, but, in general, it was on the level of similar EU companies (0.3%), but lower, than the science intensity indicator for the US oil and gas companies (0.5%). The Gazprom Group possesses over 1200 patents to various inventions.

It is interesting to note that only in 2002-2004 Gazprom increased its outsourcing volume, i.e. the researches conducted under contracts with external organizations, from 0.3 bill to 0.94 bill Rbls., or approximately to one-third of the total expenditure on R&D. The company financed implementation of R&D in the leading research institutions with a view to improve efficiency of its core activities along three directions – gas extraction, liquefying and transit, environment protection, communications and information technologies. In 2005-2007 there was some turn in this tendency – the greater part of R&D was now implemented inside the Gazprom divisions.

For better use of the research potential of the Russian and foreign research centers and oil-and-gas companies OJSC “Gazprom” develops mutually beneficial cooperation with “Rosatom”, OJSC “Russian Railroads”, “E.ON Ruhrgas AG”, “BASF AG” / “Wintershall AG” and others.

In 2005 for creation, accounting and rational management of the objects of intellectual property (OIP) “Gazprom” approved the Concept for Intellectual Property Management in OJSC “Gazprom”. In 2007 the unprecedented growth of OIP cost was witnessed: from 0.8 mln rbls at the beginning of the year to 50.9 mln Rbls. at the end of the year.

In nonferrous metallurgy GMC “Norilsk nickel” is one of the leading Russian companies. In 2004 “Norilsk nickel” spent 40 mln US dollars on external R&D that made 0.6% of total sales (data on internal R&D in the company are not available).

The Company comprises four geological survey companies, the design-technological institute, the research division, the company oriented to implementation of innovation projects. In 2006 “Norilsk nickel” spent 20 mln US dollars on R&D implemented by external organizations, in 2006 – 18 mln US dollars. The outlays to geological surveys were: 49 mln US dollars in 2006 and 113 mln US dollars in 2007.⁴³

The Company has its own research institute in Saint-Petersburg and on its basis in 2006-2007 there was established the single research complex. The total personnel of the institute number 1350, of which more than 1100 are the research and engineering staff. The institute consists of two main units – design and research. The personnel of the design unit make 900 specialists working in 28 technological and 6 service departments. The research unit employs 256 specialists working in 10 research laboratories and 3 sectors.

From 1 July 2007 “Norilsk nickel” included into its system the research division “Norilsk Process Technology” (formerly LionOre Technology and Western Minerals Technology) that happened after purchase by GMC of the company LionOre Mining International Ltd.

The division “Norilsk Process Technology” has many patents on some key technologies needed for the metallurgical process Activox®⁴⁴ The division “Norilsk Process Technology” is located in the city of Osborn Park in Western Australia.

In **ferrous metallurgy** OJSC “Severstal” has most prominent experience. Being the major ferrous metallurgic company it actively updates the technology and supports both internal (in the company) and

⁴³ Here and hereinafter the data of the Consolidated Financial Statements of OJSC GMC “Norilsk nickel” for 2007 financial year.

⁴⁴ Activox® is a hydrometallurgical process of oxidation of the finely crushed sulfide raw material under a relatively low pressure.

external R&D. In 2004 the total expenditure on R&D was 40.1 mln Rbls. ensuring the economic effect from introduction of new products evaluated at 437.8 mln Rbls. In 2005 the Company's expenses on R&D reached 65 mln Rbls. or 0.28% of the sales. In 2005 the Service for Technology Innovations and Development was organized that elaborates the innovation policy, business strategy of the Company, defines the ways and methods of its effective regulation.

The main directions of R&D are the works related to information technologies, optimization of technological parameters, and development of mathematical models. In 2005 the greatest amount of funds was allotted to R&D on development of new technologies and new kinds of products. For this purpose a special agreement was concluded with the Central Research Institute of Ferrous Metallurgy named after I.P. Bardin (Moscow).⁴⁵

The Company has the Private Educational Institution "Corporate University "Severstal". Apart from the education function proper the university acts as a methodological and consulting center for "Severstal" enterprises in R&D along the following directions: corporate researches; social and political researches; marketing research; media studies; labor market research; business analysis. In 2007 the Corporate University conducted more than 30 research projects at 25 enterprises of OJSC "Severstal".⁴⁶

In the Russian *machine-building industry* as a statistical aggregate in the economic sector "**Manufacturing of Machines and Equipment**" in 2006 R&D was implemented by 2,700 people, including 1,900 of researchers. In the structure of intramural current expenditure on research and development the prevailing were developments – 95.6%, while the applied research took 4.4%. The basic research along this direction was not conducted.

The basic sources of financing were internal funds – 47.1%, the funds of organizations in the government sector – 32.4%, the funds of the federal budget – 13.1%, the funds of organizations in the business enterprise sector – 7.2%. The greater part of research is connected with production of machines and equipment (81.4% of the total implemented R&D) that was carried out by the Company's research teams.

In the automobile industry the researches are implemented mainly by "AvtoVaz", the Russia's major automobile company. "AvtoVaz" has its own research capacities. It is the best stuffed and equipped company in the industry. According to the corporate reporting of the Company, the expenditure on R&D is tending downward and this drop is rather significant.

R&D is implemented using internal capacities and outsourcing. The internal R&D is conducted in the Science and Technology Center of OJSC "AvtoVaz" and the core of it is the Research Center. The main tasks of this division are study of materials, development of technologies for their processing and also study the possibilities of applying new materials. Compared to large foreign companies, the expenditure of "AvtoVaz" is small, both in absolute and relative figures. In particular, in 2007 four international automobile companies spent on R&D more than 6 bill US dollars each, the science intensity indicator in the global automobile industry is 3.5-4.0%, while of "AvtoVaz" – only 0.44%.

6.3.2. Innovation activity in high technology industries

According to the Federal State Statistics Service, in 2003-2008 the dynamics of indicators regarding manufacturing of high technology products had negative trends (Table 6.8).

Table 6.8. Indicators of high technology economic activities

⁴⁵ For more details see www.severstal.ru

⁴⁶ According to the information contained on the university official site <http://www.universtal.ru>

	2003	2004	2005	2006	2007	2008*
High technology industries	128.2	129.0	115.4	110.2	113.8	102.5
Manufacture of aircraft, including spacecraft	128.7	120.7	124.0	105.5	111.3	112.0
Manufacture of office machinery and computer facilities	129.6	162.7	115.4	102.4	115.0	76.9
Manufacture of radio, TV and communication equipment	109.8	167.5	119.8	112.5	112.5	93.9
Manufacture of medical, measurement and optical equipment, clocks	218.5	130.3	115.7	116.6	112.2	93.1
Manufacturing of pharmaceutical products	106.7	94.9	95.6	110.2	107.0	96.1
Medium technology industries of high level	104.7	107.7	103.4	104.8	109.0	94.2
Manufacture of machines and equipment	112.2	120.8	99.7	109.4	119.1	104.0
Manufacture of ships and other transport means	105.4	100.2	89.9	102.5	112.0	112.0
Chemical production	104.7	107.8	103.7	104.8	108.9	66.1
Manufacture of electrical machines and equipment	93.5	120.8	105.9	113.3	115.7	87.7
Manufacture of vehicles, trailers and semi-trailers	106.2	111.5	107.1	103.9	117.3	104.6

Sources: "Rosstat", "Minpromtorg" of Russia (Minpromtorg of Russia provides data only on marketable products).

* estimates.

Traditionally high technology are considered the industries in which products the share of expenditure on research and development is no less than 4.5-5%, while highly science intensive industries (HSII) – over 10%.⁴⁷ It should be noted that the OECD classification is based on the structure of high technology industries adopted in the developed countries. Table 6.8 presents the classification of high technology industries used in the Russian Federation. Some industries, such as electronic industry (EI), atomic industry and atomic power generation (ATP&AE), production of sophisticated machines and equipment (CE) are referred to the *science intensive*, while the aerospace industry (ASI) – to the *highly science intensive* industries.

The data on the science intensive industries for 2003-2008 are summarized in Table 6.9.

Table 6.9. Summary data on science intensive industries

Sectors	2003	2004	2005	2006	2007	2008 ²
Growth rates¹ (science intensive sectors)	1.095	1.012	0.992	1.088	1.147	1.075
Including:						
ASI	1.045	0.937	0.991	1.165	1.185	1.078
EI	1.181	1.018	0.987	1.108	1.304	1.145
CE, including medical equipment	1.215	1.099	1.064	1.009	1.080	0.997
Manufacturing of pharmaceutical products	1.067	0.949	0.956	1.102	1.070	0.961
ATP&AE	1.122	1.019	0.977	1.02	1.06	1.05
Export of science intensive products, bill US dollars	9.82	10.46	10.8	11.57	12.4 ¹	14.0 ¹

¹ Estimates of IEF RAS (on the basis of the official data regarding the growth rates of marketable products, manufacturing of science and engineering products and official deflators).

² Forecast of IEF RAS.

Table 6.9 shows that in 2003-2008 the aerospace industry demonstrated the 1.44-fold growth, the electronic industry – 1.96-fold, ATP&AE – 1.27-fold, while the science intensive, high technology

⁴⁷ See, for example. Science and Engineering Indicators – 2008. Washington: NSA, 2008.

complex, in general – nearly 1.5-fold growth. For comparison, in the same period the Russian industry growth was 42.6%.

Production plans of the highly science intensive industries (HSII) are mostly prepared on the basis of the government order. While in 2003-2005 the government order to highly science intensive industries was practically unchanged, compared to 2002, then in 2006-2008 it became 1.36 times more.⁴⁸ It follows from Table 6.9 that the HSII export was sustainably growing. In 2008 it grew by 42.6% compared to 2003. In the period from 2006 to 2008 the average annual growth rates in the atomic industry reached 5-6% and HSII in general – 10.4%, which is 1.8 times more than the average annual growth rates in manufacturing.

The measures for support of HSII are continued in the crisis period (additional increase of the government order, 100% advance payment of government purchases and redemption from the federal budget of the additional emission of shares of high technology organizations).

It should be noted that many high technology organizations having no other sources of financing managed to survive in 2003-2007 only due to fulfillment of government orders or export contacts that permitted them to direct a part of their profit to renovation of their fixed assets.

In the recent years the key structural and institutional transformation in HSII was creation of the so-called “integrated structures” (IS).⁴⁹ However, this process goes not energetically enough. According to the data as of 1 January 2008 there were established 16 integrated structures that were duly executed in legal terms.

Analyzing the innovation activity in the science intensive industries it should be remembered that the official statistics of Rosstat and Rosprom (in May 2008 it was included into Mintorg) differ essentially. This is connected with application of different methods of innovation activity assessment and different sample organizations (in Rosprom all organizations subordinated to the agency were sampled). The Rosprom departments also summed up data on the codes of the Russian Classification of Economic Activities (OKVED).⁵⁰ The data on the innovation activity are summarized in Table 6.10.

Table 6.10. Share of the innovation-active organizations in high technology industries

	2005	2006
<i>High technology industries (Rosstat data)</i>		
Manufacture of aircraft, including spacecraft	22.3	22.5
Manufacture of office machinery and computer facilities	26.9	21.4
Manufacture of radio, TV and communication equipment	38.4	41.0
Manufacture of medical, measurement and optical equipment, clocks	24.8	26.8
Manufacturing of pharmaceutical products	23.5	27.4
<i>High technology industries (Rosprom data)¹</i>		
Aerospace industry	31.9	35.6
Electronic industry	58.8	61.2
Manufacture of complicated equipment	26.6	29.6

¹ Estimates of IEF RAS on the basis of Rosprom data.

⁴⁸ Here the government order is deflated with regard to the deflator index of GDP.

⁴⁹ **Integrated structure** is a group of technologically linked organizations united by a complex of technological chains from manufacturing of key completing parts to the final products formed by transfer to them a part of its powers as a head company and subordination of the development plans to the common interests of the united structure.

⁵⁰ This is facilitated by a rather complicated and intricate methods applied for generalization of the data received from organizations by Statistical Form 4 – “Innovations”.

The tendencies in the innovation activity of organizations in the science intensive industries in the period from 2005 to 2006 are as follows:

- the number of the innovation-active organizations has increased in all high technology industries;
- according to official data for 2006 the specific share of the innovation-active organizations is the largest in the electronic industry (61.2%), which is more than 6 times higher than the level of innovation activity of organizations in the manufacturing industries (about 10%).

According to the official statistics, the overall expenditure on technological innovations in the high technology industries in 2006 was increased by 38%. In the total structure the expenditure on innovation products prevailed. In 2005 their share was 74% and in 2006 it increased to 83% (Figure 6.10).

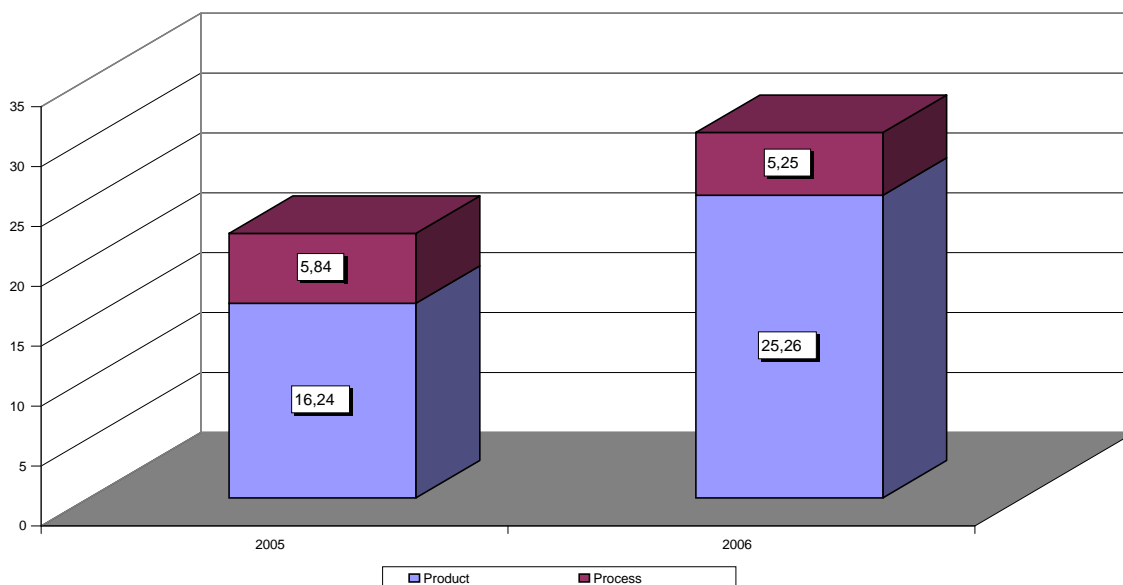


Figure 6.10. Dynamics of expenditure on technological innovations in the high technology industries in 2005-2006, bill Rbls., in current prices

It should be noted, that by official data the expenditure of organizations on innovation products has grown during a year in all industries. In 2006 the leader was the aviation industry where the investments into the innovation products have grown nearly three-fold (in the aerospace industry in general – nearly doubled) (see Figure 6.11).

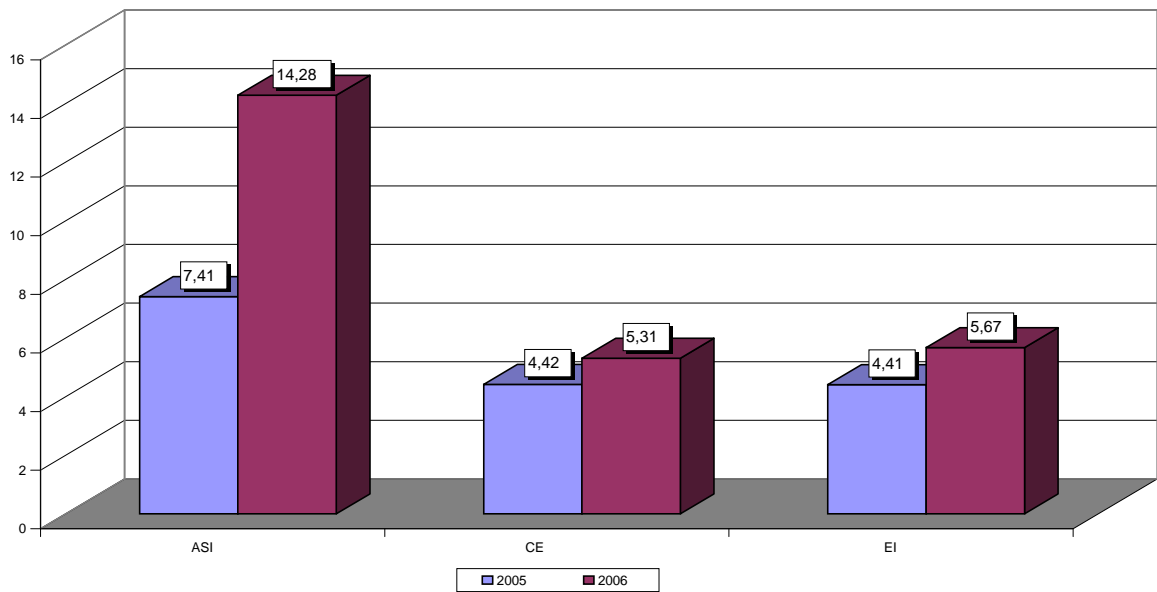


Figure 6.11. Dynamics of expenditure on innovation products by aggregate complexes of high technology industries in 2005-2006, bill. Rbls., in current prices

In 2006 in the electronic industry the expenditure on the innovation products was increased by nearly 28.4% and in the complex equipment industry in general – by 20.1%.

The expenditure of organizations in the science intensive industries on innovation processes was much less. In some industries this expenditure dropped significantly. For example, in shipbuilding it became more than 80% less.

The leaders by expenditure on innovation processes are the aviation industry (2.83 bill Rbls.) and electronic industry (1.8 bill Rbls.) (Fig. 6.12).

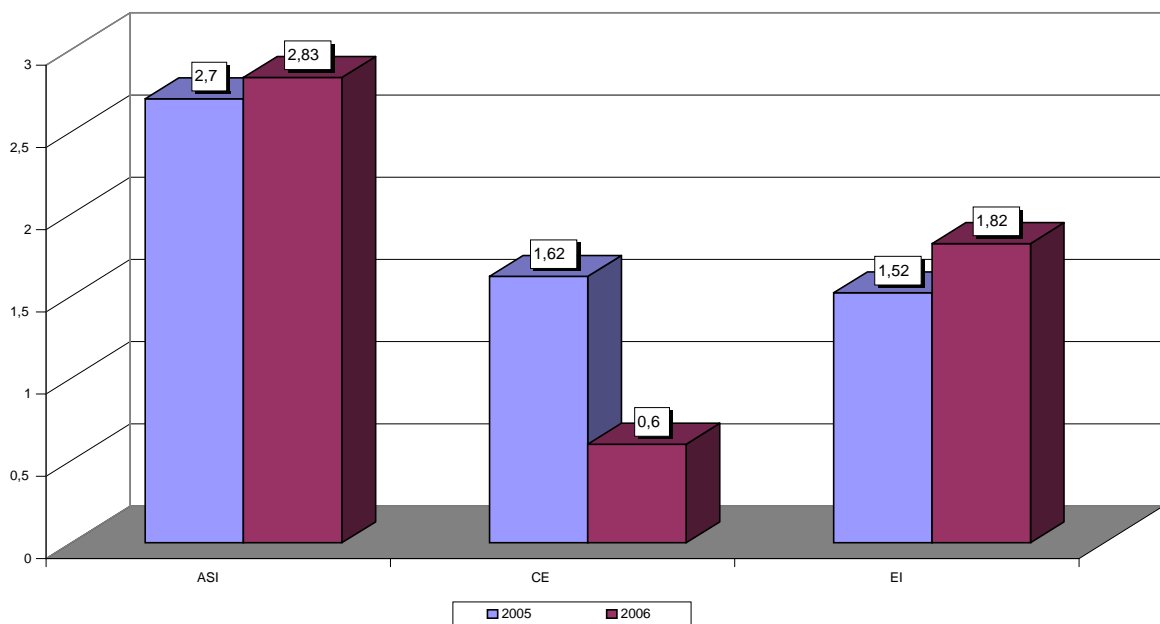


Figure 6.12. Dynamics of expenditure on innovation processes by aggregate complexes of high technology industries in 2005-2006

In the structure of expenditure by innovation activities the share of the expenditure on research and development (R&D) is the largest. There is also a tendency to its growing due to reduction of expenditure on purchase of machines and equipment.

The expenditure also increased on purchase of new technologies (by 67%) and on production design (by 42%), while the expenditure on purchase of software in general for HSII increased 4-fold.

In 2006 the leaders by the growth rate of financing of research and development were the aviation industry where the expenditure was increased nearly 3-fold and in the shipbuilding industry where the expenditure more than doubled.

6.4. Innovation in the services sector

According to the adopted classification of statistical data, the sector of paid services to the population in the Russian Federation includes: everyday, transport, housing, utility, medicine, sanatorium and health improvement, veterinary, legal, tourist services as well as the services on physical training and sport, the education systems, communication services, hotels and cultural services. The structure of the paid services to the population is presented in Table 6.11.

Table 6.11. Structure of paid services to the population (in percent to the total)

	2001	2002	2003	2004	2005	2006	2007	
							%	Bill Rbls.
All provided Services	100	100	100	100	100	100	100	3407
including:								
household	12.2	11.7	10.7	10.5	10.1	9.9	10	339.1
transport	26.6	24.2	22.9	22.2	21.5	21.2	21.3	725.7
communication	12.1	14.8	16.7	17.6	18.5	18.6	19.6	666.7
housing	3.7	4.3	4.5	4.8	5.3	5.6	5.2	178.4
utility	15.1	16.1	17.3	17.4	18.3	18	17.3	590.3
hotels and similar accommodation	3	3	2.9	2.9	2.6	2.7	2.6	88.9
cultural	1.9	2	2.3	2.5	2.3	2.2	2.4	80.2
tourist	1.5	1.4	1.3	1.3	1.5	1.6	1.5	50.1
physical training and sport	0.4	0.4	0.4	0.5	0.7	0.6	0.6	19.1
medicine	4.7	4.9	4.8	4.9	4.8	4.9	4.9	167.5
sanatorium and health improvement	2.5	2.1	1.8	1.7	1.6	1.5	1.5	49.5
veterinary	0.3	0.3	0.3	0.2	0.2	0.2	0.2	6.6
legal	4.8	3.9	3.2	2.7	2.3	2.5	2.6	88.8
educational	6.9	6.7	6.7	6.8	6.7	6.9	6.8	231.7

other paid services	4.3	4.2	4.2	4	3.6	3.6	3.5	124.4
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Source: RF Rosstat

The statistical system existing in RF fixes the innovation activity only in the communication sector as well as in the services related to application of computers and information communication technologies (ICT). This impedes significantly the assessment of the general level of innovation activity and the input of the services sector into development of the Russian research system. Moreover, this makes it difficult to conduct complete international comparisons.

The most intensive innovation development is observed in the following service areas: provision of ICT-based communication and data transfer (cellular, fiber-optical, satellite communication and others), Internet services (including the bank sector, wholesale and retail trade via Internet) as well as transport services and space tourism market. This section outlines some essential specific features of development of the **information communication technologies – ICT**.

The ICT is one of the most dynamically developing sectors in RF. All its segments reveal a sustainably high double-digit growth rates. The ICT sector includes: the market of IT (information technologies) that incorporates provision of computers and office equipment, software, IT-services and the market of TC (telecommunications) that incorporates provision of communication, communication facilities for end users and communication-network equipment.

In the Russian Federation the services in ICT envisage provision of various communication services (mobile, stationary, broad-band access to Internet and others). The Russian market has some differences from the USA and EU countries. In particular, Russia has wide expanses not covered by the traditional communication means, so, for Russia the advanced introduction of wireless and satellite technologies is critical. The unit cost of the satellite communication does not, in fact, depend on the size of the serviced territory and in Russia it has certain advantages compared to other means. According to experts, the geographical specifics of Russia will determine also the long-term tendencies in development of the mobile communication of the third generation. It is expected that the 3G systems will be much inferior to the similar networks existing in the EU countries by the coverage density (in fact, they will be found only in large cities), but, at the same time, they will be oriented to provision of diverse services. The difference between situations in Russia and European countries is that the 3G networks developed in Europe on the basis of the fully formed network of the second generation – GSM. In Russia the GSM networks continue developing and they did not cover as yet 100% of the territory. For this reason the investments into the networks of the second generation remain large, while the 3G networks develop weakly. Moreover, in large cities the main rivals of the third-generation networks are the multimedia services on the basis of the Wi-MAX technologies.

Basic indicators of innovation activity

Many companies providing services in communication, data transfer and Internet in Russia appropriate, to this or that degree, the funds to technological innovations. However, the total volume of such funds is not large as the greater part of the receipts is used either to extensive development or to purchase of new assets capable to increase the company capitalization on the market (Table 6.12).

Table 6.12. Expenditure of the companies providing services in ICT on technological innovations (mln Rbls.)

	2000	2001	2002	2003	2004	2005	2006	2007
In current prices	11794.1	6328.6	6049.3	14782.7	19495.3	17544.4	18892	25125.5

In fixed prices of 1995	2496.5	1149.87	949.976	2037.083	2237.16	1688.85	1574.39	1838.98
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Source: *Russian Science and Technology at a Glance: 2008. M.: CISN, 2008.*

In general, it can be said that beginning from 2003 the expenditure on introduction of innovation technologies did not grow remaining more or less stable and, with regard to inflation, even revealed some downward tendency. At the same time, from 2003 to 2005 the volume of innovation services provided by the companies in the ICT sector increased, but from 2006 this growth stopped (Table 6.13).

Table 6.13. Innovation products* of organizations in the communication and information technology sector (mln Rbls.)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
- in current prices	1376.3	7958.8	18033.2	9144.1	4261.9	20132.3	28020	43465.3	54260.2	34753.5
- in fixed prices of 1995	691.5	2318.1	3817.2	1661.4	669.3	2774.3	3215.4	4184.0	4521.8	2543.7
Per a ruble of expenditure on technological innovations	3	1.6	1.5	1.4	0.7	1.4	1.4	2.5	2.9	1.4

*Here and hereinafter the term "commodity" includes also the performed work and provided services.

Source: *Russian Science and Technology at a Glance: 2008. M.: CISN, 2008.*

The main source of financing of the innovation technologies in the information communication services sector is the internal funds of companies. And the expenditure of the companies providing communication services is 9 times greater than of the companies using information technologies. This may be explained by the fact that in the recent 5 years the communication market (in particular, mobile communication) has been intensively developing reaching its peak in 2006. At the same time, the market of information technologies was only shaping. The Russian operators of cellular communication had and still have foreign shareholders who invest into the innovation development of the companies. At the same time, the ICT sector is not as yet an attraction for foreign investments. It usually receives funds from the federal and regional budgets for concrete projects needed by the government bodies proper. Regardless of initiating several federal programs on development of the infrastructure of venture financing such funds are not involved so far in the innovation development of the ICT sector.

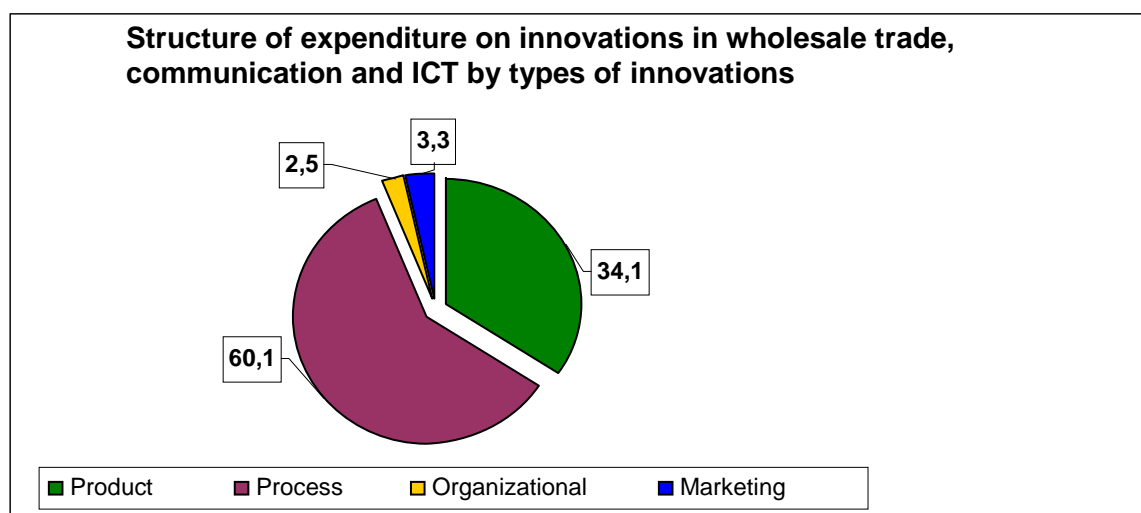


Figure 6.13. Structure of expenditure on innovations in communication and ICT by types of innovations

Analysis of the structure of expenditure of companies providing ICT services on innovation (Figure 6.13) has shown that the greater part of funds is spent on innovation processes, i.e. on development and introduction of new or considerably improved methods of services provision. Approximately twice as less funds is allotted to development of new products. The organizational and marketing innovations are rare. And this is quite understandable as in the recent years the companies operating in the ICT sector have been targeted to increase of their market share and client base.

Analysis of the specific share of expenditure of the ICT companies on some kinds of innovation activities in the total expenditure on technological innovations has indicated that the funds are directed mostly to purchase of equipment. It is quite natural because the period from 2003 to 2005 was marked by active construction with widening of the geographical coverage of mobile communication networks and also fiber-optical networks and development of various Internet access technologies. Beginning from 2005 the WiFi networks started quickly developing in large cities. The peak of expenditure on purchase of new technologies and software was observed in 2004 and after this it dropped significantly. From 2005 the growth of expenditure on internal research and development has been witnessed.

7. Innovation Infrastructure

The infrastructure of the innovation system is a unity of subjects of innovation activity facilitating implementation of innovation activity, including provision of services on development and sale of the innovation products.⁵¹

At present more than 80 technoparks and still more innovation technological centers, over 100 technology transfer centers, 10 national innovation analytical centers, 86 centers of science-engineering information, about 120 business incubators, 15 innovation consulting centers and many other organizations of the innovation infrastructure are registered in Russia. The national information analytical center on monitoring the innovation infrastructure of scientific and engineering activity and regional innovation systems (NIAC MIIRIS <http://www.miiis.ru/>) keeps information about 688 organizations belonging to the innovation infrastructure.

7.1. Information, organizational and financial Infrastructure

The information infrastructure is formed by a group of organizations providing information and consulting services. These groups of organizations incorporates analytical centers, databases, information analytical centers, information centers, research coordination centers, technology transfer centers.

Analytical centers are usually represented by consulting companies providing services in certain areas, such as Center “Concept” at the Moscow Physical Engineering Institute⁵² or Analytical Center “Expert” established by the publishing group with the same name in various regions of the country.

The functions performed by **the information centers (IC)** and **information analytical centers (IAC)** differ only slightly. In 2008 there were 98 such centers (compare 89 in 2006) in Russia.

The information centers in Russia are mostly public organizations.⁵³ Their greater part (71 out of 98) subordinates to the Ministry of Industry and Trade of Russia and the Ministry of Energy of Russia. The need in such organizations in Russia is satisfied, in general, with the exception of some regions among which there is the Khabarovsk Territory where the Far Eastern Public Scientific Library took the functions of IC.

National information analytical centers. In 2005 within the framework of the Federal Target Research Program “Research and Development in Priority Areas of Science and Technology Development in Russia for 2002-2006” (block “Commercialization of Technologies”) aimed at monitoring the priority areas in science and technology development, innovation structure of science and engineering activity and regional innovation systems, training of the personnel for the research and innovation activity and ensuring their mobility, equipment base for researches, including centers of collective use and unique test stands and installations there were established 10 national information analytical centers (NIAC). The customer was the Federal Agency on Science and Innovations of the Russian Federation.

The **Internet resources** providing information about the innovation infrastructure and innovation activities in the Russian Federation include the following.

⁵¹ Basic Trends in the Policy of the Russian Federation in Development of the Innovation System for the Period Till 2010 approved by Resolution of RF Government No. 2473П-П7 of 5 August 2005.

⁵² Analytical Center “Concept” specializes in conceptual analysis and design for resolving complex problems of strategic planning and management.

⁵³ Such structures are traditional for Russia. In the past they existed at departmental and territorial establishments as centers or institutes of scientific-engineering information.

Federal portal on science and innovation activities (www.sci-innov.ru) is the information portal opening access to the most important documents on the science and innovation activities. It contains references to the main organizations operating in this area. It provides information about the content and progress of FTP implementation.

Portal of information support of innovations and business “Innovations and Business Enterprise” (www.innovbusiness.ru). This portal contains the database on innovation projects, analytical materials describing main issues and problems faced by entrepreneurs engaged in innovation activity.

Information Internet-channel “Science and Innovations” (www.rsci.ru) was created in September 2000 and operates under the auspices of the Basic Research Foundation of Russia and the Foundation for Promotion of Small Enterprises in Science and Technology.

Science and Technology in RF (<http://www.strf.ru>) was created in 2005 with the support of the Federal Agency on Science and Innovations. This project is an information-analytical expert presentation of actions within the framework of the Federal Target Research Program “Research and Development in Priority Areas of Science and Technology Development in Russia for 2007-2012”.

Information Portal InfoNTP (www.infontr.ru) provides information about present-day achievements in science, engineering and technology.

Portal “Competition of Russian Innovations” (www.inno.ru). The competition was organized by the journal “Expert” in 2001. The Expert Board of the competition comprises representatives of the federal bodies, including the Minister of Education of the Russian Federation, 5 academies and representatives of large business. This portal makes this competition more open and actively promotes the “histories of success” of the winners.

Science and Innovations in the Regions of Russia (regions.extech.ru). This portal is oriented to attraction of regional research and coordination centers that may represent proposals from regional organizations.

Institutional infrastructure

Research and coordination centers are engaged mainly in coordination of research and innovation processes. In 2008 as well as in 2006 there were registered only 18 such organizations. Some RCCs act as affiliated territorial structures of central organizations of the infrastructure. For example, RCC “Renacord” acts as the Voronezh representation office of the Federal Foundation for Promotion of Small Enterprises in Science and Technology.

Centers of collective use. In the recent years this kind of the innovation structure has been developing most quickly. If in 2006 there were only 15 such centers, then now only in the city of Tomsk the United Center of Collective Use existing at the Tomsk State University includes 10 profile centers of collective use providing services on the use of unique equipment and devices, software to the users – personnel of higher education institutions and academic institutions as well as industrial enterprises and various commercial organizations.

Many RAS institutions that need unique and costly equipment for their research created the Centers of Collective Use (CCU). Thus, in 1994 the Center of Collective Use at the RAS Physical and Engineering Institute named after A.F. Ioffe was established and it is still functioning successfully. The specific feature of this CCU is an integrated approach to addressing the interdisciplinary tasks of the basic, applied and sectoral science and industry.

CCUs not simply provide access on a contractual basis to the unique equipment. They also perform, on orders from other research institutions and industrial enterprises, the integrated research, teach students, work with postgraduates and doctorants, organize advanced training courses for specialists – users of the newest analytical equipment.

Technology transfer centers (TTC). In 2003 in six federal districts the first technology transfer centers were established on the basis of the RAS institutions, universities and public research centers of the Russian Federation. TTC were called to become the missing link in the infrastructure that could, quite legally and professionally, ensure commercialization of the research results attained with the appropriations from the budget. This became possible, first of all, through creation of small high technology enterprises and conclusion of license agreements.

According to the National Center on Monitoring the Innovation Infrastructure of Scientific and Engineering Activity and Regional Innovation Systems, at present there are over 100 TTC in Russia and their greater part is created by the Ministry of Science and Education of Russia. More than 60% of such centers locate in the Central, Volga and Northwestern Federal Districts.

Special economic zones (SEZ) are the perspective mechanism for development of the state-private partnership and stimulation of investments. Federal Law “On Special Economic Zones in the Russian Federation” No. 116-FZ of 22 July 2005 envisages provision to the resident SEZ of customs privileges, release of organizations from payment of the property tax and land tax during 5 years from the time of registration as resident SEZ, considerable reduction of the unified social tax. Pursuant to the law, three types of SEZ may be established on the territory of the Russian Federation – industrial-production, tourist-recreational and engineering-commissioning. And the engineering commissioning SEZ should become one of the most essential mechanisms of innovation development envisaging development of the state-private partnership in the innovation field. In 2005 the winners in the competition on selection of engineering commissioning SEZ were 4 regions of Russia: Moscow (Zelenograd), Saint-Petersburg, Moscow Region (Dubna) and Tomsk. In 2007 the main works were completed on creation of the SEZ infrastructure – engineering networks, including information-communication networks, and transport communications. The status of resident SEZ is awarded on a competitive basis.

Financial infrastructure

Development of the financial infrastructure of innovations is one of the key requirements for modernization of the country’s economics. And this obvious circumstance is taken into consideration in the Russian innovation policy that draws due attention to formation of the integral system of innovation support using the capacities of the established financial development institutions,⁵⁴ such as Investment Foundation of the Russian Federation, Open Joint Stock Company “Russian Band for Development”, Open Joint Stock Company “Russian Investment Foundation for Information-Communication Technologies”, Open Joint Stock Company “Russian Venture Company” as well as some federal corporations.

Investment Foundation of the Russian Federation was established in 2006 for provision on a competitive basis of the governmental support to implementation of investment projects aimed at creation or development of the infrastructure and also at realization of institutional transformations within the national innovation system. The following forms of governmental support are envisaged:

- co-financing of investment projects;
- direction of funds into the equity capitals of legal entities;
- provision of governmental guarantees for investment projects and other security of liabilities stipulated in the budget law being in the authorities of the Government of Russia.

⁵⁴ Concept of Long-Term Socio-Economic Development of the Russian Federation for the Period Till 2020.

Russian Bank for Development (OJSC) was established in 1999. Since 2004 the Bank has been implementing the Program of Financial Support of Small and Medium Business in the following priority areas:

- realization of projects in science, innovations and high technologies areas;
- projects aimed at realization of the national projects in the field of public healthcare, education, housing, agriculture and demography;
- projects facilitating development of the infrastructure in the subjects of the Russian Federation;
- projects realized in the regions suffering from the funds shortage;
- projects aimed at improvement of competitiveness of small and medium enterprises on the foreign markets.

Russian Investment Foundation for Information-Communication Technologies.

Pursuant to Resolution of the Government of the Russian Federation No. 476 of 9 August 2006, the Russian Investment Foundation for Information-Communication Technologies (OJSC “Rosinfocominvest”) was assigned the status of a legal entity with 100% of its equities being in the federal ownership (its equity capital is 1.45 bill Rbls.). It is also envisaged that the interest of the Russian Federation in the equity capital will be reducing till complete withdrawal in 2010.

The scope of investment interests of OJSC “Rosinfocominvest” includes small and medium organizations operating in the field of information-communication technologies.

In the period from May through December 2008 more than 894 applications were received from innovation companies. Today the specialists of the Foundation formed the preliminary portfolio of investment projects comprising dozens of well developed and efficient projects. Moreover, some private investors expressed their wish to become shareholders of OJSC “Rosinfocominvest” for joint financing of innovation projects in the field of information-communication technologies.

At the same time, pursuant to Resolution of the Government of the Russian Federation No. 476 of 9 August 2006, the financing of projects becomes possible only after reduction of the fraction of ordinary registered shares of the Foundation being in the federal property to 51% of the total number of the ordinary registered shares through sale of the additional emission of shares floated by open subscription.

For attraction of a private investor for redemption of the additionally emitted shares OJSC “Rosinfocominvest” should organize respective bids in order to find the most effective co-investor. But till now such bids were not declared.

Venture financing

The first venture foundations appeared in Russia in the 1990s. Many expectations were connected with them regarding the financing of technological projects, but many of these expectations fell short because the science and business could not present to each other some intelligible business projects. As a result, many venture foundations that were set up by 2000 were transformed into direct investment foundations.

Among the actions taken by the government in the recent decade that were aimed at development of the mechanisms of venture investment and involvement of business in this work there were the following:

- creation in 1997 of the Russian Association of Venture Investment (RAVI) that united both Russian and foreign investors;

- beginning from 2000 organization of annual venture fairs that have become a communication site for investors and venture companies;
- creation in 2000 of the Venture Innovation Foundation (VIF) as a “foundation of foundations” playing a role of a catalyst in establishment of venture foundations (started functioning from March 2004).

In 2005-2006 the improved situation with the budget receipts thanks to the favorable situation on the world raw material markets permitted the RF Government to increase essentially its input into formation of the venture investment institute leading to the qualitatively new level.

In this context the following major events occurred on the Russian market of direct and venture investments:

- the first regional venture foundations of investments into small enterprises in the science and engineering area were formed and in 2005 started functioning; they were established as the co-investment sources on the basis of the partnership of the federal and local authorities with the business;
- the conditions were created for establishment of the Russian Investment Foundation for Information-Communication Technologies, the Russia’s first foundation of venture investments with participation of the state;
- there was established OJSC “Russian Venture Company” (OJSC RVC) – the foundation of foundations for venture investments foundations;
- the first engineering-commissioning Special Economic Zones (SEZ) were established and started developing.

Russian Venture Company

The “Russian Venture Company” (OJSC RVC) was established following Resolution of the Government of the Russian Federation No. 838-p of 7 June 2006 for stimulation of creation in Russia of the venture investment industry and considerable increase of the funds of such venture foundations, development of the innovation industries and moving of the Russian science-intensive technological products and services to the world markets.

The sole shareholder of OJSC RVC possessing 100 percent of its equities is the Russian Federation represented by the Federal Foundation for Promotion of Small Enterprises in Science and Technology.

As a result of two competitions conducted by OJSC RVC in 2007 and 2008 there were established 7 venture foundations with the total capitalization of 19.983 bill Rbls.:

“VTB Venture Foundation” (with the net assets value – 3.086 bill Rbls.);

“Bioprocess Capital Ventures” (with the net assets value – 2.902 bill Rbls.);

OJSC “Alliance ROSNO Assets Management” (the size of the established foundation – 3.061 bill Rbls.);

LLC “Maxwell Asset Management” (the foundation size – 3.061 bill Rbls.);

CJSC “Leader” (the size of the established foundation – 3 bill Rbls.);

LLC “Managing Company “North Asset Management” (the size of the established foundation – 1.8 bill Rbls.);

CJSC Managing Company “CenterInvest” (the size of the established foundation – 2 bill Rbls.).

By the results of two competitions with participation of OJSC RVC the established venture foundations may be described as follows:

legal status – Closed Equity Investment Fund (CEIF);

parity of co-investment funds of OJSC RVC and a private investor (49% / 51%);

possibility of an early redemption of equities by a private investor at a price equaling the purchase price increased by 5% interest per annum, but not higher than the inflation level;

the objects of investments for the funds are the companies established under the laws of the Russian Federation and which activity corresponds to the priority areas of development of science, technologies and engineering of the Russian Federation and/or which products/services are put on the list of the critical technologies of the Russian Federation;

in pursuing the investment policy OJSC RVC does not have a right of voting at adoption of investment solutions regarding the established funds.

The rules of trust management of the funds formed as a result of the second competition envisage partial payment of equities at formation (a system of “commitments”).

As of 1 July 2009, two foundations (CEIF “VTB-Venture Foundation”, CEIF “Bioprocess Capital Ventures”) were financed by 14 innovation companies to the total amount of 1.738 bill Rbls. And the total number of projects analyzed by all foundations exceeds 1500.

Among the main areas for investments by the established venture foundations there are biomedical technologies, power engineering and energy saving, information and telecommunication systems, technologies of software manufacturing.

At present OJSC RVC verifies the basic principles of relationships with the formed venture foundations as concerns the higher requirements to disclosing of the information about their activity, formalization of the mechanisms of selection and financing of the projects formed by the venture foundations, greater involvement of OJSC RVC in elaboration and realization of the investment policy of foundations.

OJSC RVC contemplates to elaborate a scheme of “seed” investments into the innovation projects that will fill the gap in the chain of financing of innovations between financing of research and experimental-design works and the venture investments proper at the start-up stage where the venture funds are created and operated, including with participation of OJSC RVC.

The scheme of “seed” investments approved by the Board of Directors of OJSC RVC assumes creation of CEIF amounting to no less than 2 bill Rbls. with participation of OJSC RVC as a stockholder possessing 100% of equities (seed investment fund). The companies implementing innovation projects at the earliest stages will receive to 75% of the required investments from the seed investment fund. Such projects will be selected and prepared by the companies – venture partners of OJSC RVC which competences will also include management of the financed projects and withdrawal from them of the seed investment fund.

Venture partners of OJSC RVC will perform in the regions with high innovation activity, large research and educational centers.

A possibility is being considered regarding application of the model used by OJSC RVC during establishment of the seed investment funds of GC “Rosnanotech” for consolidation of efforts for development of venture investments. It is contemplated a joint use of the infrastructure of seed investments in the form of an expert base and a network of venture partners for preparation of investments and post-investment monitoring of innovation companies.

OJSC RVC also performs non-financial activities aimed at development of the venture market in Russia and developing of relations with the international venture community among which there are:

- organization of regional meeting of practical consulting;
- accomplishment of a program of interaction among higher education institutions;

- realization of PR actions for widening the awareness about innovation business enterprise and informing the innovators about the programs of support of high technology business enterprise;
- holding of “round-the-table” meetings with the market participants;
- joining by OJSC RVC the membership in EVCA and RAVI and signing agreements on cooperation with the Foundation for Promotion of Small Enterprises in Science and Technology, National Investment Foundation of Kazakhstan, Federal Agency on Management of Special Economic Zones (RosSEZ) and with some regions of Russia.

The works are underway on development of information sites for formation of the single information environment of the Russian venture community and wide informing of the public about venture investment activities.

The Board of Directors of OJSC RVC at its meeting on 6 June 2009 approved the basic provisions of the company’s strategy based on the Concept of Long-Term Socio-Economic Development of the Russian Federation for the Period Till 2020.

Following the approved basic provisions of the strategy of OJSC RVC the company sees its mission as follows:

“To ensure accelerated formation of the effective and globally competitive national innovation system by creation of the self-developing venture sector cooperating with other development institutions by attraction of the private venture capitals, development of innovation business enterprise and technological business expertise, mobilizing the labor resources of Russia”.

Regional venture funds

For support of small business in science and technology and also for realization of the mechanism of the private-state partnership by attraction of private investments into high technology enterprises it is arranged to fulfill the program “Creation and Development of Infrastructure for Support of Small Enterprises in Science and Technology” within which the regional venture funds are being created in the regions of the Russian Federation.

The objective of the private-state venture funds created within the framework of this program is to develop on the territory of a region the infrastructure for venture (risk) financing of small enterprise in science and technology. For attainment of this objective the funds use the property only for purchase of investment equities of the closed equity investment funds.

The boards of trustees of these funds include three representatives from a region and the Ministry of Economic Development of Russia each. The powers of such boards of trustees comprise approval of a competition-based selection of a managing company, taking decisions on selection of a managing company, taking decisions on placement of temporarily idling money of the fund and others.

The funds are entitled to transfer the assets into trust management of a managing company that has won a competition. After registration of the rules of trust management with the Federal Service for Financial Markets of Russia a managing company starts formation of a closed equity investment fund which assets should consist for 50% of the assets contribution of the Fund and 50% of the assets of other (non-budget) settlers of trust management.

The period of action of a trust management agreement is no longer than 7 years. The companies which investment projects are seeking financing from the regional venture fund should pass the expertise of the supervisory board consisting of representatives of investors (stockholders) and a managing company that decides whether a company may be referred to small enterprise and whether there are no signs of affiliation to a managing company or stockholders.

For the period from 2005 to 2008 in the course of implementation of this program there were established 23 regional venture funds in 21 regions. Practically all funds are actively engaged in selection of investment projects and financing of the selected projects. Three funds in the Novosibirsk Region, Chelyabinsk Region and Republic of Bashkortostan cooperate energetically with the managing companies regarding elaboration of the Rules of Trust Management of Funds.

As of 30 May 2009, the total capitalization of regional venture funds was 8.650 bill Rbls., of which the appropriations from the federal budget make 2.1 bill Rbls, the total number of companies that received investments – 29, while the total amount of investments – 1.4 bill Rbls.

And the half of investments of these funds were put into the information and telecommunication small companies, the fifth share – into biological and medicine technologies and equipment and each tenth project related to the nanosystem and nanotechnology areas.

About 45% of the invested projects are at the stage of product development. Each fifth project includes the companies realizing test deliveries of the product.

In 2008 the Ministry of Economic Development of Russia initiated formation of the funds of mixed investments and funds of shares into small production companies on the principles of the private – state partnership. The federal subsidies in the amount of 100 bill Rbls. were granted to the Orenburg Region, Chelyabinsk Region and Khanty-Mansi Autonomous Area. Three funds established with participation of the mentioned subjects of the Russian Federation and taking together the finance from the regional budgets and the finance of non-budget investors will ensure investments in the amount of 1.2 bill Rbls. into projects of small companies 30-50 mln Rbls. worth.

Public corporations

Among development institutions a special place is given to public corporations. They are a transitional form called to facilitate consolidation of the public assets and to improve efficiency of their strategic management.

Table 7.1 describes main features of public corporations oriented to operation in R&D.

Table 7.1. Public corporations in high technologies

Name and date of establishment	Area and objectives of activity	Evaluations of property and assets
Russian Corporation of Nanotechnologies 19.07.2007	The corporation is aimed to facilitate implementation of the federal policy in nanotechnologies, development of innovation infrastructure in the area of nanotechnologies, implementation of projects on development of perspective nanotechnologies and nanoindustry.	Property contribution of the Russian Federation in 2007 made 130 bill Rbls.
State Corporation for Assistance to Development, Production and Export of Advanced Technology Industrial Product "Rostekhnologii" 23.11.2007	To facilitate development, manufacturing and export of high technology industrial products by support of the Russian developers and manufacturers of high technology products on the domestic and foreign markets, attraction of investments into organizations of various industries, including the defense-industrial complex.	The final composition of the property has not been identified as yet.

State Atomic Energy Corporation "Rosatom". 01.12.2007	The corporation operates for support of the federal policy, realization of the regulatory-legal control, provisions of governmental services and management of public property in the area of nuclear energy use, development and safe operation of organizations in the atomic energy-industrial and nuclear armament complex of the Russian Federation, ensuring the nuclear and radiation safety, non-proliferation of nuclear materials and technologies, development of nuclear science, equipment and professional education, promotion of international cooperation in this area.	The assets are evaluated to 1 tril Rbls. (scientific centers, nuclear stations, U-mines, plants on uranium dressing and nuclear fuel production, enterprises and objects ensuring nuclear and radiation safety).
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Source: Federal laws regarding establishment of public corporations; official sites of public corporations.

With strengthening of the institutions of corporate regulation and financial market some public corporations should be converted into joint stock companies followed by complete or partial privatization. Some public corporations with the end-date of their existence should cease to exist.⁵⁵

Innovation foundations

This group takes together the organizations with various forms of ownership in which investments and innovations are one of the line of activities.

Some part of the federal budget is appropriated to R&D on a competition basis via three foundations: Russian Foundation of Basic Research, Russian Humanity Research Foundation and the Foundation for Promotion of Small Enterprises in Science and Technology. Their activities are described in other sections. We should also add here the **Russian Technology Development Foundation (RTDF)** being the head organization in the system of non-budget foundations for support of science and technology. RTDF undertakes registration of non-budget and, first of all, industry foundations and control of their activities. At present the system of non-budget foundations of R&D includes 29 foundations of which 16 are established by the federal executive bodies, while the rest – by commercial organizations. Now the industry foundations have the following organizations: the Ministry of Transport, Ministry of Information and Communications of Russia, Rosatom and OJSC “Russian Railroads”. Subject to the effective laws, the non-budget R&D foundations are formed from voluntary contributions in the amount to 0.5% of the gross receipts.

The budget of RTDF is formed from 25% of deductions from the budgets of industry foundations and its amount varies within 1.5-4% of the federal expenditure on civil science. In addition, RTDF that finances R&D on a refundable basis forms its resources from the funds repaid by executing organizations.

The so-called non-budget foundations may also include:

- Foundation for Promotion the Innovation Activity in the Higher School;
- Foundation for Small Business Support operating at the European Bank for Reconstruction and Development;
- Russian Technology Foundation is the international foundation for venture investment, practicing in some cases direct investments into large innovation projects, representing such investors as International Financial Corporation, SITRA and the Asset Management Company. At the same time the essential part in the Foundation capital is made of contributions of private international investors from the USA and Europe.

⁵⁵ Concept of Long-Term Socio-Economic Development of the Russian Federation for the Period Till 2020.

Operating are also regional foundations, such as Bashkiria Foundation of Innovation Support or the Ekaterinburg Foundation of Small Business Support “Business – Incubator”.

In the Northwestern Federal District an important role is played by the Regional Foundation for Science and Technology Development of Saint-Petersburg. This foundation was established as a non-profit organization in 1992 for promotion the regional science and engineering and development of innovation activity in Saint-Petersburg and Leningrad Region.

We should also mention here the International Foundation for Technologies and Investments (IFTI), the Innovation Foundation “AZ Capital” (Ekaterinburg) and OJSC “Khakassky Innovation Foundation”.

Special floors for trading securities of high technology companies

At present Russia faces the deficit of stock markets, in particular, targeted to high technology companies, including small and medium enterprises. What is needed now is to create and develop the special floors for trading securities of such companies, if to take into consideration that the existing stocks exchange specialize mostly on trading securities of large companies handling raw materials.

Still in 1999 an attempt was made to start the project “Growth Market of Saint-Petersburg” for creation of the trade segment with the same name of the Saint-Petersburg Currency Exchange (SPCE) for trading shares of the growing innovation organizations, first of all, in Saint-Petersburg, Leningrad Region and Northwestern Region of Russia. This project was elaborated to develop a mechanism for financing small and medium dynamically developing Russian organizations through placement of their shares at stock exchange. The Project “Growth Market of Saint-Petersburg” was realized by the stock exchange with the help of the Company for Promotion of Exchange and Financial Markets in Central and Eastern Europe that provides consultancy services as a member of the Group “German Exchange” and was supported by the TRANSFORM Program of the German government. However, this project that lasted for about 3 years was not successful. The high technology exchange failed to attain the due status.

In order to overcome the gaps in the legislation, in 2005-2006 there was conducted a competition for development of the regulatory, legal and methodological base for functioning of the electronic high technology marketing system and implementation of pilot projects within the framework of the Federal Target Program “Research and Development in Priority Areas of Science and Technology Development in Russia for 2002-2006”.

In 2006 the RF Federal Commission for Securities registered the High technology Stock Exchange (HTSE) that was established two years before and stated that its mission was to attract investments into perspective Russian high technology projects and perform this on the conditions that were utterly beneficial for emitters and investors alike. The stock exchange should provide practically the whole range of services typical of such organizations, but focusing mostly on trading securities of high technology companies. It will organize trading and clearing on the market of securities and their derivatives.

7.2. Infrastructure of support of small innovation business enterprise

In the system of support of innovation processes the key role is played by support of small business which contribution, as of 1 January 2009, into GDP was 21%.

According to the Resource Center of Small Enterprise (that is in itself is an important infrastructure link in the considered structure), 99 regional, interregional and other foundations for support of small business enterprise, 110 municipal foundations, 22 leasing companies, the Special Bank for Crediting Small Business (CMB Bank) with its 18 regional offices, other banks having programs for support of small

business enterprise as well as non-bank microfinancial organizations, credit cooperatives and other organizations are operating in Russia. However, not all of them take part in financing of small innovation organizations.

7.2.1. Foundation for promotion of small enterprises in science and technology

This Foundation provides funds for financing R&D companies at the initial stages of their development and science organizations. This foundation is a public non-profit organization established by the Government of the Russian Federation in 1994. This Foundation is directed 1.5 percent of funds from the federal budget appropriated to financing civil research and development. In 2008 the Foundation was allotted 1567.5 mln Rbls. and in 2009 – 2326.6 mln Rbls.

Basic objectives of the Foundation:

- pursuing state policy on development and support of small enterprises in science and technology;
- rendering direct financial, information and other support to small innovation enterprises implementing projects on elaboration and development of new science-intensive products and technologies on the basis of the intellectual property of these enterprises;
- creation and development of the infrastructure for support of small innovation business enterprise.

The representation offices of the Foundation are opened and operating in 30 regions of the Russian Federation. The projects are subject to independent expertise for their scientific and engineering novelty, financial and economic feasibility, good prospects for manufacturing and marketing. For expertise of projects more than 2455 independent experts are invited, of which 748 are doctors of sciences, 1050 – candidates of sciences. By the beginning of 2008 financial support was provided to more than 5000 projects.

The greater part of the Foundation funds is used on R&D projects. Other funds (about 15.0%) are directed to creation of a network of innovation and technology centers (about 30 such centers were already established in Russia), development of the infrastructure for technology transfer, attraction of university students and young scientists of RAS into innovation business enterprise, support of the companies for their participation in exhibitions, workshops, training of managers.

The Foundation develops its activities on the basis of ***special programs***.

From 2003 the *Program "Start"* has been implemented. For its recipients the two-stage support procedure was adopted. At the first (seed) stage lasting to one year they do the following: development of a product prototype, its testing, patenting, registration of an enterprise if this was not done earlier, elaboration of a business plan for the next two years. The application for participation in a competition may be submitted on behalf of an enterprise if it was established no earlier than two years prior to application submission. At the second stage lasting to two years the startup of a company occurs. The projects are financed by conclusion of federal contracts on the non-repayable and royalty-free basis. The total budget of the project supported by the Foundation may reach 6.0 mln Rbls., including to 1.0 mln Rbls. in the first year, to 2.0 mln Rbls. in the second year and to 3.0 mln Rbls. in the third year of the project implementation.

Transition to the second and third years of financing goes on through competition. The main requirement for continuation of the financial support is fulfillment by the executor of all obligations on attraction of an external investor.

The Foundation selects for financing to 400 new projects under the Program “START”. This Program is organized rather well. It has a mechanism for independent expertise of the submitted applications.

Program “Umnik” (Clever) (“Participant of the Youth Science-Innovation Competition”) focuses on revealing the young scientists seeking self-realization through innovation activity and stimulation of wide participation of the youth in science, engineering and innovation activities through organizations and financial support of innovation projects. The Foundation finances fulfillment of the R&D projects by the Program participants that may be private persons aged from 18 to 28 only (students, postgraduates, young researchers) selected at the events accredited by the Foundation (conferences, competitions, seminars, scientific schools) in particular science areas.

Program “Pusk” (Start) (partnership of universities and companies) focuses on financing (in partnership with executors) of innovation projects implemented by small innovation companies on the basis of developments and with the personnel support of RF universities. The source of financing – the funds of the federal budget appropriated to science.

A participant of a competition may be a small innovation enterprise in partnership with a higher education institution of the Russian Federation (executors of works).

Program TEMP – Technologies to Small Enterprises – has been realized since 2005. The project should be based on acquiring of new technologies and engineering solutions from the Russian universities, academic and industry institutions. The Foundation provides financial support on the non-repayable and royalty-free basis to small enterprises for covering their expenditure on R&D that should be performed for keeping the license.

It is contemplated that the full use of the license (100% of production under a license agreement) will take no more than 3 or 4 years and implementation of the required R&D will be completed by the time of attaining 50% in development of product manufacturing under a license.

The institutional base for implementation of START and TEMP Programs is the innovation infrastructure supervised and controlled by the Foundation (the Foundation proper and its representation offices in the regions).

Program “Razvitie” (Development) operates in accordance with the Federal Law “On Development of Small and Medium Business Enterprise in RF” adopted in 2007. The support on the parity basis is provided to small companies having plans on commercialization of a particular scientific concept. A company submitting its project to a competition should have the right to performance of R&D. It’s good if such company has its own scientific, engineering and financial history and has a certain niche on the market. The project should be based on the professional analysis of the market situation and well developed business plan. The project will receive financial support not only from the Foundation for Promotion of Development of MP NTS, but from internal funds of an applying enterprise.

Under the Program “Stavka” (Interest rate) the Foundation repays a part of the interest rate on a credit or leasing payment to enterprises realizing innovation projects. This Program keeps in view the enterprises that are planning to receive (or already received in 2005) the bank credit at any operating bank of RF for the R&D project or to purchase equipment on the leasing basis.

The scheme of relationships between the Bank and the Foundation is as follows:

1. A small innovation enterprise receives a credit from the Bank.

2. If a small enterprise for attainment of the objectives for which the credit was taken implements simultaneously R&D, then such enterprise may apply to the Foundation for non-repayable funding amounting to the interest rate on the Bank credit.

Program "INTER" is designed for small enterprises – residents of special economic zones of the engineering-commissioning type (ECE) and technoparts by the Foundation for Promotion of Small Enterprises in Science and Technology together with the Federal Agency for Management of Special Economic Zones.

7.2.2. Incubators, technoparks and innovation technology centers

Beginning from 1990 Russia initiated formation of the elements of an innovation infrastructure of the market type (science-engineering parks and business incubators). At first the technoparks were established on the basis of higher education institutions – in 1990 in Tomsk, in 1991 in Moscow and Zelenograd. In the mid-1990s the first technoparks set up on the basis of large public research centers (PRC) started appearing, and later on the regional technoparks were established.

Business incubators. At present in Russia about 120 business incubators are operating that were established for support of the companies at their early stage of development. The incubators provide premises for rent on a privileged basis as well as consulting, accounting and legal services. The total area of operating business incubators is 178,000 sq. km; they provide 10.8 thousand workplaces.

Technoparks. Russia witnesses the quick growth of the number of organizations registered as technoparks. According to NIIAC MIIRIS, in 2006 there were registered 55 technoparks, in 2008 their number increased to 83.⁵⁶ During two years 3 new technoparks appeared in the Voronezh Region, 4 in Moscow and the Republic of Tatarstan each.

Some Russian technoparks are working quite successfully, but, unfortunately, their number is not large. By the results of technopark accreditation conducted in 2000-2003 no more than 25-30 percent of technoparks available that time satisfied the assessment criteria. These criteria for assessment of technopark activities included the following: technopark scale (number of small innovation enterprises – SIE); contacts with universities (base organization); SIE origin; SIE growth dynamics; scope of the resolved tasks; sources of financing; qualifications of technopark managers; personnel training.

So far the Russian technoparks differ significantly by the objectives, functions and composition. Thus, in particular, they may be equivalent to the innovation technology center. In some cases they act as a business incubator. Quite often their functions go beyond the infrastructure framework and add to a technopark the features of innovation organizations. The most vivid example is the oldest Russian technopark in the city of Tomsk. It functions now as the "Innovation Technology Center "Technopark". At the same time it is not a compact organization and identifies itself as "extended ITC". While the Tomsk International Business center "Technopark" that isolated from it functions as a real technopark.

In 2006 the Government of Russia adopted the Federal Program "Establishment in the Russian Federation of Technoparks in High Technology Area". It envisages creation of a network of technoparks of a higher level than most of the existing ones. According to the idea of the Program developers, they should become rather the technopolises⁵⁷, the cores of the developing high technology clusters.

⁵⁶ As there are no distinct requirements to organizations of such type, some experts believe that at present Russia has some 800 organizations that may be referred to this category.

⁵⁷ The Russian Large Dictionary of Law Terms define technopolis as one of the forms of a free economic zones called to activate the innovation processes with the help of regional centers on development and manufacturing of high technology products. The multi-field activity of a technopolis is based on formation and execution, with the

The Ministry of Information Technologies and Communications of Russia is charged with coordination of the efforts of the federal authorities on establishment of technoparks in the high technology areas as stipulated in the State Program.

The State Program envisages as pilot projects the establishment of technoparks in high technology areas in 2006-2010 on the territory of the Moscow, Novosibirsk, Nizhegorodsky, Kaluga, Tomsk and Tyumen Regions, in the Republic of Tatarstan and in Saint-Petersburg.

Technoparks and innovation technology centers in the subjects of the Russian Federation the establishment or essential development⁵⁸ of which is envisaged in the State Program are presented in Table 7.2.

Table 7.2. Technoparks and innovation technology centers in the subjects of the Russian Federation which establishment or essential development⁵⁹ is envisaged in the State Program

Moscow Region	Science and technology park in the high technology area in the Dmitrov District of the Moscow Region (in 2008 the total financing was 50000.0 thou Rbls.)
Moscow Region	Science and technology park in the town of Chernogolovka of the Moscow Region (in 2008 the total financing was 47210.0 thou Rbls.)
Novosibirsk Region	Technopark "Novosibirsk" in high technology area (in 2008 the total financing was 388500.0 thou Rbls.)
Nizhegorodsky Region	Technopark in the high technology area being established in the village of Ankundinovka of the Nizhegorodsky Region (in 2008 the total financing was 248138.7 thou Rbls.)
Kaluga Region	Obninsk Science and Technology Park "INTEGRO" (in 2008 the total financing was 409711.3 thou Rbls.)
Tyumen Region	Tyumen Science and Technology Park (in 2008 the total financing was 300000.0 thou Rbls.)
Republic of Tatarstan	Innovation Production Technopark "Idea" in the high technology area (in 2008 the total financing was 596440.0 thou Rbls.)
Saint-Petersburg	Technopark in the high technology area being established in Saint-Petersburg (in 2008 the total financing was 160000.0 thou Rbls.)
Kemerovo Region	Kemerovo Science and Technology Park in the high technology area (in 2008 the total financing was 100000.0 thou Rbls.)

It is assumed that the federal support will be substitute the market mechanisms of development of high technology industries regardless of the fact that the infrastructures of technoparks are created using, among others, the funds from the budget of the Russian Federation.

Innovation technology centers (ITC). The first innovation technology center was opened in Saint-Petersburg in 1996 on the basis of AOOT "Svetlana" specializing in instrument making. The model of innovation technology center was taken into consideration in the future for elaboration of the Interdepartmental Program for Innovation Activity in Science and Technology in Russia that was initiated in 1997 by the joint efforts of the Ministry of Science, Ministry of Education, RTDF and the Foundation for Promotion of Small Enterprises in Science and Technology. It was adopted that ITCs were

state support, of the projects of basic and applied research and their subsequent utilization in industry (through the science and industry technopark).

⁵⁸ Some centers, such as for example Technopark "Novosibirsk", have been operating for long, but their essential updating is planned.

⁵⁹ Some centers, as, for example, Technopark "Novosibirsk", have been operating for long, but their essential updating is proposed.

conglomerates of numerous small enterprises located within one territory. Significant funds were appropriated to their formation. They were invested largely into repair and equipment of the premises to be occupied by small enterprises.

The number of ITC is growing quickly and their number is not less than 85 now. In 2006-2008 about 20 new ITC appeared in different regions of the country.

The main specific feature of ITC is that they, in fact, are a structure for support of the already formed and operating small innovation enterprises. They are called to ensure more sustainable links between business and industry. So, they are most often created at enterprises or research-production complexes. This very scheme of a network support of ITC in technoparks is used in Novosibirsk. Here a whole network of ITC is operating in the Technopark "Novosibirsk".

The "classical" ITC is the Research Park of the Moscow State University (MGU). In fact, it transformed from one form into the other and became ITC, while the name "Research Park of MGU" became its proper name. ITC provides a complex of services to small enterprises inside it: apart from rent of premises it provides engineering, information and consultancy support as well as formal and informal guarantees for small enterprises seeking sources of funds for their development.

However, the objectives and tasks formulated by ITC for their activity are very diverse. Thus, ITC of the Saint-Petersburg University of Information Technologies, Mechanics and Optics (SPGU ITMO) is the structural division of this university. It states its mission as creation of long-term competitive advantages to ITC residents and partners through integration of education, science and business. For this purpose ITC develops its own infrastructure and provides it (including equipment for research, experimental and design works) to small innovation enterprises and companies and also to individual scientists, specialists and research teams. The center provides legal, financial, engineering, marketing and other services, carries out expertise, analysis and assessment of innovation proposals and science-engineering projects, marketing of respective products and search for partners on the domestic and foreign markets, supports and organizes technology transfer among ITC residents and also transfer of technologies developed in ITC to Russian and foreign customers. For financial support of innovations ITC participates in establishment of special foundations. And, of course, it gives a helping hand to small enterprises in improvement of their relationships with the governmental authorities.

Some ITCs regardless of the fact that they were established rather long ago failed to become the really operating entities. It should be reminded here that organizations that did not pass accreditation conducted at the beginning of this decade continue their official existence. We think that the main reason should be sought in the very principle of the infrastructure formation – "from top" without taking into consideration the actual condition of the business enterprise environment in a region.

Blurring of the ITC functions hampers the monitoring of these objects, makes impossible the elaboration of criteria for assessment of their activities. Consequently, some analytical work should be done to verify the situation in this area.

Innovation centers. This group of organizations in the innovation infrastructure with a rather wide scope of functions is characterized by an inhomogeneous composition. The directions of activity of innovation centers differ greatly in reality. Some of them, for instance IC "Koltsovo", are well-developed organizations that perform different functions, those of a technopark, innovation technology center and technology transfer center. IC "Koltsovo" is a part of the Russian technology transfer network. The Research-Production Association "Siberian-Ural Innovation Center" also has a wide range of activities, including production. Other ICs perform largely the consulting functions.

The number of IC is quickly growing. Since 2006 it has increased from 10 to 15. New ICs were established in 5 regions, and 2 of them in the Khabarovsk Territory.

7.3. Regional profile

While analyzing the regional distribution of the infrastructure organizations one should take into consideration the orientation of an organization, the way of its establishment and sources of financing. For example, technoparks were established largely on the initiative and under the auspices of universities and research centers that often financially supported them, so technoparks acquired some freedom of operation. Therefore, the number of technoparks is greater in those regions of Russia where there are more research organizations and where they are larger. The same may be applied to ITC, although at first their establishment was initiated by the government. As concerns the technology transfer centers, the federal and regional authorities do not officially participate in their establishment, although they provide some indirect support to them. That is why their distribution pattern over the country is practically the same as with technoparks.

Table 7.3 shows distribution of technoparks, ITC and CTT by federal districts of the Russian Federation.

Table 7.3. Distribution of technoparks, ITC and CTT by federal districts

	Number of research organizations	Number of researchers	Number of technoparks	Number of ITC	Technoparks and ITC	Number of CTT	Technoparks per a research organization	ITC per a research organization	Technoparks and ITC per a research organization	CTT per a research organization	Technoparks per 100,000 of researchers	ITC per 100,000 researchers	Technoparks and ITC per 100000 researchers	CTT per 100,000 researchers
Russian Federation	3622	388.9	83	89	172	100	22.9	24.6	47.5	27.6	21.3	22.9	44.2	25.7
Central Federal District	1426	206.4	31	37	68	33	21.7	25.9	47.7	23.1	15.0	17.9	32.9	16.0
Southern Federal District	312	16.4	6	6	12	12	19.2	19.2	38.5	147.4	36.6	36.6	73.2	73.2
Northwestern Federal District	531	54.6	3	16	19	11	5.6	30.1	35.8	20.7	5.5	29.3	34.8	20.1
Far Eastern Federal District	156	6.63	4	5	9	8	25.6	32.1	57.7	51.3	60.3	75.4	135.7	120.7
Siberian Federal District	425	29.5	6	16	22	10	14.1	37.6	51.8	23.5	20.3	54.2	74.6	33.9
Ural Federal District	225	22.1	12	2	14	6	53.3	8.9	62.2	26.7	54.3	9.0	63.3	27.1
Volga Federal District	547	53.3	11	7	18	16	20.1	12.8	32.9	29.3	20.6	13.1	33.8	30.0

If we measure the activity of research organizations and higher education institutions with regard to their sizes on creation of the innovation infrastructure of these types in their regions by the number of infrastructure organizations per 100,000 researchers, then we may see a sharp differentiation of the regions both by separate kinds of infrastructure and in general (see Figure 7.1).

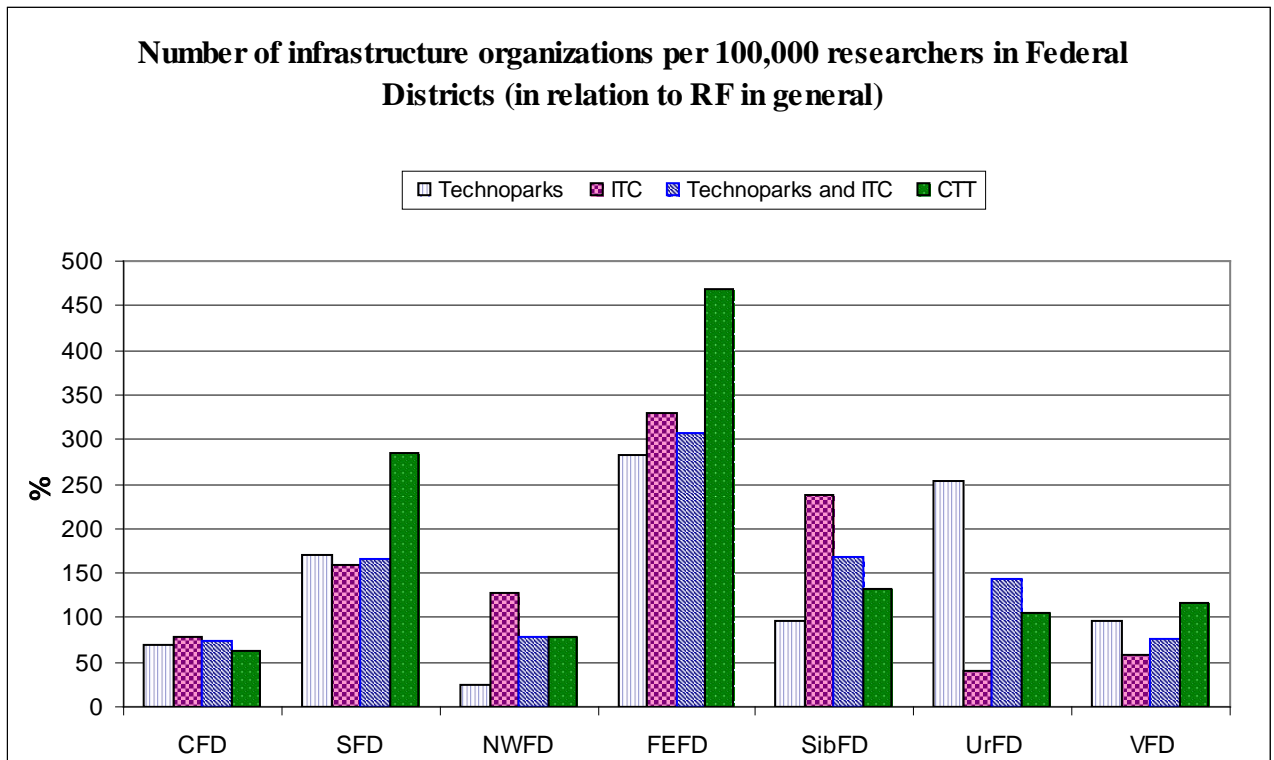


Figure 7.1. Number of infrastructure organizations per 100,000 researchers in Federal Districts

The Figure shows that the ratio between the number of technoparks, ITC and CTT and the number of researchers is lower in the regions where the research and technological potential is the highest. The Central Federal District where practically all characteristics are determined by Moscow and Moscow Region is highly saturated with research organizations and higher education institutions and reveals rather a small number of infrastructure organizations. The Central Federal District concentrates over 50% of researchers in the Russian Federation. Therefore, in most research-saturated regions, including Moscow, the relative involvement of researchers into activity of the innovation infrastructure is the lowest. This situation may be explained differently. The main thing is that in CFD the researchers are historically involved in the established relationships with the organizations in industry and services and resolve the problems of innovation activity without formal intermediaries. On the other hand, higher education institutions in the regions where the relationships of scientific and educational organizations with the industry were formed anew in the market conditions turned out more sensitive to the work of new objects of infrastructure.

8. SWOT-ANALYSIS OF THE INNOVATION SYSTEM OF RUSSIA

The current economic crisis has demonstrated that despite obvious enormous advantages in such aspects as:

- beneficial geographical location;
- enormous prospected reserves of natural resources, energy and technological raw materials;
- great scales of initial processing;
- considerable development of technology in defense and related industries, such as space, aviation, shipbuilding, chemical;
- high educational level of the population;

- availability of the qualified research personnel and world acknowledged scientific schools, especially in the fundamental sciences;
- solid energy base and infrastructure,

the Russian economics keeps its raw-material orientation and its significant technological backwardness is retained in many industries.

The previous sections described the present-day level and development trends of the main segments of R&D – education, science, business and infrastructure. And it becomes visible that one of the key problems of Russia R&D is inadequate coordination among three basic components of R&D: the research and development sector, the higher education sector and the business enterprise sector. And these factors become responsible for:

- low efficiency of commercialization of R&D results;
- low demand for the potential capacity of the academic and higher education sectors of science;
- imbalance in development of some elements of the innovation infrastructure, lack of effective economic interrelation among them that results in poorly performing mechanisms of transfer of knowledge and new technologies to the domestic and foreign markets;
- lack of special training of the personnel for particular areas of innovation activity;
- breakdown of a chain of reproduction of research personnel, engineering personnel in some areas of science and technology.

Before getting to the SWOP-analysis we would like to detail on the merits and drawbacks of one of the most important systems characteristic of R&S – forms and methods of financing the science and innovations.

Federal financing of the research, engineering and innovation policies of Russia uses three basic mechanisms – cost estimate, program-targeted and foundation-grants, and it is realized as follows:

- RF budget that envisages expenditure on fundamental and applied research in the sections “General national issues” and “National defense” and others;
- targeted financing through federal target programs (FTP);
- financing through a system of public foundations of research activity and innovations and through non-budget foundations;
- financing through a system of startup, “seed” foundations, venture foundations, direct investment foundations (being shaped and so far the establishment of such foundations is financed).

Budget financing

The procedures of preparation and verification of the initial budget assumptions applied in Russia are determined by the structure of the federal power bodies, correlation of the functions and powers legally assigned to them (regulations on ministries and departments), the regulatory-legal base of the budgeting process and also the established practice and informal procedures of interaction. For example, according to the main parameters of a budget the RF Ministry of Finance informs the RF Ministry of Education and Science about the financing limits by sections of a budget: “fundamental science” and “applied science”. The procedure of formation of budget assumptions is determined in the resolutions of the RF Government regarding elaboration of the country development forecasts and budget parameters, including by direct recipients. The main managers of the budget funds appropriated to civil science are the RF Ministry of Education, other ministries and departments, federal academies of sciences (including the Russian Academy of Sciences, the Russian Academy of Medical Sciences, the Russian Academy of Arts and others), the Moscow State University and budget funds for science support.

Russia has three types of budget classification of expenditure: by functional, departmental and financial assignments.⁶⁰ These classifications are used for preparation of a budget and also for analysis and control of its fulfillment. The specific feature of the Russian budgeting process is permanent changing of the *functional budget classification*. Thus, since 2005 it *lacks a special section of expenditure on science* ("Fundamental research and promotion of progress in science and technology). The same is true of the draft budget for 2009-2011. Appropriations to science are scattered over all sections named "fundamental research" in the section "General national expenditure" and "applied research" everywhere. This circumstance impedes the assessment, monitoring and correction of government actions in this area.

System of foundations

The projects financed through a system of foundations are distinguished by a possibility to conduct competitions of initiative projects and competitions of executors. Moreover, the foundations help to resolve the problem of rendering support to the initiative projects of individual researchers, inventors, creative teams organized without formation of a legal entity. Therefore, a system of foundations is called to ensure an access to funds for the most qualified and creative researchers, inventors and research teams, innovation companies for their support at final stages (commercialization of results and support of innovation business).

The regulatory and legal base for a system of non-budget foundations of R&D, including the Russian Technology Development Foundation – RTDF, was elaborated in the mid-1990s and at present it becomes outdated and obstructs development and better output of foundation activities. There are legal restrictions of investment by a foundation of funds into organizations of the innovation infrastructure (technoparks, technology transfer centers and others). The requirement about obligatory repayment of all funds received from foundations within 3 years restricts significantly the scope of projects applying for financial support. As RTDF has no status of a legal entity it is unable to reinvest the repaid funds and to attract non-budget funds.

At present in RF *there are no foundations that ensure support of applied developments and inventions implemented by private persons*. The government *does not support the formation of non-federal research organizations* on the basis efficient creative teams by provision to scientists and students the institutional grants on applied researches and establishment later on of a research company for further research and developments.

Development of new types of foundations may become one of the key mechanisms of support and stimulation of technological modernization of different industries in RF. *Now in this field we can name the following problems:*

- weak support of high technology companies at the early stages of an innovation cycle due to restricted scale of activity and resource supply of respective areas of activity of the Foundation for Promotion of Small Enterprises in Science and Technology;
- poor development of a system of private-federal regional and industry venture foundations, industry foundations of direct investments aimed at support of innovation projects of high technology small and medium business enterprise.

With the existing system of budget planning and federal appropriations to science, education and technology development oriented mainly to industry channels of financing it is rather difficult to formulate and more so to realize effective actions to overcome the consequences of the global financial and economic crisis. Although nothing is said about cutting of expenditure on science due to the

⁶⁰ Functional and departmental assignments are used in preparation of a budget, the financial assignment – the Rosstat.

financial crisis, but at the same time there is no a program of actions regarding support of the research and development sector in the crisis situation as it was made in some leading developed countries.

Table 8.1. SWOT-analysis of the Russian NIS

Strong points	Weak points
<ol style="list-style-type: none"> 1. Abundant natural mineral resources, extensive territory that may be effectively developed by innovation companies. 2. High growth rates in economics in 2000-2007. 3. Technical modernization of some industries being successful in the pre-crisis period. 4. Historically solid research and engineering culture, traditions and accumulated experience in organization and performance of researches and developments. 5. Qualified (higher than in China) and cheap (cheaper than in Europe) labor force and science and engineering personnel. 6. Soaring growth of the number and diversity of infrastructure in innovation area. 7. Relatively good equipment of the management body of companies with modern information and technological facilities. 8. Industry has moved rather far on the road of market reforms, the management quality has improved, in many sectors the process of corporate construction has completed. 	<ol style="list-style-type: none"> 1. High level of monopolization of the national and regional markets, domination of large companies from the raw material sector in the groups of leaders of Russian business. 2. Inadequate coordination between public and private sectors in development of priorities for research, engineering and innovation development and measures for their implementation. 3. Prevailing of the budget financing of all forms of research and innovation activity and innovation infrastructure. 4. Lack of a coordinated policy regarding transfer of knowledge and technologies. 5. A low level of support of small innovation organizations. 6. A low level of innovation activity of business. Prevailing of non-innovation methods for creation of competitive advantages in the majority of companies. 7. Outdated technological structure of the basic capital in many industries, reduction of possibilities for modernization in the face of modern crisis. 8. The crisis situation in industry and company's science, great inhomogeneity of the research sector, a gap between industry requirements and science. 9. Inadequate level of internal demand for innovation products. 10. A low level of innovation culture and lack of experience in innovation business enterprise.
Possibilities	Threats
<ol style="list-style-type: none"> 1. Possibilities for leapfrogging to higher levels of technology development in some sectors due to the effect of lagging development. 2. Soaring development of the global market of engineering services on which the Russian companies and research organizations are positioned rather high. Areas of specialization are development of aerospace technologies, software and some fields of ICT. 3. Integration into the global technological chains in the traditional and high technology industries. 4. Enhanced competition on the domestic markets 	<ol style="list-style-type: none"> 1. Persisting technological lagging behind in some important monopolized sectors of economics. 2. Exhausting of advantages by the quality of the human capital and other components of the innovation potential. 3. Sharp cutting of expenditure on research and development in conditions of the global financial and economic crisis and growing backwardness of Russia in technology. 4. Intensification of the protection tendencies in conditions of the global financial and economic crisis.

<p>as a stimulus for innovation activity. 5. Joining WTO and lowering of barriers to the world markets.</p>	<p>5. Greater involvement of the state in economics and lowering of stimuli for business enterprise activity.</p>
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PART III. STATE INNOVATION POLICY

9. Development of National Innovation System

Basics of the Russian innovation policy were laid in the 1990's and set out in Federal law "On Science and State Scientific and Technological Policy" in 1996. During this period the State took active measures to support science under crisis conditions and at the same time to establish new institutional environment, new mechanisms and institutions for science and innovative activities.

In the 2000's experts began to prepare the conceptual documents, called to specify the strategic, long-term research and innovation policy and to incorporate it into other economic initiatives of the State. During this period, problems of formation of the national innovation system and transition to the innovation economy, embodied in a number of government documents were formulated. This section considers the main objectives and tasks, set forth in documents of this period, analyzes changes in the structure of public administration and incentives for innovation development.

9.1. Long-Term goals of the Russian Federation innovation policy

In accordance with Federal law "On Science and State Scientific and Technological Policy" (redrafted in 2006), main objectives of the state scientific and technological policy as a main component of innovation policy are development, rational distribution and efficient use of technological capabilities, enhancement of the contribution of science and technology in the development of the country's economy, the implementation of primary social tasks, provision of progressive structural changes for the field of material production, enhancement of its efficiency and competitive advantage of production, improvement of environmental conditions and protection of information resources of the state, strengthening of the state's defenses and security of a person, society and state, integration of science and education.

The government scientific and technological policy is carried out on the basis of the following major principles⁶¹:

- Acknowledgment of science as a socially significant branch, which determines a level of development of productive forces of the state.
- Publicity and use of various forms of public debates in selection of priority directions of science and technology development and examination proceedings of research and technology programs and projects, which implementation is based on competition.
- Guarantee of priority development of basic scientific research.
- Integration of science and education in R&D on the basis of various forms of participation of teaching staff, postgraduates and students of higher professional education institutions through establishment of study-research complexes, laboratories, based on higher professional education institutions, platforms on the basis of scientific organizations of government academies of sciences, as well as research organizations of federal executive authority.
- Support for competition and entrepreneurial business in science and technology.
- Concentration of resources in priority areas of science and technology.
- Promotion of scientific, technological and innovation activity through a system of economic and other benefits.
- Development of scientific, technical and innovation activity through creation of public research centers and other structures.

⁶¹ Federal law "On Science and Governmental Scientific and Technological Policy".

- Development of international scientific and technological cooperation of the Russian Federation. Long-term strategic objectives of the Russian Federation in the field of science, technologies and innovations are embodied in a number of conceptual and policy documents adopted in 2002 – 2007:
 - “*Fundamentals of the RF Policy in the Sphere of Development of Science and Technology for the Period of up to 2010 and beyond*” (2002). This document assigned the thesis of the need for transition to innovative development.
 - “*Principal Directions of the RF Policy in the Sphere of Development of Innovation System for the Period of up to 2010*” (2005). This is the first official governmental document, which defines an innovation system and lists its main objectives:
 - Reproduction of knowledge, including knowledge with the potential market demand, through performance of a fundamental and exploratory research in the Russian Academy of Sciences and other academies of sciences of the state status, as well as in universities of the country.
 - Carrying out applied research and technological development in the national research centers of the Russian Federation and scientific organizations of industry, introducing scientific and technological results into production.
 - Manufacturing competitive innovative products, developing technologies and provisioning services.
 - Development of innovation activity infrastructure.
 - Personnel training for organizations and management in the sphere of innovation activity⁶².

In accordance with this document, the main objective of the government innovation policy is to create economic conditions for launching competitive market innovative products in order to implement the strategic national priorities of the Russian Federation by creating a favorable economic and legal environment, innovation infrastructure, and R&D result commercialization system.

In 2006, the Interdepartmental Commission for Science and Innovation Policy, chaired by the Minister of Education and Science adopted “*The Strategy of Development of Science and Innovation in the Russian Federation for the Period till 2015*”.⁶³ The medium-term objective of the Strategy is formulated as follows: “... the formation of a balanced R&D-effective innovation system sector, providing the technological modernization of the economy and enhancing its competitiveness through advanced technologies and transformation of scientific potential in one of the major resources for sustainable economic growth.”

Among the tasks expected to be resolved in the framework of the Strategy, the most important are:

- Creating a competitive R&D sector conditions for its expanded reproduction.
- Development of the effective national innovation system.
- Establishment of institutes of R&D result legal protection.
- Modernization of the economy through technological innovations.

⁶² In addition, innovation policy activities include the development of long-term scientific and technological forecasting of public-private sector partnership, public support for innovative industries and export promotion, stock market development, leasing of scientific equipment.

⁶³ “Strategy of Development of Science and Innovation in the Russian Federation for the Period till 2015”. The document was approved by the Interdepartmental Commission for Science and Innovation Policy, chaired by the RF Minister of Education and Science on February 15, 2006.

“The Program of Socio-Economic Development of the Russian Federation for Medium Term”⁶⁴ (2006) also emphasizes that promoting innovation is a means to achieve the strategic goals of the country. However, in this paper R&D sector is considered separately from the national innovation system, and among the resources for innovation development there is no system of education.

The integrated program of scientific and technological development and engineering modernization of the RF economy until 2015, elaborated by the Russian Ministry of Education and Science in 2007 served as an important milestone in the development of innovation policy. The program is called for providing comprehensive and focused efforts of government, private business and civil society institutions to promote scientific and technological development and technological modernization of the RF economy, as the various incentives are “scattered” in various target programs, sectoral strategies, different departments.

The Program regulates the design management of long-term scientific and technological forecasting by Forsyth methodology, formulates the principles of formation and organization of the implementation of national priorities of technological development. The characteristic of priority areas of technological upgrading of Russian economy key sectors is also given.

*The Concept of Long-Term Socio-Economic Development of the Russian Federation for the Period of up to 2020*⁶⁵ was adopted in November, 2008. Section 6 “Development of National Innovation System and technology” of the Concept defines the goal of creating the national innovation system, including provision for the creation and dissemination of innovation in all sectors of the economy, large-scale technological renovation of production, based on advanced scientific and technological development, the establishment of the R&D competitive domestic sector.

The key to achieve the stated goal of the Concept is the availability of adequate prediction tools that allow concentrating state resources in priority areas and the most effective expenditure of available resources, primarily budgetary funds .

Such tools have been developed during work on a long-term forecast of scientific and technological development of the Russian Federation until 2025, organized by the Ministry of education and science in conjunction with other federal departments and Russian Academy of Sciences. In November 2008, this work was completed, its results are presented to the President and the Government of the Russian Federation, as well as to the expert community and the general public for discussion.

Overall, after considering the results of the forecast one may state that a specific nature of the transition to an innovative scenario of the country development lies in the fact that Russia will have to simultaneously solve both problems of sharp reduction in the actual-to-date gap in the level of technological development of economy as a whole and of creating conditions for advancing breakthrough development in those sectors which determine its future specialization in the global economy.

At present, experts fulfill the work to establish a permanent system of scientific and technological forecasting, which will become an integral component of the state system of socio-economic conceptual foresight.

In addition, just now experts have elaborated a plan of the measures for stimulation of innovative activity of enterprises to be carried out in 2009-2010 in the frame of implementation of the Principal

⁶⁴ “The Program of Socio-Economic Development of the Russian Federation for Medium Term” is approved by the Government Order dated January 19, 2006.

⁶⁵ The Concept of Long Term Socio-Economic Development of the Russian Federation was elaborated for the period until 2020 in accordance with the RF President order following the results of the RF State Council session on July 21, 2006.

directions of the RF Government activity for the period until 2012⁶⁶. The plan includes measures for support of the priority areas of technological development, innovation activity of established businesses for improvement of the institutional environment, for support of establishment of innovative business and upgrading efficiency the innovation infrastructure, creating incentives for innovation activity in the public sector.

Totally, the comparison of the listed government documents suggests that the state innovation policy is a combination of measures to create a favorable climate for innovation, to stimulate industrial demand for R&D results and high technology, to arrange more favorable conditions for protecting intellectual property rights, to use incentives for the development of small innovative enterprises, to support innovation infrastructure and to promote cooperation networking.

The problems of stimulating innovations are specified both in a number of other federal programs and sectoral strategies of development. From the standpoint of innovation development of economy the most important ones are “*Energy Strategy of Russia for the Period of up to 2020*”, “*Federal Space Program*”, “*Development of Technologies for Civil Aviation*”, “*National Engineering Capability*”, “*Strategy of Development of Russian Chemical and Petrochemical Industries for the Period of up to 2015*” and others.

9.2. National priorities in science and technology

Fundamentals of the RF policy in the field of science and technology development for the period of up to 2010 and beyond provides for the establishment and implementation of the *RF Priority directions of science, technology and engineering development* and the *RF List of critical technologies*. The Priorities and the List of critical technologies, developed and approved by the RF President in May, 2006 (see Annexes 2.1 and 2.2) on the basis of Russia's national interests and taking into account global trends in development of science, technology and engineering, are aimed at solving the complex scientific and technological problems and focused on the end result, which could become an innovative product.

At present, Russian experts are working to adjust the approved priorities and the list of critical technologies on the basis of a long-term forecast of scientific and technological development with regard to the crises and trends of recent months.

At that it is obvious that under conditions of limited resources, aggravated in the world financial crisis conditions, the number of priorities should be reduced, but these will be the priorities, which will give maximum effect to ensure national security, increase of the production competitiveness and social development.

The critical Technologies allocated within the frames of each priority area will be most promising in terms of technological and innovation development, as well as will determine the guidelines of development for scientific and technological system of the country, taking into account the medium-term objectives of socio-economic development.

The priority areas and critical technologies will cover the regions with the greatest concentration of scientific and technological potential of Russia, mostly suitable to achieve scientific and technological breakthrough and to form new promising markets.

With regard to implementation of the approved priorities and critical technologies it should be noted that at present a significant problem is a low level of their integration into the system for adopting practical solutions on technical and scientific development and technological modernization of the Russian economy. Issues of development of critical technologies and their integration into the country's economy have not been adequately reflected in strategic documents of federal executive bodies and public corporations, including sectoral strategies and plans for their implementation as well as plans for technical, scientific and technological development.

⁶⁶ The Principal directions are approved by the RF Government Decree No. 1663-p, dated November 17, 2008.

Implemented federal and departmental target programs are also not fully focused on implementing specific critical technologies as an important element of the state scientific-technical policy. The exceptions are the Federal Target Program “Research and Development in Priority Directions of Development of Russia Scientific-Technological Complex for 2007–2012” and the FTP “Development of Infrastructure of Nanotechnology Industry in Russia for 2008–2010”.

9.3. Structure of the innovation activity government management

Government authorities at the federal level, formative research, technology and innovation policy of the country include: President of the Russian Federation, the legislature (the Federation Council and State Duma of the Federal Assembly of the Russian Federation), the Government of the Russian Federation and other executive bodies (federal ministries, federal services and federal agencies).

The President of Russia ensures coordinated functioning and interaction of bodies of state power, determines the main directions of state policy in the field of development of RS, the main directions of scientific-technical and innovation policy through the issuance of decrees and orders. The position of the head of state on the main provisions of the state policy is specified in the basic document – the President’s message to the Federal Assembly. The positions stated by the head of state on science, technology and innovation policy are taken into account by both the Parliament and the Government in drafting the bills scheduled, determining the positions of deputies on bills.

To assist the President in exercising his constitutional powers for determining domestic policy, the State Council of the Russian Federation was established under the President . This is a permanent advisory body, which *promotes the exercise of the RF President powers to ensure coordinated functioning and interaction of government authorities*. The structure of the State Council consists of executive staff of the Federation. Meetings of the RF State Council are held four times a year, its members discuss issues of special national significance, including those related to science, technology and innovation policy.

To facilitate development of national science and technology and innovation policy, there are also **Council for Science, Technology and Education under the RF President** – an advisory body established to inform the head of state of affairs in the sphere of science, technology and education, to ensure his coordination with scientific organizations and educational institutions, workers of science and education, to formulate proposals for the President on urgent issues of national science and technology and innovation policy, government education policy, and the recently established **Commission for Modernization and Technological Development of Russian economy** – an advisory body in the field of modernization and technological development of the country economy.

The Federation Council of the Federal Assembly of the Russian Federation takes part in the development of innovation policy through the Committee for Education and Science, the Industrial Policy Committee, the Information Policy Committee and initiates discussions in expert councils. The State Duma of the Federal Assembly of the Russian Federation includes several committees which discuss innovation policy: the Committee on Science and High Technology, Committee on Industry, Committee on Energy, Committee on Information Policy, Information Technology and Communications, Committee on Education.

Immediate provision of the RF Government activity, as well as interaction with the relevant federal ministries, federal services and federal agencies involve specialized **departments of the RF Government Office**. RS is managed by three specialized departments:

- The Department of Culture and Education of the RF Government.
- The Department of Defense Industry and High Technologies of the RF Government.
- The Department of sectoral development of the RF Government.

Under the RF Government, there are also consultative and coordinating bodies that ensure the interaction of federal executive bodies, executive bodies of RF subjects, and other organizations to implement a unified state policy in the field of science, technology and innovation policy. The RS management of the RF includes following commissions under the RF Government:

- The government commission to combat violations of intellectual property, its legal protection and use.
- The government commission on high technology and innovation.
- Military-Industrial Commission under the RF Government.
- Government commission on the investment projects of national importance.

The system of state executive bodies responsible for science and technology and innovation policy consists of the following ministries and agencies:

- (a) The Ministry of Education and Science, which occupies a central place in forming and implementing public research and innovation policy.
- (b) Agencies involved in policy making and coordinating activities in this area: the Ministry of Finance, Ministry of Economic Development, Ministry of Industry and Trade, Ministry of Energy, Federal Space Agency.
- (c) Governing (controlling) authorities. Major regulators of R & D sphere are the Federal Service for Intellectual Property, Patents and Trademarks (Rospatent), Federal Agency for Technical Regulation and Metrology and the Federal Antimonopoly Service (FAS).

The Federal Agency for Science and Innovation, which belongs to the Ministry of Education and Science, is the executive authority performing functions of public policy implementation, accomplishment of public services and management of state property in science, technology and innovation field. This includes control over the activities of the federal centers of science and high technology, public research centers, the unique scientific stands and installations, the leading scientific schools, the national research computer network and information support for scientific, technological and innovation activity.

The agency supports research and innovation in various fields of science, using various tools, primarily such as the federal target programs (FTP). Among them are “Research and Development in Priority Directions of Scientific and Technological Complex of Russia for 2007–2012”, “Development of Nanotechnology Infrastructure in the Russian Federation for 2008 – 2010”, “World Ocean”. The Agency also participates in implementation of the FTP “National Engineering Capability for 2007–2011”, “Development of Electronic Component Base and Radio Electronics for 2008 – 2015”, the FTP “Scientific and Scientific-Pedagogic Cadres of Innovation Russia for 2009–2013”. In addition, the Agency renders support for development of science parks, technology transfer centers, centers of technology commercialization, etc.

Other federal departments and agencies implementing R&D and managing innovation within their sectors include:

- *Ministry of Defense*, which controls the most part of expenditures on defense R&D.
- *Ministry of Industry and Trade*, which controls significant amounts of budget, related to R&D in industry, as well as to defense R&D.
- *Ministry of Economic Development*, which finances applied research in the field of national economy. The Ministry has initiated several programs, related to innovation, such as support for small businesses, tax exemptions for industrial undertaking R&D, the program of creation of free economic zones and venture capital firm.

- *Ministry of Communications and Mass Media*, which via *the Federal Information Technology Agency* controls budget allocated for R&D in information technology.

9.4. Development of the intellectual property legislation

The government of Russia has always paid considerable attention to regulation of rights to the intellectual property, including the one created by the budget because the state remains one of the key sources of R&D financing.

Part IV of the RF Civil Code unmaking all previous laws in IP filed has become valid since January 1, 2008. According to the Code, the fact of financing affects the ascertainment of the holder of exclusive rights to the results of scientific and technological activities. It is the public contract that ascertains the one who becomes a rightholder, i.e. the one economic agent, which, in each specific case, decides on the disposal of intellectual property rights. Clause 1 of Article 1546 of Chapter 77 "Rights of the Russian Federation and Subjects of the Russian Federation to Technology" sets up the conditions under which the right to technology belongs to the Russian Federation. If a single technology is developed for needs of defense or security, as well as if the Russian Federation assumed financing of works before development of the single technology or later to bring the single technology to the stage of practical application, the right to the technology belongs to the Russian Federation. In addition, if until the expiry of six months after completion of works on creation of the single technology the developer has not made all provisions for all legally actions necessary for recognition of his rights or acquiring exclusive rights to the results of intellectual activities which are part of the technology, the owner of it becomes the RF . In all other cases the right to the results of intellectual activity must belong to the organization – the executor. The State also reserves the right to grant voluntary non-exclusive license for public use. The fourth part of the Civil Code has defined the procedure for distribution and consolidation of rights to the results of intellectual activities among customers, executing agencies and authors.

With reference of performed codification of laws and regulations on intellectual property, introduction of any substantial changes in the fourth part of the Civil Code is not expected until law enforcement and detection of serious problems (this term is approximately accounts for two years).

In elaboration of Part IV of the Civil Code, the Federal Law "On Transfer of Rights on Single Technologies" was adopted in December of 2008. The law is aimed at encouragement of researchers to create technologies, as well as removal of the existing administrative and financial barriers for commercialization. The law specifies that a single technology, created at the expense of budgetary funds and with consolidated right for the Russian Federation, may be transferred to private investors through the procedure of open tenders or auctions in exchange for commitments to its commercialization. At that, means from technology sale will come in the budget, and the conditions of remuneration of authors will be determined by individual government decree. When the holder is an organization of technology developer, the Civil Code provides the organization-developer with a full extent of the rights to the technology, including negotiating with the private sector, the conclusion of license agreements, contracts on alienation, etc. There are only general framework conditions, specified by the State which the parties must follow. At that, the value of technology returns to the State in the form of tax revenues from its commercialization, but not in the form of direct payments to the budget.

At the same time, improvement of regulation of intellectual property rights is not limited to normative legal acts, developed for implementation of the fourth part of the RF Civil Code. It may affect the administration, budget legislation, legislation on non-profit organizations, the law on economic societies, the law on accountancy, tax legislation.

9.5. Tax privileges for research and innovation

Federal law "On Introduction of Alterations in Certain Legislative Acts of the Russian Federation Concerning the Formation of Favorable Tax Remission Conditions for Innovative Activities Financing" No. 195-FZ, dated July 19 2007 has become valid since January 1, 2008 .

In terms of direction of stimulus to innovation activity, introduced in the legislation on tax and fee, changes may be divided into the following areas:

- Reducing the tax component in the price of scientific and innovative product.
- Creating incentives for the expansion of demand for research.
- Creating incentives for investment in science and innovation sphere.
- Promotion for small innovative and scientific organizations.

In order to stimulate the innovation activity, alterations are introduced in chapters “Value Added Tax”, “Tax on Profit of Organizations” and “Simplified Tax System” of the RF Tax Code, providing the following measures of stimulating effect:

1. The introduction of incentives for value-added tax in the form of exemption from taxation for the implementation of the exclusive rights to inventions, utility models, industrial designs, programs for electronic computers, databases, topographies of integral circuits, trade secrets (know-how), the rights to use these results of intellectual activity under a license agreement, as well as expansion of the existing incentives and exemptions from this tax for organizations performing R&D and technological work related to the creation of new products and technologies or to improvement of products and technologies.
2. The increase in 3 times (up to 1.5 per cent) of the requirement criterion of taxpayer expenditures on research and/or development activity undertaken in the form of contributions to the formation of the Russian fund of technological development, as well as of other sectoral and inter-sectoral funds of financing R&D works and experimental designing.
3. Extension of research funds, which resources, received within the frame of target financing are not accounted in determining the tax base for tax on the profit of organizations.
4. Introduction of a specific rate of accelerated depreciation to the amortization quota for the permanent assets of organizations, which are used only for scientific and technical activities.
5. Expanding the bead-roll of expenditures, that the taxpayers, engaged in innovation activity and applying the simplified taxation system, may take in revenue diminution, keeping in mind expenses on patenting procedure and expenditures on research and/or development activity.

10. International cooperation

Among the major areas of the State S&T policy the international science and technology cooperation (ISTC) occupies a special place. It is necessary to note, that at present carrying out research in many fields of science and technology requires great financial and material inputs, which is often cannot be provided by one country. International cooperation in scientific research allows to unit resources of different states and enables to solve scientific, technical, technological problems.

At the present one of the major tasks of Russia is to create favorable conditions and mechanisms for development of mutually advantageous and equal in rights international cooperation in science, technology and innovation.

For its performance the State support of the international cooperation aimed at realization of the major innovation projects of the state value, priority areas of S&T development and enhancing basic researches is provided.

In this regard, provision has been lately made for signing of a significant number of intergovernmental and interdepartmental agreements of multilateral and bilateral issues, which have not only expanded the geography of cooperation, but most importantly – defined the principles and ways to bring interaction with foreign countries to a higher level of quality.

In this respect enhancing mutually advantageous cooperation with the European Union (EU) which is now one of three, together with the USA and Japan, technological poles of the world, is of special importance for Russia. An important part of this cooperation is strengthening positions of Russia within the framework of realization of the provisions of the "Road map" aimed at establishment of the common S&T space of Russia and EU, the further perfection of mechanisms and structure of interaction in Russian and European S&T and innovation priorities.

In connection with the expiration of the Agreement on Partnership and Cooperation between Russia and the EC, special attention is paid to the preparation of a new basic agreement in terms of scientific and technological research and development, as well as Russia's involvement in the 7th Framework Program for Research, Technological Development and Demonstration Activity of the EC (2006–2013) and obtaining status as an associate member of this EC program by our country.

Successful interaction between Russia and EU is well-known and is characterized, for example, by the fact that in 2002 - 2006 about 100 most important projects in 6 priority areas of the Sixth Framework program of the EU were implemented with participation of Russian researchers. Those priority areas also corresponded to priority areas S&T of development of Russia (life sciences, ecology, nanotechnology and new materials, safety of food, information society, aeronautics).

The multilateral cooperation project aimed at the launch in September 2008 of the "Large Hadron Collider" created in CERN and further participation of Russian scientists in its experimental program is one of most important projects of multilateral cooperation between Russia and other developed countries.

The Joint Institute for Nuclear Research (JINR) established through the Convention signed on 26 March 1956 in Moscow by representatives of eleven founding states to unite their scientific and material potential in order to study fundamental properties of matter is a vivid example of multilateral S&T cooperation. It was registered with the United Nations on 1 February 1957. The Institute is situated in Dubna 120 km from Moscow in the Russian Federation.

JINR today is a world-known centre where the fundamental research (theoretical and experimental) is successfully integrated with the new technology work-out and application of the latest techniques and university education.

In future creation of new sources of energy is connected to development of thermo-nuclear power. Its starting point will be the launch of International experimental thermo-nuclear reactor (ITER). Russia has joined the ITER treaty in 2006 and now its contribution is equal to about 10% of the project cost. ITER is based on the results of the project "TOKAMAK" developed in the Kurchatov Institute in Moscow.

In 1998 the dialogue concerning cooperation between EU and Russia in space research started. Both parties are interested to have as much projects of cooperation in the field of space research and corresponding applied technologies as possible. The reality of such integration of scientific and technological capacities of Russia and EU is confirmed by such successful joint projects, as "Galileo/Glonass", space monitoring of the environment of Europe, new generation nuclear reactors, procedures training aircraft, etc.

In December 2001 the tripartite Joint memorandum about «New opportunities of the Russian - European partnership in the field of space» has been signed by the European commission, the European space agency and the Russian Space and aviation agency. (Rosaviasmos). The memorandum has established a political basis for the future work and covers cooperation under projects Galileo/Glonass, Global monitoring of an environment and safety (GMES), research in the field of launching installations, as well as for industrial cooperation and research in the field of space transport systems. In 2005 representatives of the Russian and European space agencies have signed the agreement on long-term cooperation in elaboration, construction and use of space rocket launchers.

The recommendations adopted by the G8 take an important place in the international cooperation between Russia and the highly developed countries. In accordance with the decisions in the field of energy security, adopted in 2006 during the presidency of Russia in G8, the joint implementation of projects in the field of alternative energy sources is continuing.

According to decisions in the field of the power safety, adopted in 2006 during presidency of the Russian Federation in the G8, joint realization of the most large scale projects in this area goes on. Russian representatives participate in multilateral cooperation within the framework of the partnership formulated by this group: the sequestration of carbon (technology of "pure coal », hydrogen economy, commercial use of nonconventional resources of methane, bio-energetics, complex use of secondary waste products, efficiency and problems of development of renewable sources of power.

Traditionally, an important partner of Russia in the field of scientific and innovation co-operation is the United States. The Russo-American Joint Committee on Science and Technology continues joint works in the field of energy, including nuclear safety issues, the fundamental properties of matter, telecommunications, medical research, counter-terrorism, etc. Such promising areas cooperation as nanotechnology, construction materials, nanobiotechnology, nanoelectronics are under consideration as well.

A strategic partnership with Germany, within the frame of which Russia has set a course for implementing large-scale scientific and technical projects is intensively developing.

A joint development of large-scale international mega-project of 14 countries, including the EC countries, Russia and China to create X-ray free electron laser (XFEL) is well underway. The purpose of this project will consist in carrying out research of new properties of a matter in areas of femtochemistry, cluster physics, physics of plasma, nanotechnology, biology, new materials and medicine.

A promising cooperation with Germany in the scientific programs of the European Center for the Study of Ions and Antiprotons (FAIR), which is under construction in Darmstadt is of no less importance for Russia.

Russia continues implementation of agreements on cooperation in the development and introduction of nanotechnologies with such countries as Belgium, India, China, Netherlands, Republic of Korea, Finland, France, Republic of South Africa and Japan.

The growing emphasis in the development of International Scientific and Technological Cooperation (ISTC) is placed on its innovative component. Appropriate arrangements to this effect have been made with the United States, Germany, France, China, India, the Czech Republic and the CIS.

The existing scientific potential allows Russia to participate in the international innovation and technological cooperation by establishing special economic zones or of commercializing Russian technologies including technoparks, technological incubators and research-and-production complexes of science cities.

A middle term program of joint scientific research with China within the framework of complex large-scale scientific and technical projects is under consideration.

In the framework of the Russian - Indian Complex long-term program of S&T cooperation till the year 2010 establishment of infrastructure elements for joint commercialization of R&D results and transfer of technology is actively conducted.

The priority for Russia in the sphere of ISTC is the interaction with participating States of the CIS.

Here it should be noted the development of interstate cooperation programs in the field of basic and applied sciences and the establishment of international research centers and organizations.

An important step towards strengthening cooperation of scientists of the Commonwealth countries was a meeting of heads of state organizations on science and technology with participation of representatives of the International Association of Academies of Science, held in Bishkek in October of 2008.

Decisions, adopted at the meeting are aimed at activating the cooperation of participating CIS members in science, coordinating joint actions in the development of nanotechnologies, creating conditions for the sharing of unique research facilities, located on the territory of participating CIS members.

The close attention is paid to interaction with CIS countries in innovation, first of all, with a view of transfer of the advanced domestic technologies for modernization of national industries of these states. The recently established International center of cooperation in innovation became one of the tools for cooperation of the CIS countries organizations.

Implementation of long-term plans aimed at formation of the common educational and scientific and technological space of the Union State of Russia and Belarus goes on. The List of priority S&T and innovation programs and projects has been submitted to is Union Government. The Council of Ministers of the Union State approved the «Guidelines for establishing of the common science and technology space of the Union State », elaborated by the Ministry of Education and Science of the Russian Federation and the State Committee on Science and Technology of Belarus.

An important role for developing S&T and innovation cooperation, and also for protecting intellectual property belongs to cooperation with specialized international organizations: OECD, ECE UN, UNIDO, UNESCO and others.

One of the most important guidelines of the State policy of Russia in ISTC is integration of Russian basic and applied science into the global R&D space and providing in this respect favorable conditions for the full scale participation of Russia in global projects and programs within the framework of multilateral cooperation.

Information on international scientific activities, as well as on international projects, participation of Russia in which is supported by the Ministry of Education and Science, is publicly available at: <http://www.science-forum.ru/index.php?name=conf&snc=18bd4b2652aa967db08ca7edb8a31cc8>.

11. Key Aspects of regional innovation policy

Due to historical conditions, the Russian regions differ significantly in terms of socio-economic development, population size, industrial and scientific-technical potential. Almost 80 % of the population of the country live in the European part which area does not exceed 25 % of territory of all country. It also produces almost 74% of GDP and 80% of industrial output. At that, Siberia and the Far East provide two-thirds of the output volume of mineral resources and energy feedstock.

In accordance with the Concept (2008) of Long-Term Socio-Economic Development of Russia until 2020, innovative development of Russian regions is focused on:

- Development of technical, scientific and educational potential of large urban agglomerations with a high quality living environment and human potential, dynamic innovation and educational infrastructure.
- Formation of regional production clusters, aimed at high-tech industries in priority sectors of the economy, with a concentration of such clusters in urban areas.
- Formation of regional production clusters on deficiently developed territories, aimed at advanced processing of raw materials and energy production using modern technologies.

Regional development until 2012 will be determined mainly by the already-formed zones of outstripping economic advance, which include:

- The largest agglomerations with the most dynamic economic growth, ensuring the flow of people and investments.
- Major cities – centers of regions, the growth of which is provided by the concentration of service functions and industrial productions.
- Territories, focused on mining and processing operations, development of which is less stable and dependent on price environment, but significant budget receipts allow to develop human capacity and infrastructure.

After 2012, a significant contribution to regional development will make advanced centers of outstripping economic growth, which include:

- Agglomerations and industrial centers in the Volga region, Southern and Middle Urals with developing scientific and educational centers and concentration of rather powerful high- and medium technology industries as well as primary and processing productions. These regions have one of the highest unrealized potential for innovation development.
- Cities of Siberia with a higher level of human capital development and potential for development of innovative economy, as well as the ports of the North and the Far East (Tomsk, Novosibirsk, Krasnoyarsk and Irkutsk).

11.1. Specific features of innovation activity regulation in Russian regions

Currently, an active formation of innovative systems takes place in several regions of the Russian Federation. This process consists in:

- a) Preparation of regional forms of innovation activity regulation. Often forms of regulation reproduce “the best practices” that have occurred in some regions, and fit into the macroeconomic conditions and programs, offered by the Russian Federation.
- b) Development of innovation infrastructure.
- c) Formation of innovative practices of economic activity actors.

In various regions the mutual influence and coherence of these processes have different quality and intensity and are determined by several key factors, one of which is a regional innovation policy with regulation of innovation activity at the regional level included.

The main documents regulating the issues of innovation development at the regional level, are:

- Strategies of regional socio-economic development (in a part of determining the development and use of innovative capacity).
- Innovation activity laws.
- Regional target programs of innovation development.
- Regulations for specialized bodies, responsible for the conduct of regional innovation policy.

Analysis of Legal Acts

Most regions of Russia, one way or another, have paid attention to the development of innovation activity, as reflected in the acts of legislative support for innovations. Most often, these acts are of two types: regional laws on innovation activity and the laws (regulations) on the concepts of innovation development of the region or on programs for support of innovation activity. In general, laws on innovation is a document of explanatory sense, but concepts specify the actions of regional authorities to support innovation activity, which are expressed in creating conditions for innovation activity, in provisioning subsidies and incentives for innovative enterprises and organizations, etc.

Analyzing the concepts and programs of regional development of the RF subjects, the following general suggestions may be emphasized:

1. Creating a regional innovation infrastructure – parks, innovation centers, business incubators, etc., most often with an indication of the timing and amount of allocated funds.
2. Training and retraining of innovative industries staff, especially the managerial level (generally at local institutes of higher education, or on the basis of organized training centers). Sometimes foreign training of experts may be financed.
3. Tendering processes for the best innovation project and the best innovation introduction.
4. Information support for innovation activity, both to improve the investment image of the region and to promote innovation among enterprises: the creation of websites, thematic databases, the issue of booklets and monographs, round tables and television programs.

Provisions for the need of additional research to determine the directions of innovative development of the region are fixed approximately in half of the existing policies of socio-economic development of RF subjects.

An important step in shaping the legislative framework for the development of innovation activity is elaboration of measures to create mechanisms for venture financing, in particular, the regional venture funds. However, such steps so far are registered only in a small number of programs (concepts) of innovation activity development.

Some regional strategies (Rostov Region, Republic of Tatarstan, Orenburg Region, Ulyanovsk Region, Chelyabinsk Region) refer to the need to introduce tax incentives and budgetary aid to enterprises, developing innovations commercially.

11.2. Innovation map of Russia

Because of low intensity, the use of statistics, formal and covering all regions of Russia is not fully reflect the formation of innovative processes and conditions, stimulating them, as well as the reasons preventing them. Therefore, key components of the innovation process were considered on the basis of

indirect statistical indicators. A so-called index of innovation was assumed as a criterion for assessing the scientific potential. Experts identified regions that were leaders in scientific and technological potential, areas that were leaders in the implementation and promotion of scientific development in the business end-product, the regions targeted at borrowing technologies. The experts also brought forward results of the analysis of the RF regions in terms of human capacities for innovation, for the dissemination of new knowledge, for the launch of an innovative product into market.

Indicators included in the index of innovation⁶⁷ are as follows:

- Human resources
 - Post-graduate-to-graduate of university ratio.
 - The number of graduate students per 1,000 people with higher education.
 - The number of researchers with scientific degrees per 1,000 persons of population.
 - Percentage of graduates of postgraduate education institutions with degree awarded.
 - Percentage of population with higher education in the economically active population.
 - Employment in the sector of manufacturing industry.
- Creation of new knowledge
 - Internal expenditure on R&D (in percentage of GRP).
 - Number of organizations carrying out R&D (in percentage of the total number of organizations).
 - Number of personnel engaged in R&D (per 1,000 persons of population).
- Passing and application of knowledge
 - Number of patents granted.
 - Specific weight of organizations carrying out the technological innovation.
 - Expenditure on technological innovation.
- Launch of innovative products to market
 - Share of shipped innovative production on market (in percentage of GRP).
 - Volume of shipped innovative production.
 - Expenditure on information and communication technologies.
 - Number of used high technologies.

The index of innovativeness under conditions of Russian innovation system formation fixes more like a start position of regions in terms of their possession of some features necessary to create innovations. In a greater degree, the index specifies the willingness or ability of regions to innovate, rather than the actual innovation process. The advantages of the proposed index may be attributed to the complexity of indicators used for its estimation, covering – as far as modern Russian official statistics allows – the main stages or elements of the innovation process. A disadvantage of this tool is that it does not permit evaluating the quality and intensity of interaction between components of the innovative chain.

⁶⁷ According to the methodology of the Center for Strategic Research "North-West".

This study shows that RF regions may be divided by the index of innovativeness into 6 conditional groups. **Group No. 1** ("metropolises") is a leading one on all counts. It concentrates qualified human resources, and most successfully implements a market stage of innovations.

Group No. 2, which we conventionally call "innovative potential leaders" or "**regions, ready for innovation**" is to the maximum extent (after metropolises), a leading one as to a market component (corresponds to the level of "metropolises"), falling behind on the characteristics of human potential. The regions of the second group use the largest number of advanced technologies, produce the largest volume of innovative products.

Group No. 3 includes regions with the final index which has the largest weight of human resource sub-indexes. The group is slightly inferior as to these sub-indexes to the group of potential innovative leaders. However, the "market" sub-indexes, in particular, the index "launch into market" are significantly behind. This may be explained by the inefficient use of sufficiently high quality human resources, lack of stable ties between science and industry, or incompatibility of scientific and production bases in the region. This group may be characterized as **regions with unrealized intellectual potential**.

Group No. 4 is very homogeneous over the indices of the "market" and "human capital", at that, most of its regions include large cities or they are located close to Moscow, therefore, these regions have sources of human resources for creation of new knowledge. The fourth group is behind the third group as to the index of "creating new knowledge", but on one level with it according to market indices. Thus, regions of group No. 4 may be described as major production centers, based on transfer of technologies, with **the innovative potential of a medium level**, as they produce quite a large amount of products using advanced technologies, but there is no adequate number of specialists to create new knowledge. Group number 5 collected regions that are not currently among the leaders on any of the indicators, and the education system and the industrial base do not allow them to move to the next level.

Finally, Group No. 6 contains the regions-outsiders in all respects.

Below (Fig. 10.1) is presented "Innovation Map of Russia", based on analysis of the region innovativeness level⁶⁸.

Annex 2C provides abstracts of the regional innovation practices of Tomsk Region, Republic of Tatarstan and St. Petersburg, drawn from materials published in the press.

⁶⁸ The map is prepared by the Center for Strategic Research "North-West"

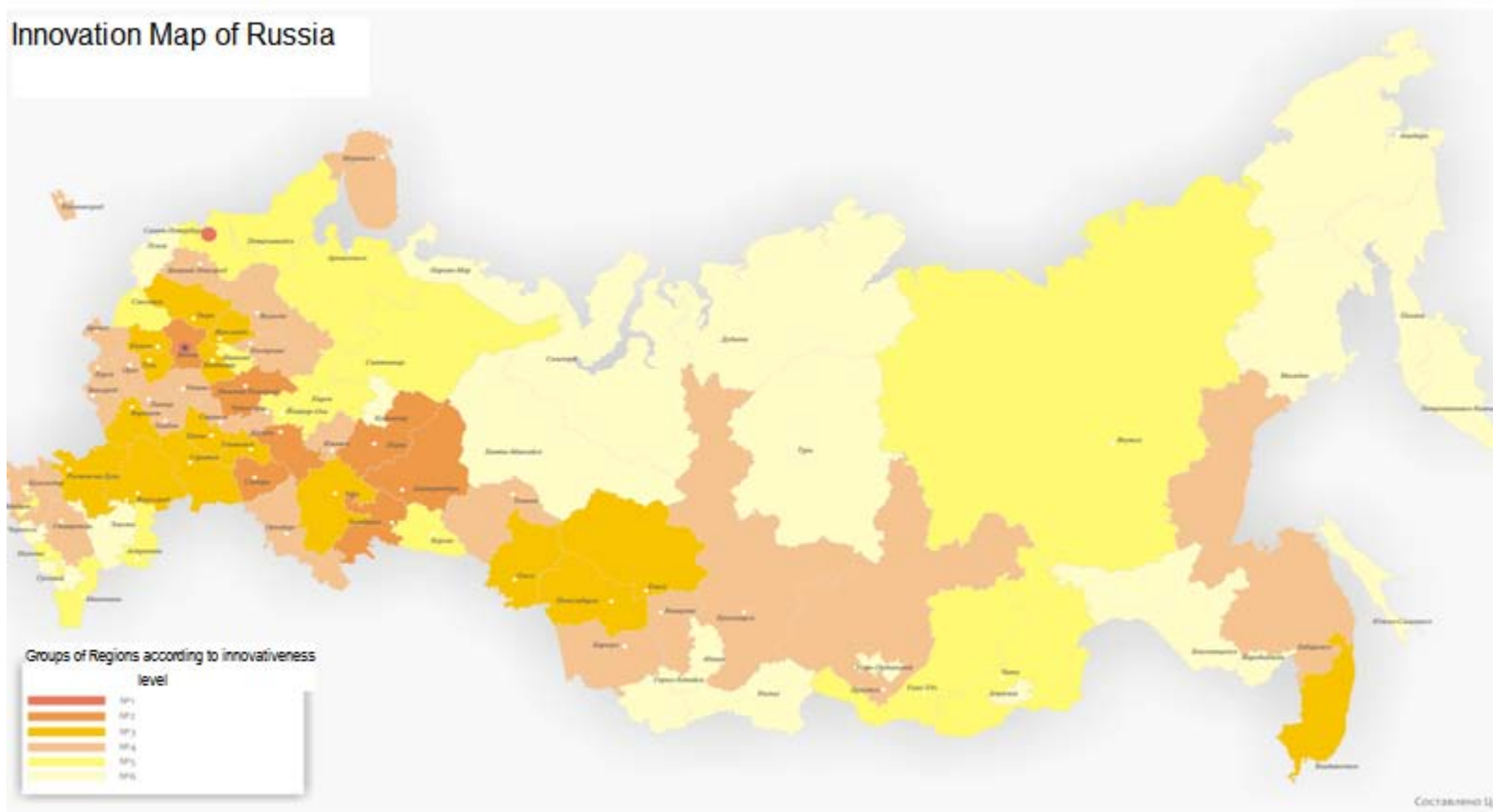


Fig. 1. Innovation Map of Russia
Groups of Regions according to Innovativeness Level:
No. 1 (red color), No. 2, 3, 4, 5, 6 (color variances according to Fig. 1)

12. Conclusion

This Baseline report is made in accordance with the address of the Russian Federation to the Organization for Economic Cooperation and Development to conduct “Review of National Innovation System and Innovation Policy of the Russian Federation” jointly with the RF Ministry of Education and Science.

As a result of the fulfilled work, experts collected extensive information base, carried out analysis and monitoring (including the use of methods of short-term prediction of scientific and technological development) of status and development trends of all the components of the national innovative system in Russia for the period of 2003 – 2009: scientific sector, sector of higher education, entrepreneurship, RS infrastructure, state innovation policy, as well as the basic parameters of the regional innovation policy. They performed SWOT-analysis of the innovation system in Russia.

Since the time that has elapsed after adoption (2005) of “Guidelines for the Policy of the Russian Federation in the Field of Innovation System Development for the Period of up to 2010” – the first official state document, which defines RS in accordance with international standards, the Russian innovation system has undergone significant changes and become a development institution, availability and importance of which there are few who dispute.

A number of federal and regional ministries and agencies, public corporations involved in the formulation and implementation of innovation policy has increased for last 5 – 6 years.

With the introduction of Part 4 of the RF Civil Code the legal framework in the field of protection of intellectual property rights improved in accordance with international standards.

With the introduction of Part 2 of the RF Tax Code a system of legislative measures for support of innovation activity was formulated.

At the same time, the RF RS has still a number of weaknesses. The main ones are:

- Insufficient coordination between public and private sectors in development of priorities and measures of financial support for R&D.
- Low level of implementation of adopted measures aimed at promoting innovation activity in the enterprise sector to solve the problems of technological backwardness of industry.
- Fragmented nature of policy aimed at improving inter-agency transfer of knowledge and technology, low level of inter-ministerial coordination of innovation activity.
- Low level of support for small innovative enterprises at all stages of development, lack of large innovative companies in the country and as a consequence, lack of promotion of real life experience of innovative entrepreneurship.

A task of the coming period is to identify measures to address the weaknesses of Russian RS.

This report is intended to serve as a tool for experts to find the answers for a number of issues facing the Russia RS, to elaborate recommendations and specific proposals for development of sectors of the RS and improvement of innovation policy.

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Symbols and Abbreviations

- Urals – an export brand of oil, a mixture of heavy, sour oil of the Urals and the Volga region with mild West Siberian oil
- CPI – Consumer Price Index
- FTE – Full-Time Equivalent
- UNECE – United Nations Economic Commission for Europe, a body of the Economic and Social Council (ECOSOC), established in 1947
- TSU – Tomsk State University
- SAS – Siberian Academy of Sciences, Siberian Branch of Russian Academy of Sciences
- CTT – Center of Technology Transfer
- ITC – Information Technology Center
- FSTEC – Federal Service for Technical and Export Control, established in accordance with Presidential Decree No. 314 dated March 9, 2004 “On System and Structure of Federal Bodies of Executive Power” instead of pre-existing State Technical Commission under the President of the Russian Federation. Russian FSTEC is a federal body of executive power in Russia, executing implementation of state policy, organization of inter-agency coordination and cooperation, special and control functions in the field of national security
- MPhTI – Moscow Physic-Technical Institute
- NPI – Non-Profit Institution, a legal body without the main objective for extraction of profit and its distribution among the participants (as opposed to commercial)
- INTAS – Independent International Association, organized by the European Union countries and some countries outside the EU to maintain and support the valuable scientific potential of the CIS countries through development of co-operation with the countries of Western Europe. INTAS ceased its activity in 2007
- NOW – Netherlands Organization for Scientific Research
- Welcome Trust – British fund, which supports biomedical research, research on the history of medicine, as well as the study of social and ethical impact of biomedical research. It has an international program of funding research in developing countries and countries where a process of restructuring goes (Central and Eastern Europe, CIS)
- DFG – German Research Foundation, the main independent research foundation in Germany, which supports research conducted at universities and public research institutions
- Fulbright Program – a program of educational grants, established by the U.S. Senator J. William Fulbright, and sponsored by the US Department of State. Provides grants to both American and foreign (including Russian) scientists and researchers
- ISTC – International Science and Technology Center, an intergovernmental organization, establishing business links between scientists from Russia, Georgia and other CIS countries with their colleagues from research institutions in Canada, EC, Japan, Republic of Korea, Norway and the United States, and promoting the implementation of international scientific projects
- CRDF – US Civilian Research and Development Foundation, a non-profit charitable organization established by the US government in 1995. The Foundation supports scientific and technological cooperation between the US and the former Soviet Union
- NSF – National Science Foundation, an independent agency under the US government responsible for the development of science and technologies
- ISF – International Science Foundation, a US private charitable organization founded in December, 1992 by financier George Soros. The Fund seeks to broad international cooperation and invites government agencies and private organizations both in the United States and other countries to connect to the activities of ISF
- DAAD – Deutscher Akademischer Austauschdienst, a Germany's largest organization for support of international academic exchanges

- Ford Foundation – a charitable foundation with headquarters in New York, USA, established to finance programs in support of democracy, to reduce poverty, to promote international cooperation and human development
- MacArthur Foundation – a private independent charitable organization founded by John D. and Catherine T. MacArthur in 1978. The headquarters of the foundation is located in Chicago, USA. In addition to programs for the independent states of the former Soviet Union, the Foundation works with programs of allocation of grants in such important areas as health, education, environment, population, peace and international cooperation, individual creativity, media, art and development of society
- IREX – International Research & Exchange Board, an international non-profit organization, under which many innovative programs to develop leadership potential in the emerging democratic countries are implemented. IREX initiatives aim is to improve the quality of education, support independent media, and multilateral development of civil society institutions
- VAT – Value Added Tax
- ORCEA – All-Russia Classifier of Economic Activities
- MMIW – Mining-and-Metallurgical Integrated Works
- Computer – Electronic Data Processing Machine
- GOZ – State Defense Order
- NVTK – Knowledge-Intensive High-Tech Complex
- EBRD – European Bank for Reconstruction and Development, an investment mechanism created in 1991 by 60 countries and two international organizations to support the market economy and democracy in 27 countries from Central Europe to Central Asia
- IFC – International Finance Corporation, an international financial institution, a division of the World Bank. The headquarters is located in Washington (USA)
- MEDT (MED) – Ministry of Economic Development and Trade of Russian Federation (Ministry of Economic Development of Russian Federation since May 12, 2008)
- TVZ – Technical Innovation Zone, a form of a special economic zone for creation and implementation of scientific and technical products, bringing it up to industrial application, including manufacturing, testing and implementation of pilot batches, and creation of software products, systems of data collection, processing and transmission, systems of distributed computing and services for the implementation and maintenance of such products and systems
- ICAO – International Civil Aviation Organization, a UN agency that sets international standards of civil aviation and coordinating its development with a view to improving the safety and effectiveness
- AM – Amplitude Modulation, a designation of AM and one of the ranges which the broadcast stations use
- DAB – Digital Audio Broadcasting (standard)
- DBM – Digital Multimedia Broadcasting
- DRM – Digital Radio Mondiale, a digital radio broadcasting in shortwave
- DVB – Digital Video Broadcasting, a digital television, in which the signal image and sound are transmitted in digital form
- DVB-H – Digital Video Broadcasting Handheld, a standard for terrestrial broadcasting for handheld devices
- DVB-T – Digital Video Broadcasting Terrestrial, a standard for digital terrestrial television broadcasting
- DVB-S – Digital Video Broadcasting Satellite, a satellite television format
- Ethernet – Ethernet LAN, 10 Mbit/s, file addressing to carrier sense multiple access with collision detection (CSMA / CD). The Ethernet standard is described in the specifications of IEEE (IEEE 802.3) and other organizations
- IEEE – Institute of Electrical and Electronics Engineers, an international non-profit association of professionals in the field of technology, the world leader in developing standards for the Electronics and Electrical Engineering

- IMT-MC – International Mobile Telecommunications - Multi-Carrier. Code Division Multiple Access . The IMT-MC standard was developed by an international organization for standardization of third generation. The IMT-MC resources of any of the networks are allocated to the particular subscriber automatically and can be changed dynamically during a session for each block of data
 - MPLS – Multiprotocol Label Switching , a multi-protocol label switching- data transfer mechanism, which emulates the various properties of circuit-switched networks over packet switched networks
 - S-DAB – Satellite Digital Audio Broadcasting, a satellite version of the DAB standard
 - T-DAB – Terrestrial Digital Audio Broadcasting, a terrestrial version of the DAB standard, designed to deliver the signal in the UHF (174–230 MGz 1) or L-band (1400–1900 MHz)
 - TETRA – Trans European Trunked Radio Systems, an open standard of digital trunking radiocommunication, developed by the European Telecommunications Standards Institute ETSI
 - UMTC – Universal Mobile Telecommunications System, a universal system of cellular communication, relating to the third generation
 - VPN – Virtual Private Network, a logical network created over another network, such as Internet
 - WiFi – Wireless Fidelity, a protocol and equipment standard for broadband radio communication intended for organization of local wireless networks
 - Wi-MAX – Worldwide Interoperability for Microwave Access, developed by a consortium of WiMAX Forum, based on the standard 802.16, allowing the signal to cover a radius of up to 50 km, with no direct line of sight
 - xDSL – Digital Subscriber Line System, a family of technologies that significantly expand the capacity of subscriber line local telephone network by using efficient linear codes and adaptive distortion correction line on the basis of the modern achievements in microelectronics and methods of digital signal processing
 - LW – Long Waves, a band of radio waves with a frequency of 30 kHz (wavelength of 10 km) to 300 kHz (wavelength of 1 km)
 - SW – Short Waves, a band of radio waves with a frequency of 3 MHz (wavelength of 100 m) to 30 MHz (wavelength of 10 m)
 - SW – Medium Waves, a band of radio waves with a frequency of 300 kHz (wavelength of 1,000 m) up to 3 MHz (wavelength of 100 m)
 - RTS – Russian Stock Exchange, conducting trades in the stock market
 - VSAT – Very Small Aperture Terminals, small satellite ground stations. According to international classification they include satellite stations with antennas less than 2.5 m
 - FGU – Federal State Institution
 - ITT – Information Technology and Telecommunications
 - SSRI – State Scientific Research Institute
- The Asset Management Company is one of the largest venture investment company in Silicon Valley along with Sequoia, NEA, DFJ, Bessemer Venture Partners, Alloy Ventures
- SITRA – National Fund of Finland for R&D
 - IFC – International Finance Corporation, an international financial institution, a division of the World Bank. It is established in 1956 to ensure a steady flow of private investment in developing countries. The headquarters is located in Washington (USA)
 - MICEX – Moscow Interbank Currency Exchange
 - OJSC – Open Joint Stock Company
 - TACIS – Technical Assistance for the Commonwealth of Independent States, a program of EU to promote accelerated economic reforms in the CIS
 - NP – Non-Commercial Partnership, a non-profit institution based on membership in Russian legislation, established by citizens and (or) legal persons to assist its members in carrying out activities aimed at achieving social, charitable, cultural, educational, scientific and management purposes

- GKRF – Civil Code of Russian Federation, a codified law code of the RF laws, regulating the civil law relations
- GRP – Gross Regional Product, a synoptic indicator of economic activity in the region, describing the process of production of goods and services
- MC – Management Company, an organization (Joint-Stock Company, Ltd.) established in accordance with the RF legislation and licensed by the Federal Financial Markets Service of Russia (FFMS) for implementation of management of unit investment trusts and private pension funds

Appendix A: Statistical information.

Statistical information to the present Basic Report is represented by statistics digest “Science of Russia in figures: 2008” of State Institution “Center for Research and Science Statistics”, which is an entity in charge of the Ministry of Education and Science of the Russian Federation.

The represented information is based on the up-to-date methodological approaches to science statistics, and completely meets requirements of international statistical standards. In the process of the digest preparation there have been used materials of the Federal State Statistics Service (“Rosstat”), the Ministry of Education and Science of the Russian Federation (“Minobrnauka”), the Federal Agency on Science and Innovations (“Rosnauka”), the Federal Service for Intellectual Property, Patents and Trademarks (“Rospatent”), the Higher Attestation Committee (HAC) of Minobrnauka of Russia, the CIS Committee on Statistics, the Organization for Economic Cooperation and Development (OECD), and proper methodical developments of the Center of Research and Science Statistics.

Appendix B: Official documents.

Appendix B.1: List of critical technologies of the Russian Federation.

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President of the Russian Federation

May 21, 2006

Пр-842

List of critical technologies of the Russian Federation

Basic and critical military, special and industrial technologies

Bioinformation technologies

Biocatalytic, biosynthetic and biosensor technologies

Biomedical and veterinary technologies for life support and protection of human and animals

Genome and post-genome technologies for creation of drugs

Cell technologies

Nanotechnologies and technologies for creation of nanomaterials

Technologies of atomic energy, nuclear fuel cycle and safe handling of radioactive waste and spent nuclear fuel

Bioengineering technologies

Hydrogen energy technologies

Technologies of mechatronics and creation of microsystem equipment

Technologies for monitoring and forecasting of the state of the atmosphere and hydrosphere

Technologies of new and renewable energy sources

Technologies of ensuring the protection and life support of the population and dangerous objects under threats of terrorism

Technologies of information processing, storage, transfer and protection

Technologies of resource assessment and forecasting of the state of the lithosphere and biosphere

Technologies for processing and recycling of technogenic products and wastes

Technologies of software production

Technologies for production of fuels and energy from organic materials

Technologies of distributed computing and systems

Technologies of reducing the risk of natural and technogenic disasters

Technologies for creation of biocompatible materials

Technologies for creation of intelligence systems of navigation and control

Technologies for creation and processing of composite and ceramic materials

Technologies for creation and processing of crystalline materials

Technologies for creation and processing of polymers and elastomers

Technologies for creating and controlling new types of transportation systems

Technologies for creation of membranes and catalytic systems

Technologies for creation of new generations of missile-space, aeronautical and marine machines and equipment

Technologies for creation of electronic component base

Technologies for creation of energy-efficient systems of transportation, distribution and consumption of heat and electricity

Technologies for creation of energy-efficient engines and movers for transportation systems

Technologies of environmentally safe resources-economy production and processing of agricultural raw materials and food products

Technologies of environmentally safe development of deposits and mining operations

Appendix B.2: Priority areas of development of science, technologies and machines and equipment in the Russian Federation.

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**Priority areas of
development of science, technologies, machines and equipment
in the Russian Federation**

Safety and terrorism prevention

Living systems

Industry of nanosystems and nanomaterials

Information-telecommunication systems

Perspective armaments, military and special-purpose machines and equipment

Rational nature management

Transportation, aviation and space systems

Power engineering and energy saving

Appendix C. Regional experience.

Appendix C.1: Innovation strategy of the Tomsk Region⁷⁰.

Starting from 2002, the Tomsk Region solves a principally new task – creation of regional innovation system, based on strategical advantages of the Region connected with its high educational and science and technology capacity. For this purpose the Innovation strategy of the Tomsk Region was adopted, being the first one in the Russian Federation. The methodology was developed basing on the European Union counties experience in developing regional innovation strategies. This experience was adapted with due consideration of distinctive features of the Tomsk Region.

The following guidelines of the Innovation strategy were recognized as priority ones:

1. Stimulation of the existing regional companies to applying innovations;
2. Stimulation of establishment of small-scale innovation enterprises;
3. Attraction of external investments (mainly to the high technology sector);
4. Establishment of effective infrastructure to support innovations;
5. Increase of the level of innovation culture in the region;
6. Development of the regional legislative framework of innovation activities.

Interdepartmental program “Development and realization of model of the territory of innovation development by the example of the Tomsk Region”, ordering customers of which were Ministry of Education and Science of Russia, RAS, Siberian Branch of RAS and the Regional Administration, served as mechanism for realization of the Innovation strategy. The interdepartmental program became an important element of the Program of social-and-economic development of the Tomsk Region for the period of 2006 - 2010. Moreover, it is aimed at establishing a stable vector of innovation development of the regional economics. The Program is to be implemented in 2 stages (1st stage – 2002-2005, 2nd stage – 2006-2008).

The program objectives could be achieved only as a complex measure through development of science and technology capacity, modernization of educational system and development of investment potential. In the process of the program realization in 2002-2007, there were solved three principal tasks.

⁷⁰ Based on materials of article by Zinchenko V.I., Pushkarenko A.B., Tjulkov G.I. “Innovation strategy of the Tomsk Region. Results of 2003-2007”. Magazine “Innovations”, special issue, 2008.

In the first place, strategic objectives of the territory development were coordinated with availability of powerful science and technology and educational capacity, and the research and education complex was determined as priority one in developing the regional economics of innovation type.

This required elaboration of an objective methodological basis for real assessment of the capacity in the following areas:

- Carrying out technological audit of organizations and their results;
- Complex evaluation of innovation projects, including express-evaluation;
- Complex assessment of scientific, educational and innovation capacities of the university, scientific center;
- Complex assessment of innovation susceptibility and activities of industrial enterprises;
- Assessment of innovation infrastructure organizations capacities.

Application of these methodologies resulted in the following:

In the first place, answer to the question: in what way to reform and to increase effectiveness of a scientific organization and a university was obtained.

The developed methodologies have considerably increased level of culture of work with business-ideas. They allowed organizations of innovation structure, first of all offices of commercialisation and business-incubators, to effectively solve problems of selection and support of projects. They also allow assessing risks of an investor.

Audit and realization of recommendations of complex assessments of university, scientific organization, provide basis and powerful motivation for elaborating strategies of development and further economic growth.

An answer to the question: in what way to increase competitiveness and innovation activity of an industrial enterprise and to create an up-to-date development strategy was obtained.

At the same time in this sector forms of statistical monitoring of innovation activities results in the region were developed and approved. They allow to monitor results of innovation development for the entire range of enterprises.

The second task was connected with establishment of innovation infrastructure and creating conditions for R&D commercialization. In 2007 establishment of a system of offices of R&D commercialization in higher education and academic institutions of the city of Tomsk was accomplished.

Establishment of R&D commercialization offices in all universities and large-scale research institutes along with establishment of student business incubators became a fundamental moment. Generally speaking establishment of a new layer of entrepreneurs in science intensive sector is possible firstly in strong universities, possessing all conditions for this: competitive R&D, professors interested in their promotion, and young people who are ready to link their careers with science intensive business.

Annually, organizations of the Tomsk Region infrastructure carry out technological audit of up to 400 R&D results, and 25% are accepted for commissioning. 15 license agreements are concluded, 30 innovation companies are established and 4-5 new products are brought to international market. During the last 1.5 years there were developed a regional network of technology transfer centers, providing for interaction of established elements of innovation infrastructure and aimed at drafting complex projects.

The third task that was solved in the process of realization of the interdepartmental program is connected with training personnel for development of innovation activities.

System of professional education of the innovation development territory in 2002-2008 was characterized by active influence of higher education institutes upon the regional innovation sector. So, during five years, from 2003 to 2008, more than 80 thousand specialists have graduated from the State higher education institutions of Tomsk. There were continuing efforts to form the innovation, education and research space, conditioned by the principal competitive advantage of the region – availability of multi-profile scientific-educational complex. Dynamics of development of research and education complex during the period of realization of the interdepartmental program is given at Figure 1.

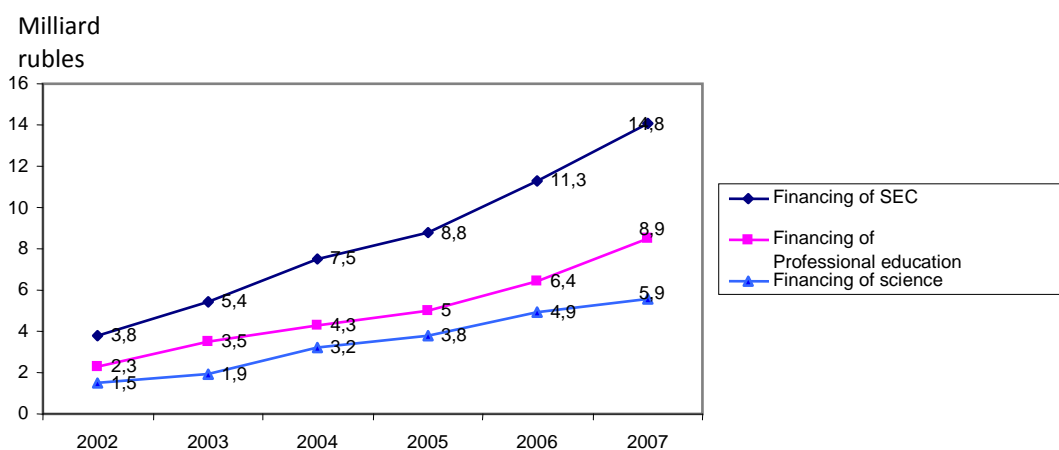


Figure 1: Development dynamics of research and education complex of the Tomsk Region

To solve the problem of training the personnel for innovation activities there are realized models of the universities of a new type – research university on the basis of the Tomsk State University (TSU), academic innovation university on the basis of the Tomsk Polytechnical University (TPU), and innovation entrepreneurial university on the basis of Tomsk University of Control Systems and Radioelectronics (TUCSR). These models have been developed owing to winning of these universities in the federal competition of innovation educational programs: TSU and TUCSR – in 2006, and TPU – in 2007. Total volume of financing of these programs came to nearly 1.8 billion rubles. These universities are engaged in training business-teams for perspective science-intensive projects. Annually, 25 business-teams are trained, up to 500 specialists for development of science-intensive business are graduated, and up to 800 working places are created in the innovation business sector.

Training personnel for innovation business is a global problem. The world fashion for special economic zones has resulted in the fact that their saturation with personnel is becoming a limiting factor. Human capital becomes more important than capital investment and creation of material and technical basis.

For different levels of education there is created a system of resource centers, providing for preparation of specialists and their professional development on the basis of innovation technologies. There have been formed patterns for all levels of education. In the first place, creation of the resource centers allows developing innovation projects and increase of profits, combining sales of technologies and training the personnel; in the second place, in the education system there are created points of professional growth, and problem of employment of trained specialists is completely solved.

In the process of realization of the interdepartmental program there is created system of regional support along the entire chain, from generation of an idea to commissioning into the market.

As to generation of knowledge, total number of grants of RFBR and RFRH has grown from 269 in 2002 to 470 in 2007. In the year of 2007 organizations of the Region realized 388 grants of the Russian foundation for basic research (RFBR) and 82 grants of the Russian foundation for research in humanities (RFRH). In 2007, volume of financing of regional competitions of the Tomsk Region Administration and the Russian foundation for basic research increased up to 30 million rubles (5 times as compared with the year 2006). Volume of financing of joint regional competition of the Tomsk Region Administration and the Russian foundation for research in humanities increased up to 5 million rubles (2.5 times as

compared with the year 2006). There was a competition of projects of oriented basic research of the RFBR, the Tomsk Region Administration and the Institute of industrial technological research (Taiwan).

In the process of realization of innovation programs universities of Tomsk acquired science, research and technological equipment for 1.5 billion rubles. There were created more than 20 centers for collective use, equipped with up-to-date equipment for carrying out research, training specialists, as well as for executing contracts of enterprises in priority directions of the regional development. Modern equipment is intensively used for perspective forms of education. On the basis of the created collective use information-telecommunication centers using the central satellite communications set of the inter-regional Tele-port, and super-computer "SKIF Siberia", there is provided realization of educational and scientific projects with use of remote technologies. In the Tele-port network, there are more than 200 stations of satellite access installed in educational institutions located in distant areas of 8 regions of the Siberian Federal District.

Organizations of the Tomsk Region took active part in realization of federal target programs (FTP). In 2006-2007, the Tomsk Region was one of five winners of competitions within FTP "Research studies and designs in priority directions of scientific-technological complex of Russia for 2007 – 2012": there were supported 39 projects with volume of financing from the federal budget of 352.5 million rubles (including 158.6 million rubles in the year of 2007) and from non-budget sources – 200 million rubles including 79.0 million rubles in the year of 2007). The most active participation the Tomsk Region takes in research and development of technologies for priority area "nanoindustry". Total volume of financing attracted annually for development of nanotechnologies in the Tomsk Region exceeds 30 million Euro. In 2007, volume of rendered services and sales of products in nanotechnologies exceeded 15 million Euro. There were established 3 joint productions with partners from Slovenia, Vietnam and Israel. There were export of small series of products to Germany, Japan, Canada, South Korea and other countries.

During last years major efforts of the Tomsk Region were aimed at joining the scientific, educational and innovation sector of the world. The main task was to establish mutually beneficial relations with world leaders in a wide spectrum: realization of joint R&D, realization of innovation projects, establishment of joint enterprises and development of joint infrastructure of scientific-educational and innovation activities. So far, working relations were established with partners from USA (Los Alamos Laboratory, Sandia Laboratory, Livermore Laboratory, companies of Silicone Valley, company "Microsoft), European partners (Commissariat for nuclear energy of France, Group of companies "INNO", (France), Technopark "Sofía Antipolis" (France), Group of companies "Oxford Innovation" (Great Britain), Fraunhofer Society (Germany), Technical universities of Berlin and Karlsruhe (Germany), Delf Technical University (Netherlands), partners from countries of Asia (Ministry of Trade and Industry

of Singapore, company “Panasonic” (Japan), Special economic zones of cities Dalian and Laoning (China), Institute of industrial technological research of Taiwan, Scientific park of Central Taiwan. There were established 2 international scientific and technical centers, 12 joint laboratories, international center for technology transfer and business-incubator; established 5 joint enterprises were established as well.

One of important elements of development of innovation activities of the Tomsk Region is the Special Economic Zone of Technology development type (TSEZ), project of creation of which was won in 2005 in the Russian competition of applications for creation of special economic zones of technology development type. Specialization of the TSEZ: new materials and nanotechnologies, IT-technologies and electronics, medicine and biotechnologies.

In the year of 2007, there was carried out realization of two projects: creation of technology of production of super-high-molecular polyethylene and creation of new technologies of production of titanium-magnesium catalytic agent. By now, there is launched the first installation for production of super-high-molecular polyethylene. Installation for production of titanium-magnesium catalytic agent is in the stage of completing of construction. Parent company OJSC “SIBUR Holding” plans to invest in 2008 around 600 million rubles for creation in the SEZ of corporative research chemical-technological center. By the end of 2008 the resident will reconstruct buildings having total area of 11 thousand sq. m., including scientific building of 2500 sq. m.; two pilot buildings with mounting of three new multi-functional installations, as well as it will reequip working places for 315 workers of the enterprise.

Thus far, number of residents of the TSEZ came to 25 innovation companies.

In the years of 2008-2010, companies-residents of the TSEZ will invest in Tomsk 1.2 milliard rubles aimed at realization of projects and there will be created around 2000 working places.

Susceptibility of innovation organizations to scientific and technical novelties is conditioned by investments into basic capital. In those organizations of industrial production, which have been applying technological innovations, share of investments into basic capital in volume of shipped goods, performed work and rendered services comes to 12.0%, and in those ones that have not been applying technological innovations – 8.8%. In those organizations of sphere of services, which have been applying technological innovations, share of investments into basic capital in volume of shipped goods, performed work and rendered services comes to 21.9%, and in those ones that have not been applying technological innovations – 4.7%.

In the year of 2007, volume of innovation and science-intensive products increased 3 times as compared with 2002. In total, in the innovation science-intensive sector there are more than 300 enterprises, 47 of which were established in the year of 2007, and which form so-called innovation belt of organizations of the scientific-educational complex of the Region.

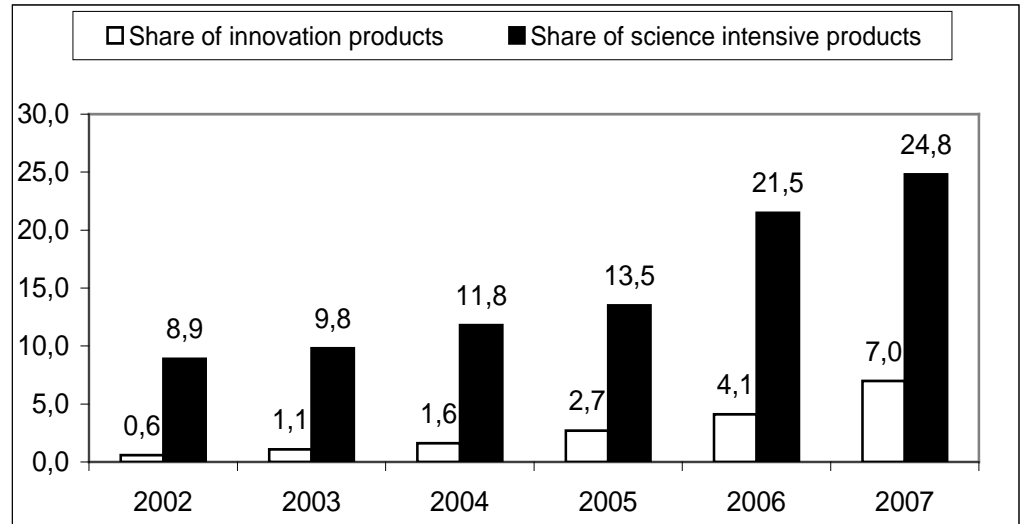


Figure 2: Dynamics of innovation sector development of the Tomsk Region

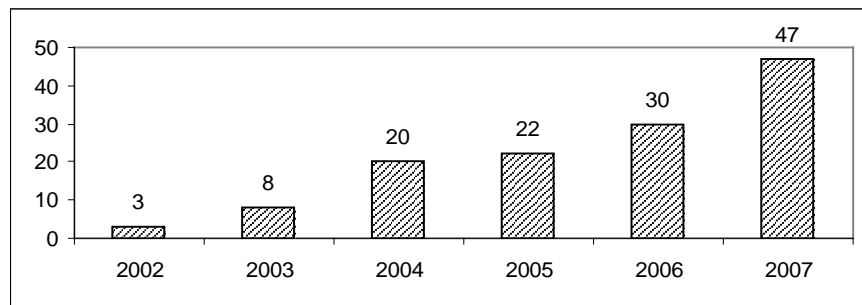


Figure 3: Number of newly created innovation organizations.

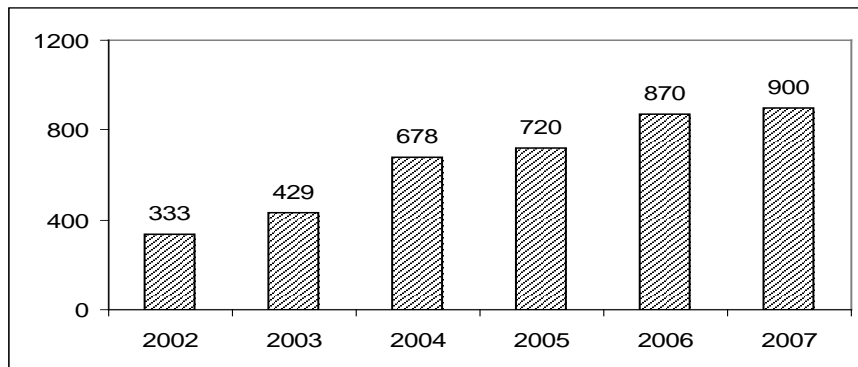


Figure 4: Average output of science-intensive products per one worker, million rubles.

Average output per one person employed in innovation sector came to nearly 1 million rubles, and in a number of science-intensive enterprises it exceeded 2.5 million rubles.

Dynamics of output (rendering services) allows single out three stages of innovation-active organizations development:

1st stage: Business generation (0 – 5 million rubles). This stage is characterized by both increased level of risk and liquidation and considerable prospects of growth of the organizations.

2nd stage: Growth of business (5 – 150 million rubles). This stage is characterized by increase of number of personnel, organization of large-scale production, development and enlargement of chosen segments of the market.

3rd stage: Business development (more than 150 million rubles). At this stage, large-scale innovation-active organizations are proceeding to planned technical upgrading, optimization of business, diversity of production, and entering new segments of the market. Lower growth rate of production volumes as compared with the previous stage provides for principal increase of production in absolute values.

As a rule, creation of working places takes place at the stages of generation and growth of business. Business development at the third stage results in relative reduction of number of personnel. At the same time, large-scale business provides for higher productivity of labor.

It is required to accentuate the fact that at the final phase of the second stage (growth of business) increase of production volumes takes place at the expense of extensive factors. These tendencies create preconditions for passing to the next stage of business development, which requires increasing investments into R&D and technical upgrading of enterprises.

The quoted results of the year of 2007 qualitatively repeat the picture of development of innovation-active sector of economy in the year of 2006.

Development of regional innovations statistics served as base for perfection of the regional legislation in the field of innovation activities. In the year of 2007 there were prepared, and in August of 2008 there were accepted proposals concerning fixation of mechanisms for stimulating accelerated development of innovation-active organizations in the regional Law “On innovation activities in the Tomsk Region”. In panel session of the State Duma of the Tomsk Region, which took place in August, 2008, there was approved new wording of the Region Law “On innovation activities in the Tomsk Region”. The new wording of the law contemplates systematic stimulation of innovation activity of small-scale, medium-scale and large-scale enterprises by means of granting them state support, via assigning to them status

of an innovation-active organization subject to conformity of indices of their activity with certain criteria of innovativeness in the field of growth of production volumes, share of proceeds from sales of innovation products in total income of enterprise, expenditure on R&D, availability of their own results of intellectual activities, patented or acquired ones.

Degree of success of realization of measures of interdepartmental and other target programs directed to achievement of objectives of the Tomsk Region Innovation strategy is characterized by comparison with the indicators of innovation development approved in the Russian Federation. According to results of the year of 2007, their values in the Tomsk Region are advanced with respect to Russia.

Summarizing results of realization of the Innovation strategy in 2002-2007, it is possible to acknowledge the fact of creation in the Tomsk Region of the regional innovation system providing for advanced growth of the economy innovation sector.

Major tasks of the next stages consist in realization of measures, directed to increase of innovation activity of industrial enterprises, increase of competitive ability of R&D sector having optimal institutional structure and providing for extended reproduction of knowledge, perfection of system of staff support of the economy innovation sector, development of international activities directed to cooperation in the scientific-educational sphere, and promotion of competitive innovation products in foreign markets.

Appendix C.2: Regional innovation system of the Republic of Tatarstan⁷¹

At the present time, tendencies of regional innovation system (RIS) of Tatarstan are specified by both starting conditions and institutional distinctive features of the Republic, and advantages and disadvantages of the Russian national innovation system (NIS) in whole.

1. Innovation and industrial policy

Tatarstan is considered as a donor region, and it has quite a competitive industrial sector, well-known scientific schools, and effective managerial sector. In 2007, growth rate of gross regional product came to more than 9%. To compare with, for the same period of last year it came to less than 6%. This year, in the Russian Federation and in the world economy there were achieved growth rates of gross product of 7.3% and 5.2% correspondingly. At that, as well as in Russia, in the republic there are increasing growth rates of processing productions, which for the year of 2007 exceeded 16%, and this fact undoubtedly creates preconditions for growth of demand for innovations and productive and constructive activities. According to ratings of effectiveness of regional social-economic indices, carried out by independent federal bodies (Center of Policy Environment of Russia), basing on results of the first half year of 2007, the Republic of Tatarstan (RT) ranked among the six best regions, together with Moscow, Saint Petersburg, and Leningrad, Sverdlovsk and Yaroslavl Regions.

The republic authorities realize necessity of every possible support of innovation activities. This fact is confirmed by “Program of innovation development of the Republic of Tatarstan up to the year of 2010” approved by Cabinet Council of the RT in 2004, in which there are fixed major tasks and principles of state, private and public bodies in the field of innovation activities. At present, in accordance with Message of Mr. M.Sh. Shaimiev, the President of the RT, and with Executive Order of Cabinet Council of the RT, there is worked out “Strategy of development of scientific and innovation activities in the Republic of Tatarstan up to the year of 2015”, being at the stage of coordination and approval, which determines innovation development of one of priority republican tasks. For today, Tatarstan is the only region, in which there is legislatively fixed use of all existing at the present time instruments of state support of subjects of investing. Taken as a whole for the country, 73 subjects of the federation apply tax privileges, 61 – loan guarantees, 60 practice co-investing commercial projects, 50 regions extend investment tax credits, 43 subsidize interest rates.

⁷¹ Based on materials of article of V.L. Vasiliev and I-R. Gafurov “Analysis of functioning and prospects of development of regional innovation system of Tatarstan”, Innovations, No 4, 2008

OJSC Innovative-Industrial Technopark "Idea" (OJSC IIT "Idea"), the largest one even according to world standards, established by the Decision of the RT Government No 640 dated November 12, 2002, became the central element of innovation policy of Tatarstan. In cooperation with the technopark there are developing its subsidiary organizations: OJSC "Kama Industrial Park "Master" in Naberezhnye Chelny and "IIT "Idea South-East", OOO in Almetievsk.

The technopark structure is represented by business-incubator, innovation-technologic center and business-park, which allows providing complex support of an innovation project from an idea and object of intellectual property to pilot commercial lot and realization of production in the market. At the moment in the technopark business-incubator there are allocated 28 small-scale innovation enterprises (SIE), 17 from which work in the sphere of IT-technologies. Altogether, in the technopark territory there are allocated more than 70 companies. During its existence, the technopark gave support to 150 companies. There were created 760 working places. During the latest years the technopark carried out several successful escapes form companies with rate of profitability of 40%, and now it has positive prospects for its growth. Among such projects there are development of autonomous equipment for fixing pricks of a sword, for carrying out fencing tournaments and medical concentrator of oxygen. Both projects are world-wide competitive.

The Republic strategy with respect to creation of technoparks is characterized by complex approach from point of view of branch-wise orientation. So, the above-named KIP "Master" represents a striking example of effective functioning of innovation infrastructure in the field of motor-car construction. Its activity is aimed to development of modern and economically effective productions for manufacturing automobile components for OJSC "KAMAZ". At the present time, there are more than 90 small-scale enterprises-tenants that carry out active industrial and economic activity in its sites, having number of employees about 1500 persons and total annual turnover exceeding 1.1 milliard rubles. Starting from 2006, in petroleum-chemical branch there is successfully functioning industrial park "Chimgrad", located in business-site of OJSC "Tasma' Holding", in which there is also planned to arrange corporative university, logistics center, and housing infrastructure.

Technopark of high-technology sphere, being created within the limits of the federal program, must become a logic and essential element in the republic innovation infrastructure. According to prognoses, volume of investments into the technopark projects for the period of up to 2009 can come to more than 6 milliard rubles. Enterprises of high-technology branches, including branches of nano-, bio- and information technologies, will become the technopark residents.

Under the conditions of the federal and republican support there is actively developing innovation structure in higher school. There are successfully functioning technoparks attached to the Kazan State Technical University named after A.N. Tupolev and the Kazan State Technological University. Positive results of activity demonstrate Centers of transfer of technologies of the KSTU named after A.N. Tupolev and the Kazan State Technological University. Task of these structures consists in supporting the most initial stages of innovation process, when innovation idea is not yet formalized and attractive for commercial and branch technoparks. As a whole, innovation structure of Tatarstan numbers 14 organizations and it is balanced with respect to all principal directions.

For the purpose of further integration of the republic innovation infrastructure into the social-economic system of regional, federal and international level, there is carried out active policy with respect to informational support of innovation activities. The Tatar Center of scientific and technical information (TatCSTI) serves as coordinator in this direction. Branch-wise and thematic trade fairs and exhibitions of scientific and technical achievements with participation of industrial, scientific and investment sectors of economy are carried out in the republic on regular basis. Innovation project of the RT are represented in the largest sites of the world: In Belgium, France, China, and Thailand. As a result, there are developing international relations in the field of innovation activities. For example, one of scientific-and-technical collectives of the KSTU named after A.N. Tupolev, which won in 2005 in competition "START" of the Fund for the promotion of development of venture capital investments into SME in the Scientific and Technical Sphere of the Republic of Tatarstan (FPD VI SME STS RT), obtained an order for development of technology for manufacturing crimped coatings for the European aviation company "Airbus".

Every year the Republic participates in the Moscow saloon of innovations and investments, the Russian venture trade fair, where in 2005 there was presented two-seat mini-airplane "KAI-81", which attracted attention of several venture financiers, including such a famous venture company as "Russian Technologies – Alfa Group". Undoubtedly, the process of a venture financier "feeling out" a company in the Russian economy is more prolonged due to low level of confidence; therefore development of network of informational sites, in which companies can increase their resource of publicity, is considered as priority task of the RT RIS. It is already for the second year as in Kazan there is carried out District Venture Trade Fair, in which participate venture financiers of the world level. All this allows permanent renewing base of both scientific-and-technical projects and investors, and this fact promotes increase of the RT RIS resource.

Significant result of the republic innovation policy, allowing integrating efforts of all subjects of the innovation sphere and taking into consideration their interests to the maximal limit, consists in creation in 2005 of Coordinating Council for innovation activities attached to the Ministry of Education and

Science of the RT, part of which form representatives of IIT "Idea", Investment and Venture Capital of the RT, technoparks of institutions of higher education, university departments of technology transfer, republican ITC, representation of the FPD SME STS, TatCSTI, and Society of investors and innovators.

Creation of federal service of special economic zone of industrial-production type "Alabuga" (SEZ "Alabuga") is basic measure within the limits of industrial policy, and it is aimed to realization of up-to-date methodology of interaction of the state, science and business. In this connection there is required state support of fundamental research oriented to be applied in SEZ "Alabuga", creation of conditions for initiation of small-scale and medium-scale business in immediate proximity to industrial sit, development of innovation and information infrastructure capable to initiate and to support interaction between innovators and investors, stimulation of the zone residents to investing into reproduction process with innovation orientation, using at that domestic scientific potential. There is required entire complex of measures with respect to creation and strengthening of interaction between the science and market in the region long-term social-economic interests.

As the first step in this direction there can be considered working out of strategy of development of Kama economic region, which comprises 5 municipal districts: Mendeleevsky, Elabuzhsky, Nizhnekamsky, Tukaevsky, Zainsky and urban district Naberezhnye Chelny. There are about 900 thousand people residing here. The program major task consists in complex and effective development of territories using powerful potentials of such industrial giants as OJSC "KAMAZ", OJSC "Severstal-auto", OJSC "TATneft", OJSC "Nizhnekamskneftekhim", Special Economic Zone "Alabuga", as well as innovation experience of technoparks (KIP "Master", "Tatelektromash", "Technopark of Prikam'e", Business-incubator "Alabuga").

2. Mechanisms of financing of innovation activities

The process of accumulation of considerable resource of venture capital on the Republic is developing. As a start of this process there can be considered establishment of the State Non-Profit Organization "Investment and Venture Capital Fund of the Republic of Tatarstan" (SNPO IVCF RT) in accordance with the Decision of Cabinet Council of the RT No 928 dated November 17, 2004.

Actually, directions of the SNPO IVCF RT activities can be reduced to two ones.

In the first place, activities relating to support of subjects of small-scale and medium scale entrepreneurship by means of giving subventions for compensation of part of commercial credit interests, application of leasing mechanism, realization of program of micro-crediting. The said direction

in a greater degree corresponds to investment activities with elements of innovation activity. At that, principal criteria of obtaining investments are the following: scientific-and-technical novelty of a project; possibility of commercializing a product (technology); availability of the market paying capability; availability of enterprise proper funds at the rate of not less than 20% of project value; project payback must not exceed 3 years; availability of personnel, organizational and production possibilities of project realization; project realization (creation of assets) in the RT territory.

In the second place, activities, characterized by sufficiently high levels of innovation risks, realized by means of giving grants to scientific collectives for carrying out R&D, carrying out competitions with the aim of stimulating professional activity of scientists, inventors, scientific and technological community, students and graduate students. Criteria for selecting R&D claiming to obtain grants are the following: possibility of effective commercializing of project results; availability of object of intellectual property and identification of same; investment attraction of project results; availability of market; scientific-and technical level of design, level of competitive advantages of R&D results and possibility of their long-continued maintaining; availability of a team of qualified specialists for project realization; provision of project with modern level of management of innovations; foundation for financing all stages of project realization; availability and development of cooperation with subjects of innovation activities; period of project completing must not exceed 18 months.

In December, 2007 there summarized results of the third Republican Competition “The best fifty innovation ideas for the Republic of Tatarstan”, organized by the SNPO IVCF RT on regular basis. In total, there were received 694 applications for participation in the Competition, including the following nominations:

“Perspective” (71 applications);

“Youth Innovation Project” (250 applications);

“START-1” (207 applications);

“START –П” (12 applications);

“The best invention of the year” (24 applications);

“Social-economic development of the Republic of Tatarstan” (130 applications).

At that, there are observed positive dynamics of accumulation of applications as per years: 2005 – 490 applications, 2006 – 621 applications.

On the one part, strategy of placing venture capitals of the IVCF RT consists in participation in mechanism “Fund of funds” at the federal level, and on the other part – in creating such a mechanism

independently, and in developing it at the regional level. The strategy in question is one of progressive ones in the RF, and it represents strong part of the RT RIS.

As is known, establishment of OJSC “Russian Venture Company” (OJSC RVC) represents an attempt to realize in the Russian economy mechanism “fund of funds”, which demonstrated its effectiveness in a number of foreign countries. Application for participation in mechanism “fund of funds”, filed by the SNPO IVCF RT, served as foundation for creation in 2006 of non-profit organization “Fund for the promotion of development of venture capital investments into SME in the Scientific and Technical Sphere of the Republic of Tatarstan (FPD VI SME STS RT). Volume of the fund investments came to 800 million rubles (200 million rubles from the republican budget, 200 million rubles from the federal one, and 400 million rubles – private investments). As a result of selective competition, CJSC MC “Troyka Dialog”, well-known company in the market of investments, became the fund management company.

Together with MC “Ak Bars Capital”, OOO, the SNPO IVCF RT became a founder of one more fund — “Regional Venture Capital Fund of Investments into SME in the Scientific and Technical Sphere of the Republic of Tatarstan” (RVFI SME STS RT). Volume of the fund investments came to 300 million rubles (75 million rubles from the republican budget, 75 million rubles from the federal one, and 150 million rubles – private investments). OJSC “Ak Bars Bank” served as private investor, and MC “Ak Bars Capital”, OOO served as Management Company.

In such a way, strategy of the IVCF RT consists in further diversification of its portfolio and in reduction of innovation risk by means of attraction of new investors. MC “Ak Bars Capital”, OOO is aware of the region peculiarity; it possesses certain level of social capital, and it has long-term relations with the principal players of the republican market of innovations and investments. It will allow filling up vacuum of confidence between participants of the innovation process.

At that it goes without saying that the IVCF RT, being a co-founder of both funds, will also attract to cooperation CJSC MC “Troyka Dialog”, which will stimulate successful functioning of the partnership in question owing to its experience in managing international venture capital transactions. Just owing to this fact the IVCF RT, CJSC MC “Troyka Dialog” and MC “Ak Bars Capital”, OOO have concluded a tripartite agreement on joint activities to meet interest of development of venture business in Tatarstan.

Abiding such a strategy, in perspective there is expected to obtain “effect of Silicone Valley”, where within a restricted territory, under favorable social-economic conditions, has been formed critical

volume of venture capital, innovation ideas and managerial resources, and this fact created preconditions for rapid innovation development.

Program "Idea-1000", organized by the SNPO IVCF RT together with the FPD SME STS and OJSC IIT "Idea" for participants of Republican Competition "The best fifty innovation ideas for the Republic of Tatarstan", is a new form of investing into innovation projects of the RIS.

Within the bounds of program "Idea-1000", there is provided for financial support in three nominations: "Youth Innovation Project", "START-1" and "START-П".

In nomination "Youth Innovation Project" there are selected up to 40 projects for carrying out R&D. Winners in the nomination in question obtain parity financing of project realization at the rate of up to 200 thousand rubles from the SNPO IVCF RT, and up to 200 thousand rubles from the FPD SME STS. In the process of competition selection in this nomination there is taken into consideration the following: applicant's age – up to 28 years; possibility of commercializing project results within medium-term perspective (5-6 years).

In nomination "START-1" there is selected up to 15 projects for carrying out development activities, corresponding to requirements of participation in program "START" of the FPD SME STS. Winners in the nomination in question obtain parity financing of project realization at the rate of up to 750 thousand rubles from the IVCF RT, and up to 750 thousand rubles from the FPD SME STS.

For nomination "START-П", as well as for other programs of the Fund for promotion, number of projects to be selected is not fixed, but it is determined by competition selection. Projects in the nomination in question must correspond to requirements of program "START" (the second year) of the FPD SME STS. Winners in the nomination of Program "START-П" obtain parity financing of project realization at the rate of up to 1.5 million rubles from the IVCF RT, and up to 1.5 million rubles from the Fund for promotion. To participate in competition selection in nomination "START-П" there is necessary to produce business-plan of a project, corresponding to requirements of Decision of Cabinet Council of the RT No 284 dated May 7, 1999.

One more form of co-investing innovation projects is a joint program of the SNPO IVCF RT and the "Russian foundation for basic research" – "RFBR – region, co-financing research studies", in which special attention is paid to interest of the RF subject. Prior to announcing a competition, regional authorities together with leading scientists form a list of priority tasks, for development of which there are required basic research studies.

3. Branch-wise innovation projects

The Republic possesses considerable scientific potential, accumulated for the years of functioning of the Soviet innovation system. Scientific and technical projects of the RT permanently win prestigious awards in competitions of various kinds. However, there are some apprehensions of gradual reduction of competitive ability of scientific sector of the RT RIS. For example, those projects from the KSTU named after A.N. Tupolev, which won in program "Idea-1000" in the year of 2007, are central objects of research studies of the university oldest chairs that carry out these designs for already 20-25 years.

Many component parts in these projects are of foreign production. So, in helicopter KAI-82-002 "Lark", there is provided for installation of the Italian-made engine "Rotax", starting pre-heaters won't be competitive without electronic ignition unit and remote starting device that are produced abroad, a lot of equipment used for testing microwave and electromagnetic radiations is also of foreign manufacture. One can believe that in those scientific schools, which are still competitive, there takes place "washing-out" of innovation ideas, which are "subtly" caught up by venture financiers. The problem consists in absence of feedback between the market of innovations and scientific medium from point of view of re-investing into principally new scientific research studies.

As is known, innovation development can be progressing in two directions: bottom-up, when science allows creating a product or a technology that obtain unexpected demand in the market, and top-down, when the market itself makes an order to science for creation of a product or a technology, "anticipating" them to be in demand.

At the present time the market, represented by production sphere, completely satisfies its needs at the expense of foreign technologies. Business in Russia is not motivated for carrying out proper research studies, and so much the less for financing domestic science. Scientific sphere, using the accumulated potential, delivers to the market innovations satisfying modern priorities of economy, but does not obtain orders from the production sphere.

Under such conditions scientific sphere is not a key factor of competitive ability of economy, and therefore it does not receive sufficient investment injections into renewal of its base; at that, venture business does not serve as conductor-intermediary in its classic understanding between the science and the market.

To solve this problem, in Tatarstan there is carried out up-to-date and active manpower policy in the field of innovation management and technological entrepreneurship.

In all advanced institutions of higher education there are created chairs for innovation management. Disciplines on economic basic foundation of technological entrepreneurship are included into educational plans of many specialties, both technical and humanitarian. Professional development institutes created on platform of the universities carry out courses in the field of innovation activities at the regional level. The Ministry of Education and Science carries out competitions for the best innovation idea among students of institutions of secondary and higher education, organizes on grant basis education of young specialists in the best educational foreign and domestic centers for innovation subjects.

On regular basis there are carried out measures aimed to preparation of specialists demanded by innovation sector of economy, such as joint scientific-practical conferences on actual problems of science and production, practical trainings of students, trade fairs of vacancies. There are being restored students' design offices and scientific hobby groups at the level of institutions of higher education. Students' diploma projects start to acquire appearance of youth innovation projects. So, students of Elabuga branch of the KSTU named after A.N. Tupolev are working out a number of diploma projects on the basis of Business-incubator "Alabuga". In Kazan, starting from 2006, initiative teams of students of the same institution of higher education participate in program "SMARTY" launched by the FPD SME STS.

Positive result of such manpower policy consists in appearance of professional managerial teams in scientific sphere. In 2007, the SNPO IVCF RT announced competition for selection of MC for transferring to it authorities of the sole executive office of those economic societies that are realizing projects – winners of Program of innovation projects "Idea-1000" in nomination "Youth Innovation Project", and for concluding with it an agreement for performance of work as per project "Creation of Center for engineering and Commercialization of Results of Scientific and Technical Activities". One of the competition winners became Non-state autonomous non-profit organization "Research Center Omega attached to the Kazan State Technical University named after A.N. Tupolev".

Essential problem, impeding harmonization of interests of participants of innovation process, consisted in absence of legislatively fixed uniform terminological apparatus of innovation sphere. In such a situation an investment project with small share of innovations of improving nature, or, possibly, with pseudo-innovations, can be considered as innovative one. Moreover, such projects can enjoy preferential taxation and even more increase non-attraction of "real" innovation activities. According to

investigations, among 255 companies that attracted venture capital investments in Russia in 1994-2005, number of high-technology ones in wide sense does not exceed 15, moreover, only 6 from them are companies of high-technology sector.

At the present time there is formed understanding of “innovation” as a result of innovation activities, which has received the market appraisal. However, according to our opinion, definition of “innovation” as of a process of generation, embodiment and realization of ideas in practical activity allows more precise determining basic conditions and instruments, which are stimulating innovation development, both at an enterprise and in economy as a whole. Furthermore, such a definition allows revealing and solving those contradictions that represent major cause of innovation risk, low motivation of investors to innovation projects, and difficulties in perception of innovation by public medium. And identification of an innovation with a result (profit, proceeds, rent) just leads to dominance in portfolios of venture capital funds of these investment projects that allow providing such result without substandard risk.

One more factor limiting placing investments into risk projects is the accepted in Russia organizational-legal form of venture capital funds, which is inadequate to classic institutions of venture business. The FPD VI SME STS RT and the RVFI SME STS RT are established in the form of closed unit investment funds of venture capital investments (CUIFVI).

In accordance with requirements of legislation, the CUIFVI in the first place must demonstrate its profitability at the rate of “not less than market average” one; in the second place, its investment strategy must be moderately-conservative, and its provisionally free assets must be invested into high-reliability shares, debenture bonds and bank deposits; in the third place, proportions of investment portfolio are stipulated in regulations of trust managing and registered in the Federal Service on Financial Markets; and in the fourth place, investments into each venture project must not exceed 15% of its cumulative budget.

The battery of the above mentioned requirements considerably circumscribes not only access to venture capital from the part of small-scale innovation firms, but also actions of venture financiers themselves, who start to avoid high risks and to invest into the late stages of innovation projects. So, for one year the FPD VI SME STS RT under direction of CJSC MC “Troyka Dialog” brought profit at the rate of 16 million rubles. One can assume that the profit in question was obtained at the expense of investing into securities of traditional, stable and liquid companies. In this case any sense of venture entrepreneurship completely vanishes.

However, it should be noted that just such organizational-legal form is capable to provide for realization of investment relations under the conditions of unstable institutional medium with low level of confidence. First of all, task of the state consists not in finding the best organizational-legal form for venture capital funds, but in increasing confidence between subjects of innovation system, strengthening stability of the existing institutions and control mechanisms. Only after that it is possible to speak about launching classic mechanisms of venture business, using package of more flexible and liberal organizational-legal forms.

Perfection of the institutional medium of the republic investment sphere is considered to be the primary task. According to prognoses of the Ministry of Economy and Industry of the RT, in the nearest there is planned to attract about 750 milliard rubles of investments into basic capital. At that, for investors granting taxation allowances is of less importance than simplification of procedures of administering business, registering transactions with land and assets.

Summary of results of the carried out investigation allows representing them in the form of SWOT-analysis of the RIS of Tatarstan (Table 1).

Table 1: SWOT-analysis of regional innovation system of the Republic of Tatarstan

Strong parts	Weak parts
<ol style="list-style-type: none"> 1. Stable social-economic growth as condition of resource provision of innovation processes, activation of creative activities and improvement of confidence environment in innovation sphere. 2. Every possible support of innovation business by the republic authorities, effective complex of instruments of state support of innovation activity. 3. Developed innovation infrastructure allowing supporting innovation projects from the earliest stages and with various branch orientations. 4. Considerable resource of venture capital, availability of diversity of venture structures, diversifying investment portfolios and reducing innovation risks. 5. System-defined manpower policy, use of advanced experience, creation of information field of innovation activities. 	<ol style="list-style-type: none"> 1. Insufficiently perfected normative-legal support of innovation activities resulting in overlapping of criteria of investment and innovation projects. 2. Low sowing financing, and support of more late stages of innovation process. 3. Dominance of interests of gaining profit over strategy of financing risk and radical innovation projects. 4. Absence of stable processes of reinvesting into scientific sphere; low motivation of business for carrying out its own R&D. 5. Priority of innovation sphere in the process of organization of processes of commercialization of novelties, absence of resources in higher school for plenipotentiary participation in venture business.
Possibilities	Threats
<p>Activation of interaction of scientific and investment sector, small-scale and medium-scale business, large-scale industrial enterprises by means of development of SEZ "Alabuga".</p> <p>Integration with the Russian and global innovation system; participation in federal investment competitions and programs; attraction of international managerial knowledge and venture capital.</p> <p>Participation in rule-making initiatives with respect to perfection of legislation in the field of</p>	<p>Reduction of competitive ability of scientific sector; aging of resource base of science; depletion of scientific potential.</p> <p>Increase of dependency on foreign technologies; increase of gap between domestic science and production.</p> <p>Intensification of drift of venture business in the direction of "private equity"; expansion of "valley of death" in financing of innovation projects at initial stages.</p>

innovation activities.	
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Appendix C.3: Regional innovation system and policy of Saint Petersburg in 2008⁷²

Preconditions and legislative foundations of innovation development of Saint Petersburg

At present in Saint Petersburg there are four basic documents determining innovation development of the city for medium-term and long-term perspective.

In conception of social-economic development of Saint Petersburg up to the year of 2005 there are singled out three scenarios of the city development: Petersburg – city open to the world (“Open City”), transport-logistics center and center of innovations and administration. At that, all the three scenarios do not contradict each other, but they are complementary. According to this document, our city aims to achieve a status of the world innovation center up to the year of 2025.

In summer of 2007, Government of Saint Petersburg approved Decision “On foundations of innovation policy for the years of 2008-2011”. Here there are determined basic principles, objectives, tasks and priority directions of innovation policy, forms and procedure of realization of measures of state support of innovation activities in the city. Apart from this, the Committee for economic development, industrial policy and trade carries out coordination of activity of executive powers of state authority of Petersburg in innovation sphere, as well as interaction with federal authorities, educational institutions and industrial companies of various branches of production and service industries, including subjects of small-scale entrepreneurship.

Basing on this document, on January 23, 2008 the city Government approved the Complex program of measures on realization of innovation policy for the years of 2008-2011 (hereinafter referred to as “Complex Program”), aiming to increase of competitive ability of the city at the Russian and global levels.

The program consists of two basic blocks. The first one comprises measures, which are realized directly by executive powers of state authority of Saint Petersburg in cooperation with subjects

⁷² Based on materials of article of S.A. Fiveisky “Administration of regional innovation system: experience of Petersburg” of article of N.L. Korenko “On realization of innovation policy of Saint Petersburg in 2008”, Innovations, No 4, 2008.

of innovation activities. These are measures on forming personnel for innovation economy, development of innovation infrastructure, forming and realization of cluster policy, supporting export of innovation products, attraction of investments into innovation sphere, normative fixing of the most important mechanisms of regulation of innovation activities, advocacy and promotion of our experience in regions of Russia and abroad. The second block consists of those projects, realization of which is carried out in Petersburg with organizational, financial and information support of federal executive powers of state authority: this is creation of Technology Development Special Economic Zone, IT-park on the base of University named after M.A. Bonch-Bruевич, Science Town and Venture Capital Fund.

It is worthwhile to note that those instruments of supporting innovation system that are included into the Complex Program are interrelated between each other; they are not contradictory.

The fourth document is the Program of social-economic development of Saint Petersburg for the years of 2008-2011, in which there are fixed target checkpoints of development of the innovation system for the nearest four years.

Apart from this, development of the innovation system of Petersburg will be influenced by working out and approval of Conception of cluster policy of Saint Petersburg for the years of 2008-2011 and of Plan of measures on its realization for the same period. Preparation of these documents started this year in our Committee.

Why does Petersburg put to itself such ambitious goals? Historical “capital” of the city becomes preconditions of innovation development. Saint Petersburg is the intellectual and culture capital of the country, the leader in the Russian education, the largest industrial and transport-logistics center in the North-West of Russia, the city of European standards of habitation.

Personnel for innovation economy

To make an example of strategy of realization of the Complex Program it is worthwhile to mention those measures that are connected with training and retraining personnel. All of them are included into the first clause of the program and aimed to creation of such a system that

would provide subjects of innovation activities with highly skilled specialists in required volume. For this purpose there will be developed educational modules, on the basis of which, in turn, there will be formed various courses of secondary, higher and after-graduation education.

These measures are the first step of the city the way of consolidation of personnel potential of the innovation system. Now we orient in a greater degree to the present needs of subjects of innovation activities and to necessity of working out effective mechanisms of retaining qualified personnel in the innovation system. That is, we support such a circle of scientific personnel, who correspond to those innovation projects that are interesting to the market.

On the other part, on the basis of prognostics and estimation of market demand in future, we determine such scientific personnel, who would be in demand in the future innovation system and, basing on it, we will form and realize programs of training such personnel and mechanisms of stimulation of trained specialists to work just in the sphere in question.

Measures aimed to training and retraining of personnel for the city innovation system will be realized both in branches of industry and in service industries, at enterprises of small-scale and medium-scale business, in institutions of higher and secondary education, in training colleges and secondary technical schools. In such a way we cover all principal subjects of the innovation system of Petersburg.

Our approach is based on the fact that we are not only stimulating training and retraining of personnel, but offering mechanisms of their retaining at enterprises and in scientific sphere. One of priority measures of this section can be worded as follows: not only knowledge, but skills as well.

Consequently, we consider that role of the state in development of innovation system is based on stimulation of innovation development, creation of conditions for commercialization of knowledge and implementation of new products and services into markets. The main principle of such an approach is development under the conditions of cooperation of the following three systems: business, state, and science and education.

Innovation policy of the city

The Committee for economic development, industrial policy and trade has proceeded to realization of the Complex program of measures on realization of innovation policy in Saint Petersburg for the years of 2008-2011.

For the purpose of planning activities on realization of the innovation policy in 2008, the Complex Program has been symbolically divided into the following two blocks of measures: methodological one and practical one, at that, they shall be realized sequentially: the methodological one in the first half-year, and the practical one in the second half-year.

Realization of the methodological block comprises the following kinds of work:

- Determination of qualitative and quantitative criteria of attributing organizations to innovation type and of indices of their innovation development;
- From the list of priority directions of development of science, technologies, and machines and equipment in the Russian Federation, and the list of critical technologies of the Russian Federation, there should be singled out those directions and critical technologies, which are the most perspective and actual for economy of Saint Petersburg (within the bounds of work concerning determination of innovation potential and of perspectives of innovation development of Saint Petersburg);
- On the basis of results of the first two kinds of work with accent to the singled out priority directions of development of the city economy, there is planned forming of a registry of innovation organizations and of information system for advanced research studies, technologies, and project developments of industrial and scientific organizations of Saint Petersburg;
- Working out proposals on perfection and implementation of statistical record-keeping and observation of results of innovation activities;
- Forming conception and plan of measures on realization of cluster policy in Saint Petersburg, and carrying out competition of projects "Pilot Innovation Cluster";
- Working out principal mechanisms of financial support of innovation activities and procedure of co-financing of innovation projects at the account of attraction of non-budget sources with partial use of funds of budget of Saint Petersburg;
- Working out complex of measures on implementation of innovation projects of industrial organizations for needs of municipal economy of Saint Petersburg, as well as

forming information base of needs of the municipal economy in innovation products and services, and corresponding proposals of subjects of innovation activities;

- Determination of list of federal target programs and projects, and working out a mechanism of supporting large-scale innovation projects within the bounds of the FTR.

Realization of the practical block of the Program will be carried out as follows.

During the second half-year there will be carried out competitions for granting subventions to subjects of innovation activities, aimed to protection of incorporeal rights, to lease of immovable property or use of unique equipment, connected with participation in the Russian and international exhibitions, trade fairs, forums, conferences and seminars, connected with production and realization of innovation products for export. In the first place the support will be given to those innovation enterprises, which produce innovation projects for priority directions of development of the city economy.

There will be developed a series of projects of normative and legal acts in the field of customs, tax and budget legislation for the purpose of stimulation of innovation activities.

There is planned a series of measures on popularization of innovation activities, such as:

- Seminars on innovation subjects with participation of representatives of business, science, associations and unions;
- Round-table conferences on investment attraction of subjects of innovation activities;
- Internet-portal “Innovation Saint Petersburg”, acting the part of a site for interaction of participants of innovation activities;
- Catalogue of innovation projects of Saint Petersburg, video clip on innovation activities in Saint Petersburg, and reference-book “Innovation system of Saint Petersburg”;
- Participation in project “Saint Petersburg – Inno-reg – promotion of regional innovation system of Saint Petersburg via transnational cooperation”;
- There will be carried out preparatory work on development of conception of annual international innovation forum, which is planned to be carried out starting from 2009.

During the whole year of 2008, together with the Committee for science and higher school and the Committee for education, there is planned to realize the Program clause on training and retraining personnel for subjects of innovation activities and to perform the following work:

- Monitoring of needs of the innovation system of Saint Petersburg in professional personnel;
- Creation of educational-methodical modules — elements of educational programs providing training and professional development of personnel in those directions, in which there are revealed corresponding need in personnel;
- Within the bounds of the portal, creation of information base on educational programs of training and retraining of personnel for the innovation system of Saint Petersburg with independent assessment and analytics;
- Working out mechanisms of stimulation of activity of graduate students, tutors and scientists with respect to training personnel for innovation activities;
- Working out a mechanism of attraction and retaining of personnel in the innovation system of Saint Petersburg.