

The features of innovative processes in the Russian Federation: Analysis of current practices

Las características de los procesos innovadores en la Federación Rusa: Análisis de las prácticas actuales

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ABSTRACT:

This article discusses the implementation of Federal target program "Research and elaboration on priority directions of development of Russian scientific and technological complex for 2014-2020". The majority of research organizations departed from the partnership interaction, as a result of which the main amount of partner scientific topics have been developed by production companies only together with universities.

Keywords: Federal target program, commercialization, development directions, high-tech manufacturing, interdisciplinary project, subsidy.

RESUMEN:

El presente artículo aborda la implementación del programa federal de objetivos "Investigación y elaboración de objetivos prioritarios en el desarrollo del complejo industrial y tecnológico de Rusia para el periodo 2014-2020". La mayoría de las organizaciones de investigación han dejado de participar en procesos cooperativos, lo cual ha provocado que una gran cantidad de proyectos científicos asociativos sean llevados a cabo únicamente por empresas de producción en colaboración con universidades.

Palabras clave: Programa federal de objetivos, comercialización, desarrollo de inversiones, manufactura de alta tecnología, proyecto interdisciplinario, subsidio.

1. Introduction

In modern conditions, when high-tech products become the core of the development of the globalizing economy, it is proper to speak about science as a *leading productive force*. Hence, the priority is the applied science, designed to promote production in the updating of the nomenclature of high-tech products, increasing the variability of consumption and creating new jobs. The important consequence of this process for the social balance, i.e. the balance of public relations, is the expansion of conditions for implementation of the law of distribution based on the work results, the law limited for market relations. Therefore,

investment in science today pursues two global goals: *economic*, aimed at meeting the growing needs of the masses and the progressive development of the material environment of the civilization, and *social*, aimed at improving the quality of life of the population and ensuring both domestic and world social balance. This is an important result and it is improper to correlate it with the "accounting" of investment in science. Nevertheless, based on the pragmatism of the society and state daily life, such "accounting" is appropriate and it concerns the costs of technical, technological, information and personnel maintenance of science.

Judging by the level of economic development, its indicator being the share of high-tech products on the national and global market, as well as by the quality of life, its indicator being the culture of the object environment and material welfare of the population, today, Russia only fits into the group of countries with developing economies. This statement is instrumental in nature and does not purport to be a heuristic conclusion. The problem described has long been recognized by the Russian government, whose reaction is embodied in the Decrees of No. 218, No. 219, No. 220; as well as the Decree No. 146 of March 4, 2011 "On keeping the register of notification registration on the establishment of corporations established by budgetary scientific and educational organizations of higher education".

2. Analysis of current practices

Despite the positive efforts made by the Government, it is unnecessary to speak about a full solution of problems that faces the development of the Russian science. According to the results of the all-Russian expert survey conducted by the Center for Development of Science, the main obstacle in the development of Russian science is seen in the following (presented in the natural hierarchy): *the lag of technological modernization of the economy* ρ *the deficiency of funds for research* ρ *imperfection of science administration* ρ *the deficiency of highly skilled researchers* ρ *management of science areas unprepared to transfer a scientific product into innovative production.*

Scientific interaction of production companies, universities and research organizations is not quite successful. *The majority of research organizations departed from the partnership interaction, as a result of which the main amount of partner scientific topics have been developed by production companies only together with universities.* The weak interaction of research organizations with production companies and universities is the result of the general crisis of scientific organizations that have not related to applied research for many years and lost some of the leading scientists (due to age and migration), the lack of modern equipment of laboratories, test bases and polygons.

It should also be pointed out that the government Decrees № 219 and № 220 were not effective enough. Thus, the implementation of the Decree № 219 did not made the effect expected. *State investment into technical development of scientific potential of universities "in gross" did not prove its value because of thematic "inaddressability".* According to experts, the successful transfer of scientific products developed by universities and research organizations to the innovative production to this day is hampered by the low functioning efficiency of the established scientific infrastructure, which is not meeting the modern challenges in the development of cooperation between science and business. The experience of the economically developed countries shows that it is more rational to invest in the development of the technical base of scientific potential with its targeted financing within the framework of thematic scientific projects. This is a positive experience and Russia is expedient to *abandon the "system" form and to move to their targeted development of scientific infrastructure of universities and research organizations.* The targeted financing should correspond to the specific scientific task to be developed and in correlation with the at-hand scientific-experimental base of the partner production company. The continuation of the activities of Decree No. 219 is irrational. Instead, for the executors of scientific projects, it is expedient to foresee the possibility the development of their fixed assets affiliated with subject of the scientific project being implemented (as part of the amount of financing allocated to the study). Subsequently, after the completion of the scientific project, the

acquired fixed assets should be retained in the ownership of the executors.

Weak efficiency of implementation of Decree No. 220 is a consequence of a number of problems.

First, not all universities, especially in the conditions of inflation, are able to pay for the work of a foreign lecturer from an economically developed country in the amount that provides full compensation for the costs of the invited teacher.

Secondly, for most of the natural sciences there are no special differences in the content and level of teaching in Russia and abroad.

Thirdly, there are difficulties in teaching at the social science faculties because of the differences, sometimes serious, in the interpretation and ideological presentation of the material by teachers from abroad.

As a result, as the experts' retrospective assessment has shown, in contrast to the expected the following result occurs: in recent years, the involvement of teachers from far abroad in Russian universities has been declining and is growing from the countries of the former Soviet space. Thus, in comparison with 2015, in 2016, the number of specialists attracted to Russia from economically developed countries of the West and South-East Asia (27 % and 13 % respectively) was considerably reduced. The number of attracted specialists from the CIS countries has increased significantly: From 7 % – in 2015 to 32.3 % – in 2016. The given indicators indicate the inexpediency of centralized policy regulation of attraction of foreign teachers for inclusion in educational process at Russian universities. The solution of this issue should be kept within the expertise of the universities themselves, allowing them to fund the involvement of foreign teachers to participate in the educational process for the funds received by the university following the participation in the market of international educational services, including training of foreign students, post-graduates, trainees.

The implementation of Decree No. 218 is more efficient and promising. It provides for the development of Russian science within the framework of priority areas of science approved by the President of Russia. However, there are many costs involved in implementing the activities of this decree. Thus, according to expert assessments, 70 % of scientific programs executed jointly by universities, research organizations and leading production companies from 2012 to 2017, ended with not more than a verbal report on the completed research. Among the remaining 30 % of joint scientific programs, the majority ended with the creation of scientific products, the transfer of which has not been implemented. *Cost-effective scientific research, in terms of innovative production, is not more than 5 % of the total number of implemented state scientific programs.* It is fair to say that in economically developed countries the total figure is almost the same: Among the patented innovative products no more than 5 % is used in the production; among the developing scientific production not more than 1 % is commercialized; among the new commodity types ready for mass production, no more than 10 % get to the market. That is, in general there is no reason to say that the funds invested in the implementation of Decree No. 218, were accompanied by high costs.

The content analysis of 1512 scientific topics, conducted by the Center for Science Development in April 2017 in the form of statistical study of projects performed by universities and research organizations on the Federal target program "Research and elaboration on priority directions of development of Russian scientific and technological complex for 2014-2020", has shown the following ratio of fundamental and applied research and organizational activities (symposiums, conferences, financial control of project implementation): 5 %: 85 %: 10 % accordingly. The ratio of fundamental and applied projects corresponds to the objective capabilities of research organizations, and the funding of "organizational and control" projects is excessively overstated, it is unlikely that it should amount to more than 1-2 % of the total state funding of scientific projects.

Areas of the research: 19.3 % – natural science, 19% – social-humanitarian, 22.5 % – technical, 39.2 % – research at the borderline of sciences. In the listed integral areas there are large topic "misalignments" in the form of domination in each case of no more than three areas, whose objective validity requires expert confirmation. Thus, in the natural

science area of physics, medicine and chemistry "absorb" 89.2 % of project topics (Figure 1). In the social-humanitarian area, science, economy, law "absorb" 93.6 % of project topics (Figure 2). In the technical area, information and computer technologies, electronics, mechanical Engineering "absorb" 88 % of project topics (Figure 3). In areas at the borderline of physical chemistry and chemical physics, biochemistry, biophysics "absorb" 96.7 % of project topics (Figure 4).

Figure 1

The subject structure of the studies conducted within the framework of the Natural science area, % (here 100 % is the share of research according to the branch – 19.3 %)

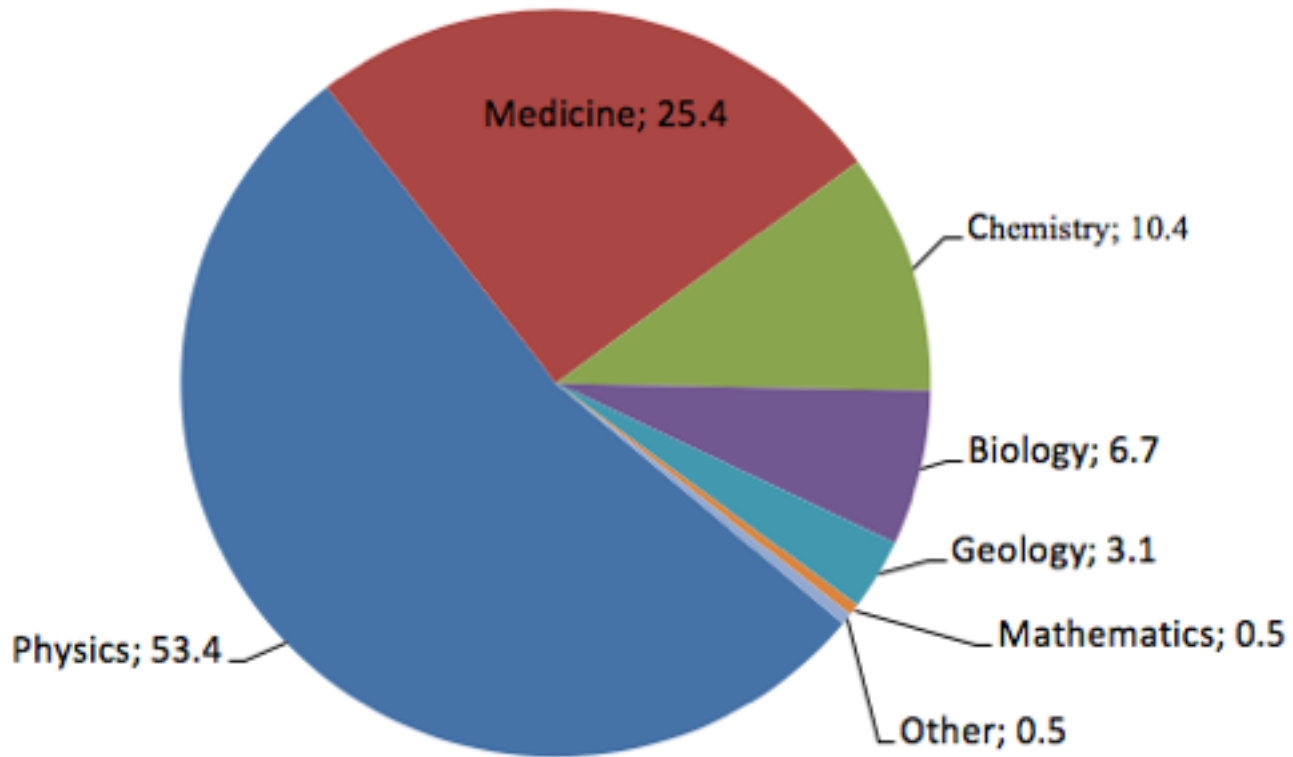


Figure 2

The subject structure of the studies conducted within the framework of the social-humanitarian area, % (here 100 % is the share of research according to the branch – 19 %)

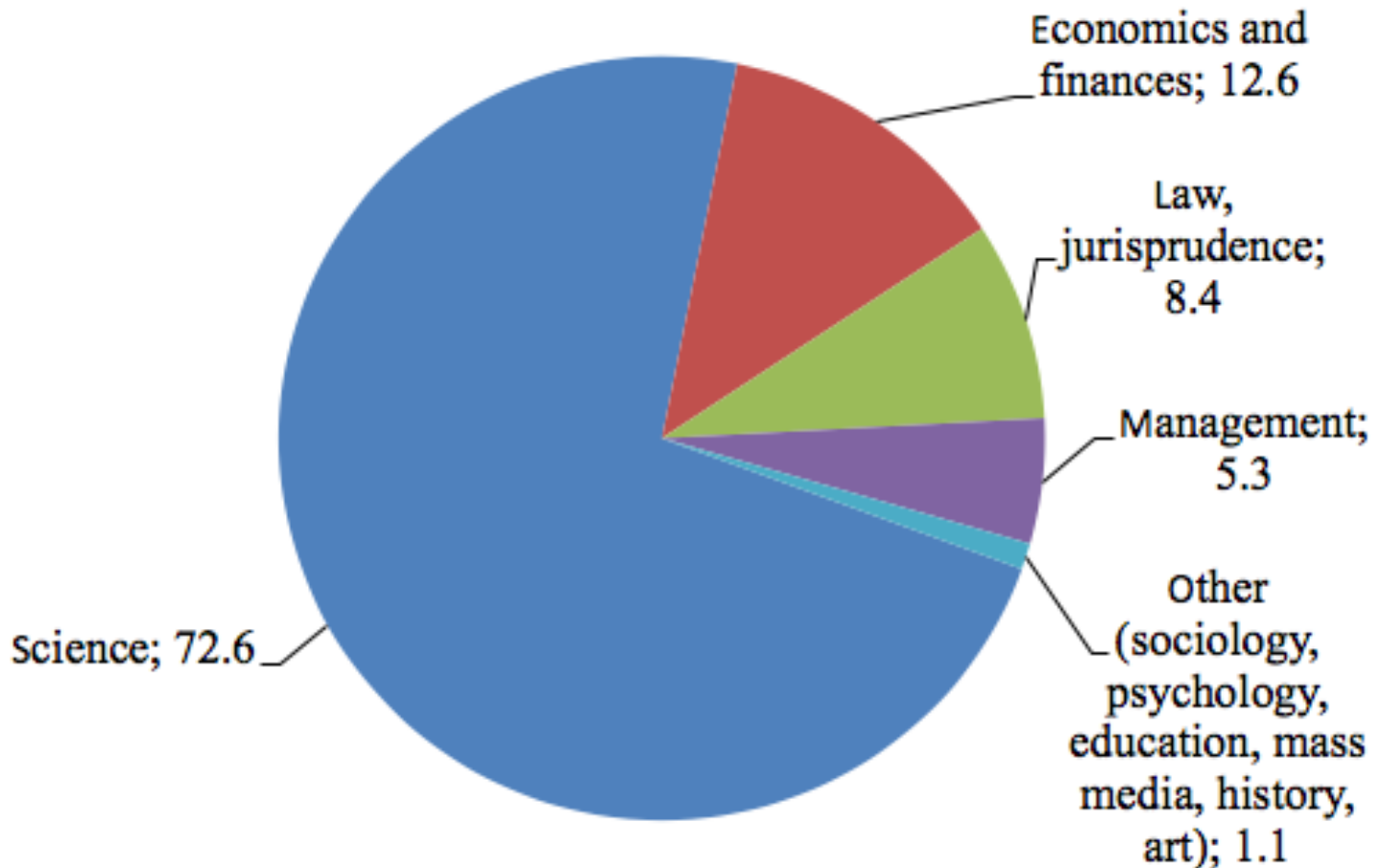


Figure 3

The subject structure of the studies conducted within the framework of technological

area, % (here 100 % is the share of research according to the branch – 22.5 %)

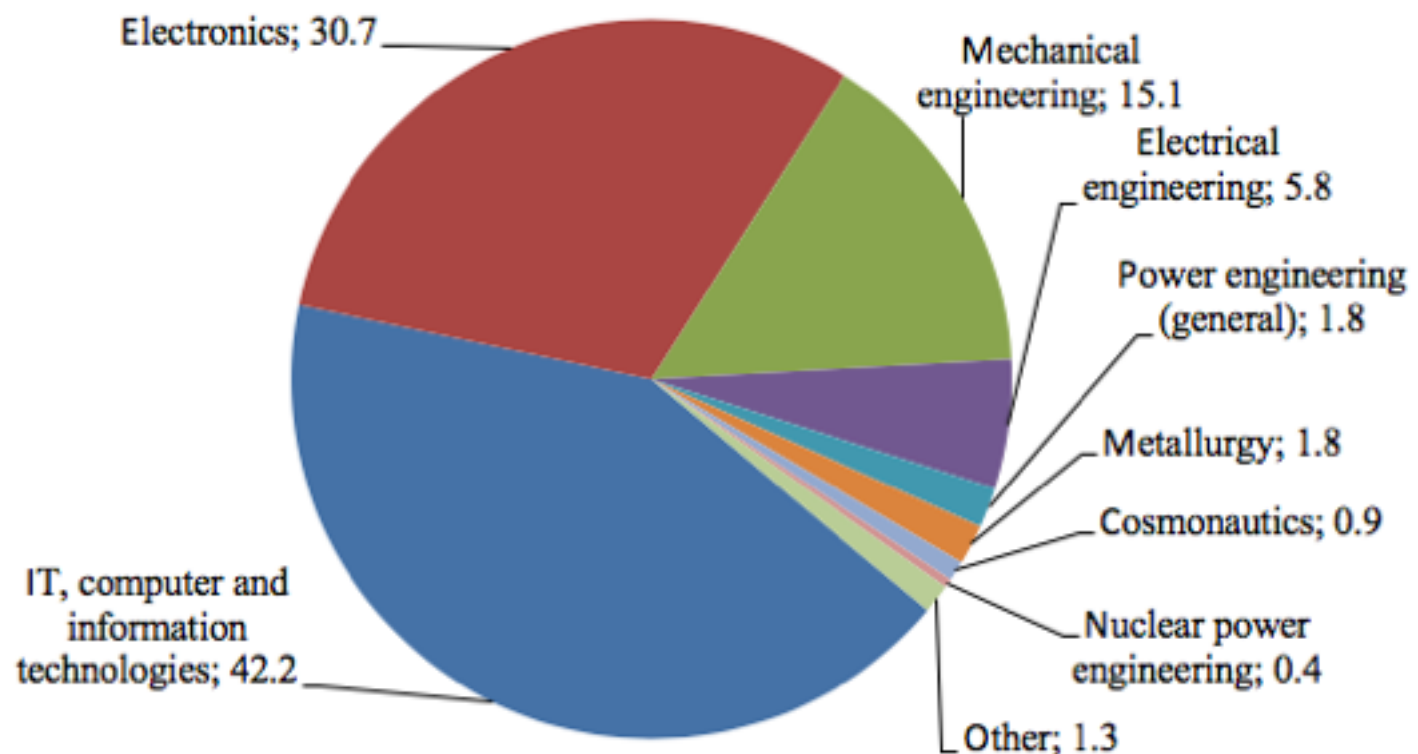
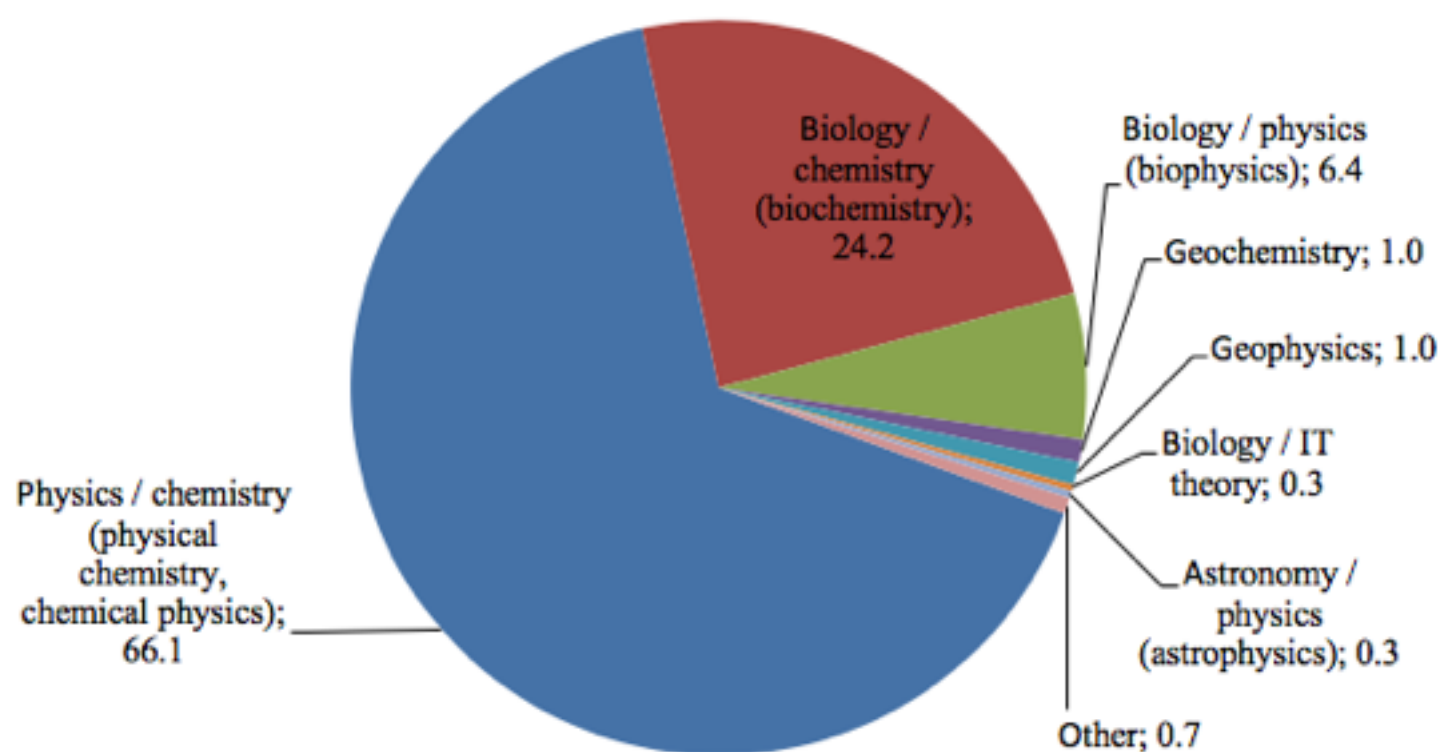


Figure 4

The subject structure of studies conducted at the borderline of the science areas, % (here 100 % is the share of research according to the branch – 39.2 %)



According to expert assessment 79 % of research topics developed on the basis of technological platforms, fit into a prospective plan of the partner production company to innovative production development. This is an important prerequisite for the subsequent practical impact of the joint research program. A lack of coherence between the partners also exists. For example, there is an increased demand on the part of production companies for the development of research topics within the priority areas of security and counter-terrorism, prospective armaments, military and special equipment, but proposals from the universities and research institutes are minimal. On the other hand, universities and research institutes show increased interest in the development of scientific topics in such areas as life science and industry of Nanosystems and materials. However, the production companies demonstrate minimum interest in the life science research topic, and the Industry of Nanosystems and materials topic is of much less interest than that of universities and research organizations.

Such discrepancies in the partnership indicate organizational deficiencies at the stage of

planning joint development of the research topic, the *need to correct the thematic focus of scientific work of universities and research organizations in accordance with the interests of production companies*. The necessity for primary consideration of the priority of the thematic interests of production companies is dictated by the fact that only companies are able to guarantee the bringing of scientific products to the stage of transfer, production and promotion of innovative product to the market.

An important form of cooperation between universities and production companies for the implementation of applied research and development – *technological platforms* as a new type of stimulation of innovative technological development in the conditions of the Russian Federation in the areas of strategic importance for improving the competitiveness of the Russian economy in the international market of goods and services through the intensification of innovative production of science-intensive products.

For Russia, the transition of the economy to an innovative way of development is a strategic task. However, it is difficult to implement, especially in universities, which had been actively engage in research work only in the 2000s. According to a Russian research, half of the scientific organizations, which are commercially active, are failing. The reasons for this-both the *lack of demand for the production of results of scientific work*, and the inexperience of universities and research organizations in commercial practice, the absence of qualified management having the experience of transfer of scientific technologies, marketing of innovative products market. *The experience of research organizations in developing business plans that include the assessment of commercial risk should be recognized as a weak point.*

The demand for research cooperation of production companies with research organizations and universities is great. According to the survey of managers of production companies, today each company participating in the State research program has an average of 13 topics (projects) performed by the company together with the university and/or research organization. The initiators of the research projects carried out by companies in partnership with universities and research organizations, in 42 % of cases are *production companies*, in 32 % of cases-*research organizations*, in 26 % of cases-*universities*. At all production companies the subjects of the applied research fit into the perspective plan for development and manufacture of the innovative product. The scientific products developed jointly by production companies, research organizations and universities are mainly designed for the common use of traditional methods (84 % of cases), IT-Technologies (76 % of cases), Nanotechnology (62 % of cases).

Over the past five years, partnerships between production companies, universities and research organizations have become more meaningful. In each production company, an average of 12 agreements on partnership cooperation on the implementation of the State scientific program is concluded. This testifies to the demand of scientific production by production companies.

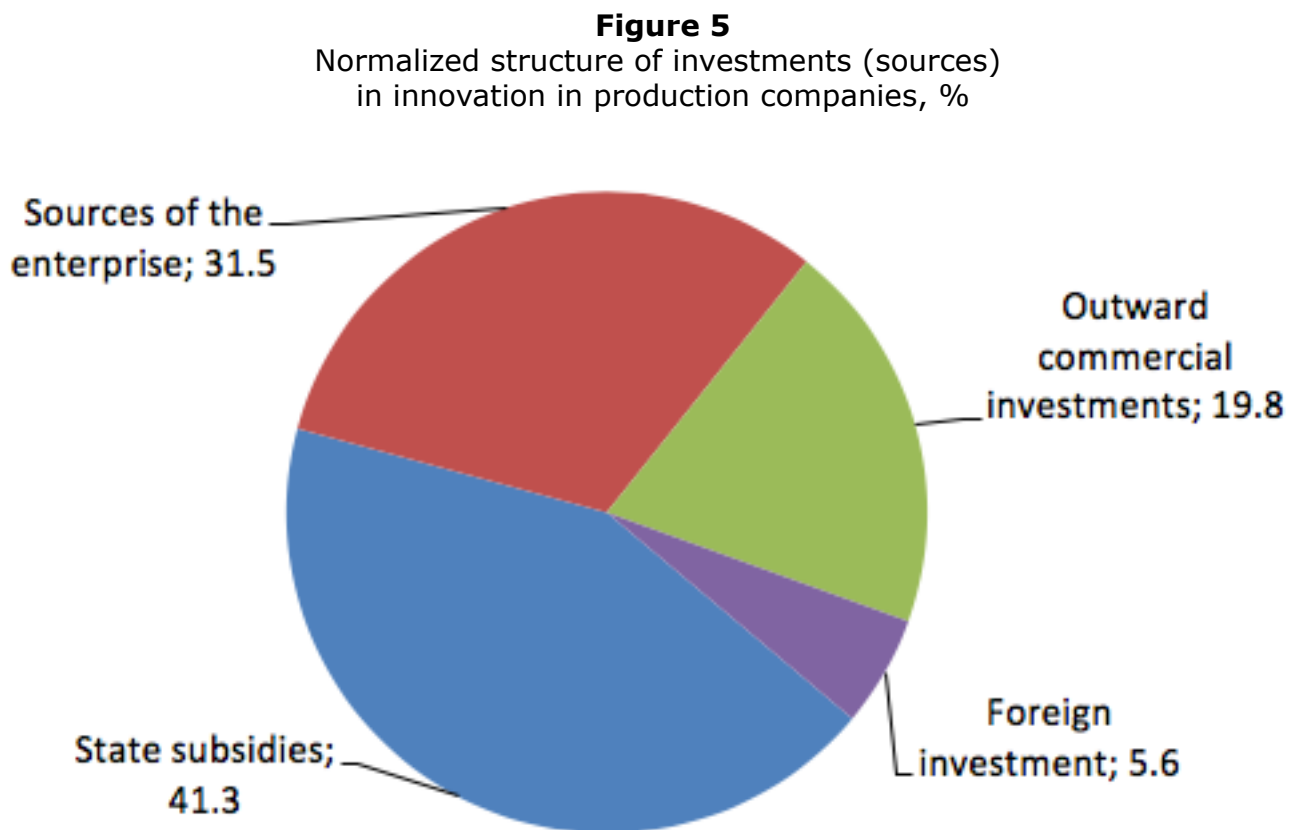
In 2010-2012, 70 % of the participants of the joint Scientific Program brought the partnership no more than to the scientific product, not conducting its tests, especially, transfer and capitalization of the result of the research. By 2015, the participants of the joint scientific program have largely moved away from the theoretical tasks and translated their interaction into the sphere of applied research. This made the interaction more subjective, predictable, which contributed to the development of more pragmatic business plans.

If in 2013-2016 years the main initiators of scientific topics were universities, then by 2017 the main initiative in proposing a scientific topic for development began to show the company, which corresponds to the logic of innovation in cooperation with science and production . Among universities, 35 % continue to take the initiative in proposing scientific topics for joint development with the companies, and these themes most often have an applied focus. As far as academic research organizations are concerned, such an initiative is seldom, not more than 15 %.

The focus of the demand of most enterprises on the results of scientific research for transfer to innovative products is largely predetermined by the nature of the regional product market. The results of the all-Russian research show that 90 % of the products produced by the enterprises of the regions have a demand in the entities of the Russian Federation. Also,

80 % of the manufactured goods are sold directly in the regions, which *highlights the importance of innovation for solving import problems in Russia*. However, 60% of the RF entities have weak investment activity, which inevitably reduces the demand for scientific products from the enterprises. To increase investment activity is possible only by increasing federal investments in regional innovation in the entities of the Russian Federation.

Insufficiency of own sources of funding compels enterprises to develop innovative products to attract state subsidies. In addition, at least 60 % of enterprises for innovation use their own funds and external commercial investments. 45 % of enterprises have an opportunity to attract foreign investments for innovations. The structure of investment in innovation in production companies is as follows (Figure 5).



Production companies are more likely than universities, but less often than research organizations initiate scientific topics for joint development.

As the expert assessments show, the scientific interaction of production companies, universities and research organizations is not quite successful. The majority of research organizations departed from the partnership, as a result of which the main mass of partner research topics are developed by production companies only together with universities. The weak interaction of research organizations with production companies and universities is the result of the general crisis of scientific organizations, long years not related to applied research, lost some of the leading scientists (and because of age, and Due to migration), lack of modern equipment and equipped with experienced laboratories, test bases and test fields.

Scientific interaction of research organizations, universities and production companies makes the difference in the style of work of creative collectives on the production-on the one hand, and in scientific and educational institutions-on the other hand, and also differences in understanding the stage of completion of applied research and assessments of the nature and degree of risk.

In the first case it is a question that the rhythm of work of the creative team of the production company is closely connected with the rhythm of production of the material product, it is more dynamic, pragmatic, focused on the product, practically applicable in the innovative Production. Scientists of research organizations and, especially, universities are more focused on the theoretical form of completion of applied research in the form of a report, not burdened with the dynamic rhythm of real production, so *time* intervals are significantly increased compared to the research carried out at the production.

The problem of clear definition of functions of science in partnership between production companies and organizations of generation of scientific knowledge production still remains.

Too many scientific studies are given for the fundamental, whereas their fundamentality lies only in the fact that the end result of the study is concluded with a verbal report.

Opinion of representatives of the majority of partner organizations on conformity of technological, technical and financial prerequisites available to the requirements of successful implementation of the scientific program resists uncertainty of representatives of most universities and research organizations on conformity of the level of competence of management with requirements for effective realization of the program, inability to determine maximum duration in time of profitable use by companies. The final results of the program implementation, as well as strengthening the company's position on the domestic and international market of goods and services in reliance on the jointly produced scientific product. Given that, partner organizations have not worked out the marketing component of the joint project.

3. Results

According to expert assessments, many program participants are more concerned about the process of target money development than the end product of the partnership. The main activities are implemented primarily by companies, and universities and research organizations are connected to these activities much less often. Particularly weak are the participation of universities and research organizations in the implementation of such activities as the assessment of risks of social, scientific, technical, environmental and force majeure, the definition of optimal cycles of technology update taking into account market factors, development of financial plan of realization of innovative project with cash resources, search of new sources and mechanisms of financing of joint innovative project. So, universities and research organizations are poorly involved in the development of activities related to the issues of production technology and its funding.

4. Conclusions

1. The demand of the production companies for scientific production has no unambiguous orientation. Transfer to the innovative product of wide consumption is suitable not more than 30 % of the final scientific production of the joint project.
2. The terms of realization of the joint project exceed 2 years, which complicates the forecast for demand conditions in the internal and external market of the planned innovative production.
3. In the business plans of the partners participating in the project with the state support, the strategy of risk assessment at different stages is often not worked out: From the development of scientific products to the market of innovative product, which introduces uncertainty in the success of the implementation of results in production.
4. Improvement of the mechanism of selection of scientific topics, planned for joint development, can be carried out by defining the main criterion in the selection of the indicator of demand in the domestic or foreign market of similar products.
5. In production companies, in general there is a deficiency of highly qualified specialists of all categories, capable to participate in innovative development. According to expert assessment, good staffing in areas such as the organization of staff Development of the company was noted; Formation of personnel composition of the groups included in the implementation of the program of innovative development of the company; Organization of the Company's interaction with universities and research institutes on joint implementation of the company's innovative development program; Development of documents describing the main directions of technological development of the company.

The security of the companies by specialists at the middle level is characteristic of such activity profiles as promotion of innovative products and services to the market; Development and implementation of measures to introduce new technologies, innovative products and services.

Most companies have a shortage of specialists in engineering, more than 2/3 companies-

managers, which are necessary for successful management of the implementation of innovative development (organizers of the research process, transfer, Production of innovative products, its promotion to the market), almost half-scientists-researchers.

In production companies the greatest demand for specialists with a master's degree is noted. In addition, the companies have a great need for specialists who have passed the traditional 5-year education in the university. The need for specialists with a bachelor's degree is not so high. There is a need for specialists with the Diploma of the candidate of sciences and to a lesser degree-with the Diploma of the Doctor of Sciences.

6. An important aspect of the operation of the enterprise in the new environment is the presence of its own infrastructure of production of innovative products. At the same time, at least 75 % of production enterprises have such infrastructure. There is a similar infrastructure in more than a sixth part of the enterprises, but it is not very efficient. Thus, the vast majority of enterprises are adapted to the further production of science-intensive products.

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2. This report is based on the results of the implementation of applied research and experimental work of Federal target program "Research and development on priority directions of development of Russian scientific and technological complex for 2014-2020". Agreement № 14.571.21.0011. October 23, 2017

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