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# Analysis of features of innovative processes in the Russian Federation

## Análisis de las características de los procesos innovadores en la Federación de Rusia

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#### ABSTRACT:

The study analysed the problem situation in the field of innovation policy in the Russian Federation. In this case we study the following issues: strategy of scientific and technological development of Russia, particularly regional policy in the field of interaction between science and production, nature and tendency of the development of scientific innovation in the Russian Federation, personnel problems and challenges of career growth and rotation of researchers, scope and focus of demand for manufacturing companies of scientific products to create innovative production and effectiveness of the introduction of scientific goods there.

**Keywords:** efficiency of science, innovation, science personnel, scientific partnership, technological platforms, transfer of scientific products.

#### RESUMEN:

En el presente estudio se ha analizado la situación de los problemas en el campo de la política de innovación en la Federación rusa. Para ello, se ha puesto especial atención en varias cuestiones, entre las que destacan las siguientes: el rápido desarrollo científico y tecnológico del país; las políticas regionales en el ámbito de la interacción entre la ciencia y la producción; la naturaleza y la tendencia del desarrollo de la innovación científica en Rusia; los problemas de personal y los desafíos de crecimiento laboral en una empresa; la rotación de los investigadores; el alcance y foco de la demanda de empresas fabricantes de productos científicos para crear bienes innovadores; y la eficacia de la introducción de bienes científicos en el país.

**Palabras clave:** innovación, colaboración científica, transferencia de productos científicos, eficiencia de la ciencia, personal científico, plataformas tecnológicas.

## 1. Introduction

The effectiveness of innovative activity is determined by the innovation infrastructure, which is the basic component of innovative economy, potential of society and it is able to bring the economy to a higher level. Innovation infrastructure is a set of interrelated, complementary production and technical systems, enterprises and relevant organizational management systems necessary and sufficient for the effective implementation of innovation and implementation of innovations.

According to many researchers, the raw material orientation of the Russian economy has a number of negative characteristics:

- insufficient international and domestic intersectoral and interregional integration;
- low domestic demand;

poor infrastructure;

backwardness of enterprises in technical and technological terms;

inefficiency of communication science and production;

discrepancy management to strategic adaptation of the national economy to the processes of globalization.

Therefore, one of the main directions of development of the national economy to achieve high dynamics of high-tech industries is to increase the efficiency of industrial enterprises in the framework of interactions of business, science and education.

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## 2. Methodology

At the moment, the scientific interaction of production companies, universities and research organizations is not quite successful. The majority of research organizations have moved away from partnership, as a result of this fact a lot of partner scientific topics are developed by production companies only together with universities. The weak interaction of research organizations with manufacturing companies and universities is the result of the general crisis of scientific organizations that have not been associated with applied research for many years, have lost some of the leading scientists (due to age and migration), lack of modern equipment of laboratories, testing facilities and landfills (Savinkov, Klyucharev, 2016).

According to the experts, the successful transfer of scientific products developed by universities and research organizations into innovative production is still hampered by the low efficiency of the created scientific infrastructure, which does not meet the modern tasks of developing cooperation between science and business.

Reasons for the lack of effectiveness of interaction between universities and research organizations with business structures are the following:

weak tangible of results of joint activities (they do not recognize the potential benefits of cooperation);

poor coordination of educational and scientific activities between partner universities to solve the most pressing scientific, technical and personnel problems;

incompleteness of information from participating companies about the capabilities of universities and research organizations on the one hand, and information about the needs and requests of companies on the other hand;

quality and elaboration of projects offered by universities, which often does not meet the standards adopted in companies and in business practice in general;

low demand from companies for domestic innovative developments, including Research and Development (R&D) of universities;

lack of a unified attitude to interaction with partners in the internal environment of the university as an integral part of the development strategy;

relative closeness of the innovation infrastructure of universities and research organizations;

uncertainty about intellectual property rights.

Technological platforms are an important form of cooperation between universities and manufacturing companies for the implementation of R&D. They represent a new type of stimulation of innovative technological development of the Russian Federation in areas of strategic importance for improving the competitiveness of the economy in the international market of goods and services by innovative production of high-tech products (Novikov, 2018).

The most popular forms of interaction between participants of technological platforms are the following:

implementation of R&D by universities and research organizations for the customer companies that are members of the technology platform;

creation of joint laboratories and other innovative infrastructure;

professional development of employees in universities;

- retraining of employees in universities;
- creation and organization of basic departments in universities;
- participation of employees in educational programs, research projects of universities and scientific organizations;
- internship in companies of students, postgraduates and teachers of universities;
- university students' practical training in companies;
- target training of students in universities;
- grant support for research projects in universities.

Also, depending on the industry affiliation of enterprises, negotiations on cooperation can be carried out in the following areas:

- placement of university departments in the territorial proximity to specific enterprises;
- employment of university graduates in enterprises;
- forecasting future demands of enterprises for specialists;
- joint development of requirements for specialists;
- master's programs;
- implementation of joint R&D in the educational process;
- excursions, joint conferences and seminars;
- enterprises support research activities and projects to improve the quality of education;
- development of infrastructure of scientific and educational sphere;
- practical implementation of the actual scientific reserve of the university and its further development;
- development of social and material-technical support of university and enterprises;
- scholarship projects;
- sponsorship;
- joint expert research;
- consulting activities, development of scientific and technical documentation;
- development of industry standards;
- joint analytical research aimed at identifying the points of growth of enterprises;
- publication of joint developments in scientific journals;
- joint work on obtaining grants, participation in national and international exhibitions and competitions;
- conducting marketing research to find segments where, depending on the technical characteristics, enterprises will be able to gain a competitive advantage;
- analysis of projects and technologies for the benefit of enterprises;
- development and implementation of quality standards;
- career guidance;
- development and implementation of joint image attributes (Tikhonova, 2016).

According to expert estimates, 79% of scientific topics developed on the basis of technological platforms are into the long-term plan of the partner production company for the development of innovative products. This is an important prerequisite for the subsequent practical effectiveness of the joint scientific program. There is also inconsistency between partners. Such inconsistencies in the partnership work indicate organizational shortcomings at the planning stage of joint development of scientific topics and the need to correct the thematic focus of scientific work of universities and research organizations in accordance with the interests of production companies.

The need of the priority of thematic interests of production companies to be primary is dictated by the fact that only companies are able to guarantee bringing scientific products to the stage of transfer, production and promotion of innovative products to the market (Zolotukhina, et al, 2017).

**Table 1**  
Role of universities in technology transfer system

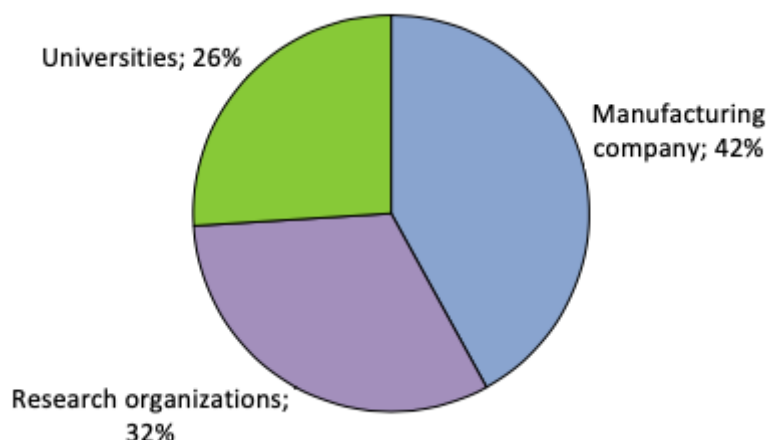
| Indicator                               | Characteristic   |
|---|--|
| Technology source                       | As a source of technology for transfer we considered the following sources:<br>- industry institutes and universities;<br>- open innovative enterprises and structures.  |
| Adaptation of the technology            | The resulting technology is adapted in the resource center of the university:<br>- selection of the target technology in accordance with the needs of the thematic industry on the basis of the competence of the university;<br>- creation of a thematic resource center of appropriate technological orientation;<br>- development of technology considering the competencies of the university with the participation of students and postgraduates (including the program of targeted training from the company interested in the transferred technology). |
| Implementation of the target technology | The adapted technology is implemented at the enterprise:<br>- it is carried out on the basis of the mastered technological route with application of the processing equipment corresponding to the resource center;<br>- it is carried out by trained personnel;<br>- on the basis of the resource center, the university continues to work on the development of technology.  |

Therefore, one of the main directions of development of the national economy to achieve high dynamics of high-tech industries is to increase the efficiency of industrial enterprises in the framework of interactions of business, science and education.

### 3. Transition of the economy to innovative way of development for Russia as a strategic task

The demand for scientific cooperation between universities, manufacturing companies and research organizations is quite high. According to the survey of heads of production companies, for each company participating in the state scientific program, there are an average of 13 topics (projects) performed by the company in conjunction with the university and/or research organization today.

**Figure 1**  
Initiators of research topics carried out by companies in partnership with universities and research organizations



All manufacturing companies developed topics of applied research stay into the long-term plan for the development and production of innovative products. Scientific products developed jointly by manufacturing companies, research organizations and universities are mostly designed for the joint use of traditional methods (84%), IT-technologies (76%) and nanotechnology (62%).

Over the past five years, partnerships between manufacturing companies, universities and research organizations have become more meaningful. Each production company concluded an average of 12 agreements on partnership for the implementation of the state scientific program (Kanashchenkov, Matveev, Minaev, Novikov, 2017). This fact indicates the demand for scientific products by manufacturing companies.

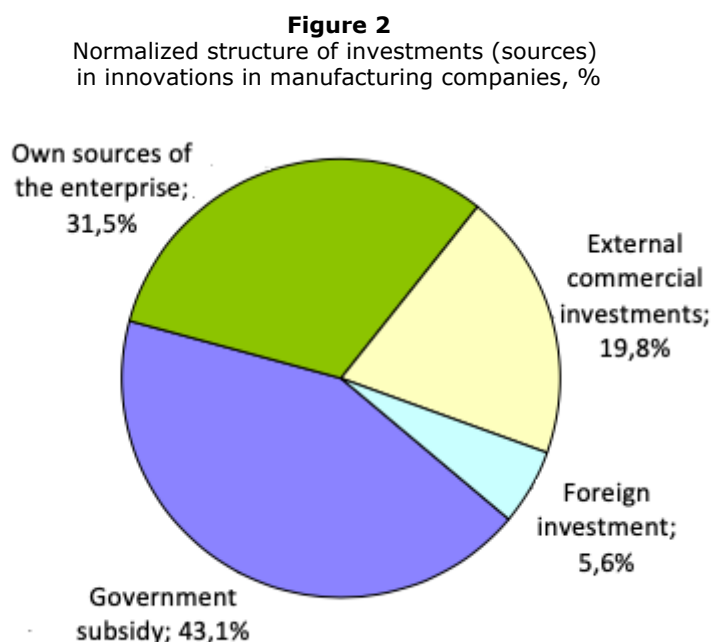
In 2010-2012, 70% of the participants of the joint scientific program had no more than one scientific product, they do not test it, do not do the transfer and capitalization of the result of scientific research. By 2015, the participants of the joint scientific program for the most part moved away from theoretical problems and transferred their interaction to the applied scientific research. This made the interaction more substantive and predictable, which contributed to the development of more pragmatic business plans (Novikov et al., 2018).

If in 2010-2013 the main initiators of scientific topics were universities, by 2015 the main initiative in the proposal of scientific topics for development began to show the companies, which corresponds to the logic of innovation in the cooperation of science and industry (Mindlin, et al., 2016).

The nature of the regional product market affects the direction of demand for the majority of enterprises on the results of research for transfer to innovative products.

The results of the all-Russian study indicate that 90% of the products manufactured by enterprises of the regions have a demand in the subjects of the Russian Federation. 80% of produced goods are sold directly in the regions, which emphasizes the importance of innovations for solving the problems of import substitution in Russia. However, in 60% of the subjects of the Russian Federation there is a weak investment activity, which entails a decrease in demand for scientific products from enterprises (Novikov, Prosvirina, 2019). It is possible to increase investment activity in the subjects of the Russian Federation only by increasing federal investment in regional innovation.

Lack of own sources of financing forces enterprises to attract state subsidies for the development of innovative products. In addition, at least 60% of enterprises use their own funds and external commercial investments for innovation. 45% of enterprises have the opportunity to attract foreign ones. In the normalized share ratio, the structure of investment in innovation in manufacturing companies is shown in the Figure 2.



The scientific interaction of research organizations, universities and manufacturing companies is complicated by differences in the style of work of creative teams in the workplace and in scientific and educational institutions, as well as differences in the understanding of the stage of completion of applied research and assessments of the nature and degree of risk (Novikov, 2018).

In the first case, the rhythm of work of the creative team of the production company is closely related to the rhythm of production of the material product, it is more dynamic, pragmatic, product-oriented, practically applicable in innovative production. Researchers of scientific organizations and, especially, universities are more focused on the theoretical form of the completion of applied research in the form of a report, are not burdened with the dynamic rhythm of real production, so the time intervals of research are significantly increased, compared with research implemented in the workplace.

The problem of a clear definition of the functions of science in the case of partnership between production companies and organizations generating scientific knowledge remains. Too many scientific studies are presented as fundamental, while their fundamental nature is only the final result of the study, which is completed by a verbal report.

The opinion of the representatives of most of the partner organizations of compliance with the existing technological, technical and financial prerequisites requirements successful implementation of the scientific program confronts the uncertainty of most universities and research organizations regarding the conformity of the competence management requirements for effective program implementation, failure to determine the maximum time duration cost-effective use by companies of the final results of the program, as well as strengthening the company's position in the domestic and international market of goods and services in reliance on jointly produced scientific product. That is, partner organizations have not worked out the marketing component of the joint project (Klyucharev, et al. 2018).

According to expert estimates, many participants of the program are more concerned about the process of mastering the target money than the final product of the partnership. The main activities are implemented primarily by companies, universities and research organizations are involved in these activities much less often. Particularly weak is the participation of them in the implementation of activities such as risk assessment social, technological, environmental, and force majeure of the nature, determining the optimal refresh cycles based on the market factors, development of the financial plan of the innovative project considering available resources, search for new sources and mechanisms for funding joint innovation project. That is, universities and research organizations are poorly involved in the development of activities related to the issues of production technology and its financing (Nedelkin, et al., , 2017).

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## **4. General conclusions of the analysis**

The demand for scientific products by manufacturing companies is not unambiguous. No more than 30% of the total scientific output of the joint project is suitable for transfer to an innovative consumer product.

The scale and "depth" of scientific and production cooperation in Russia are objectively at a fairly low level. The offered services and developments of universities and scientific organizations do not stimulate enterprises to innovation. At the same time, companies that interact with the research sector stand out from the general background of greater efficiency of innovation.

Differences in goals, priorities and mentalities of representatives of the research environment and business have different perceptions of obstacles to interaction. From the point of view of universities and research organizations, the main problem is the low susceptibility of companies to innovation, while business is most concerned about the level of price and quality of offered works and services. On the one hand, there are signs of a lack of sensitivity to mutual needs, on the other hand, all the identified problems take place there.

Level of development of scientific and industrial cooperation more or less corresponds to the overall level of research and innovation activity in the Russian economy. Therefore, it is impossible to achieve fundamental progress in the relations between universities, research organizations and enterprises without development of the "eco-environment" of knowledge generation and improvement of the innovation climate.

Terms of implementation of the joint project exceed 2 years, which complicates the forecast of demand conditions in the domestic and foreign markets of the planned innovative products.

Business plans of partners involved in the project with state support often do not elaborate a strategy for risk assessment at various stages: from the development of scientific products to the promotion of innovative products to the market, which introduces uncertainty in the success of the implementation of the results in production (Klyucharev, 2016).

Improvement of the mechanism of selection of scientific topics planned for joint development can be carried out by determining the main criterion for the selection of the indicator of demand in the

domestic or foreign market of similar products.

Despite the significant activity of the state in stimulating the interaction of universities, science and business, the development of cooperation is still one of the least common effects of state support. At the same time, the measures implemented in most cases lead only to the "capitalization" of existing, long-established ties. In such circumstances, of particular importance are the most successful practices of interaction, the best cases, which should be the object of careful study, including from the standpoint of possible replication (Kuzyk, 2016).

Attempts to increase the effectiveness of the implemented measures of state support by strengthening control over them, first of all in terms of achieving the planned values of quantitative indicators, inevitably entail the desire to avoid risks, as a result of which the focus of support is not the most promising, but the most reliable projects. It is necessary to make a consistent transition from the paradigm of checks with the purpose of punishment to the logic of monitoring the changes, including behavioral ones, to identify the results and effects that would not have been achieved in the absence of state support.

In general, manufacturing companies have a shortage of highly qualified specialists of all categories who are able to participate in innovative development. According to expert estimates the staffing in such areas as organization of professional development of company personnel, formation of personnel groups that are included in the implementation of the program of innovative development of the company, organization of interaction with universities and research institutes on joint implementation of innovative programs of development of the company, development of documents describing the main directions of technological development of the company.

Provision of companies with specialists at the average level is typical for such activities as promotion of innovative products and services to the market. development and implementation of measures for the introduction of new technologies, innovative products and services.

Most companies have a shortage of engineering specialists, more than 2/3 of companies-managers, which are necessary for the 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 of them are scientists and researchers.

In manufacturing companies there is the greatest need for specialists with a master's degree. In addition, companies have a great need for specialists who have passed the traditional 5-year training at the university. The need for specialists with a bachelor's degree is not so high. There is also a need for specialists with PhD.

An important aspect of the functioning of the enterprise in the new environment is the availability of its own infrastructure for the production of innovative products. At the same time, at least 75% of manufacturing enterprises have it. More than a 1/6 of enterprises have it, but it does not function very effectively. Thus, the vast majority of enterprises adapted to the further production of high-tech products.

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