INTERACTION OF UNIVERSITIES AND ENTERPRISES IN THE FIELD OF HIGH-TECH PRODUCTION

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ABSTRACT

The article presents a mechanism for managing high-tech scientific and technical projects based on the implementation of Government Resolution No. 218 «On Measures of State Support for Development of Cooperation between Russian Higher Educational Institutions and Organizations Implementing Comlex Projects for Creation of High-Tech Production» dated April 9, 2010. In particular, innovative activity in this sphere of the scientific center of special radio-electronic systems and management of MAI is shown and its results are simultaneously projected onto the conditions and requirements of cooperation between universities and enterprises interacting for the sake of creating breakthrough technologies and competitive products.

Keywords: university, enterprise, scientific and technical project, high-tech production, innovations, contract system, procurement, cooperation.

Background. *The system of state administration performs mainly stimulating and regulating functions in conditions of transition and formation of innovative economy [1].*

One of the most effective instruments of state stimulation of innovative activity is implementation of RF Government Resolution No. 218 «On Measures of State Support for Development of Cooperation between Russian Higher Educational Institutions and Organizations Implementing Complex Projects for Creation of High-Tech Production» dated April 9, 2010 [2]. The resolution provides for the possibility of allocating subsidies to enterprises for a period of 1 to 3 years, the amount of financing to 100 million rubles a year. This is done on a competitive basis through an open public competition.

Objective. *The objective of the authors is to consider interaction of universities and enterprises in the field of high-tech production.*

Methods. *The authors use general scientific methods, comparative analysis, analytical approach.*

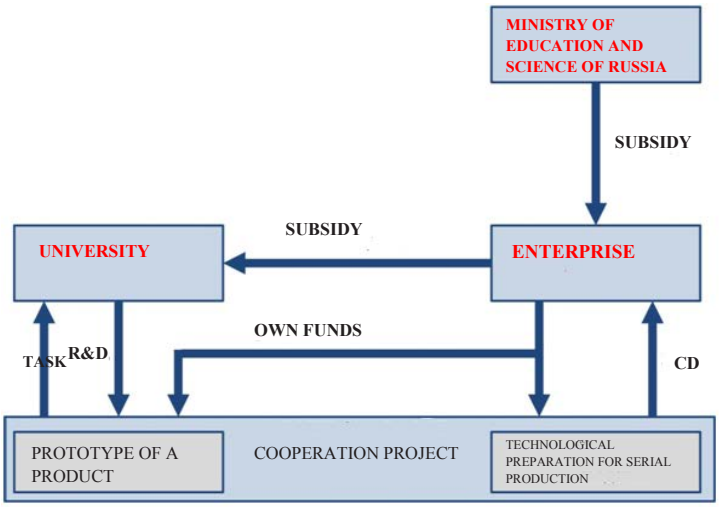
Results. *An open competition is held by the Ministry of Education and Science. Competitive documentation is posted on its official website, as well as on the website of the state procurement of the Russian Federation. A participant of the competition for the right to receive a subsidy is an organization that (Pic. 1):*

a) represents a project that provides for implementation of research, development and technological work by Russian higher educational institutions;

b) additionally allocates at least 100 % of the volume of the subsidy for the project, at least 20 % of which is used for research, development and technological work.

An enterprise selected as a result of a tender is obliged to provide information about high-tech products developed within the project and the volume of its output for at least five years after the end of the contract (agreement) on the subsidy.

In the period from 2010 to 2016, the Ministry of Education and Science announced seven competitive lines. Enterprises together with higher educational institutions and scientific organizations in total for this time submitted 1645 applications. As a result of open tenders, 271 projects have been approved for subsidizing. At the moment, the eighth line is announced. At the same time, it should be borne in mind that in the federal budget, for each regular year, planned allocations are made for the implementation of Government Resolution No. 218 (see Pic. 2). During the implementation of the Government Resolution «On Measures of State Support for Development of Cooperation between Russian Higher Educational Institutions and Organizations Implementing Comlex Projects for Creation of High-Tech Production», it became apparent that the organizational and economic cooperation mechanism should be improved in terms of the formation of additional



Pic. 1. Scheme of interaction of participants in cooperation under Resolution No. 218.

evaluation criteria for the selection of applications for scientific and technical projects, as well as subsequent process control. After all, the criteria not only determine the final place of the application in the competition, but also outline the vectors for the development of cooperation, the macro tasks of projects with high-tech production.

We will apply the following approach, often implemented in practice: we formulate the requirements for the management system and transfer them to the organizational and economic mechanism in full, and the conceptual principles of profile management will be worked out in such a way that adherence to them would allow meeting the requirements for the management system.

At all stages of the life cycle, the requirements are imposed on the control system, i.e. a list and values of properties is set, that it must have (at least to a minimum). Such requirements are of a complex nature and there may be options, to be specified according to the scheme of the exclusive «or».

The requirements for organizational and economic mechanism for making decisions on the selection of scientific and technical projects are related to (Pic. 3):

– effectiveness of management;

– process implementation of this management;

– project implementation of the organization of the management process.

The following requirements are compulsory:

• Sufficient universality of the organizational and economic mechanism, which makes it possible to apply it for:

– an arbitrary control period;

– arbitrary control discretion;

– an arbitrary number and technical and economic characteristics of scientific and technical projects;

– arbitrary indicators of state and management decisions from the number of certain, as well as parametrically arbitrary restrictions on these indicators;

• acceptable accuracy of the decision-making option for selection of scientific and technical projects, providing a level of the relative error of the preferred option in relation to the ideal solution for the expected values of state indicators not exceeding 10 %;

• acceptable promptness of the rationale for making decisions on the selection of scientific and technical projects, which can be estimated by the maximum allowable costs of calendar time;

• applicability using standard computer models for modern Russian administrative practice in the form of PC;

• possibility of the use with the involvement of management personnel with the achieved level of professional qualification in the field of competitive bidding;

• complete legality of creation, functioning and development in terms of compliance with Russian legislation:

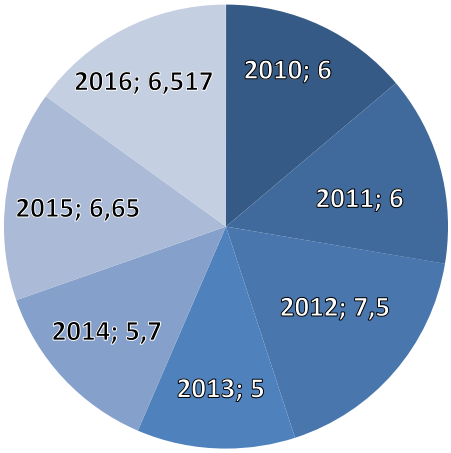
– on composition and content of management objectives and indicators of the state, managerial influences and decisions;

– on the composition, sources and methods of obtaining primary information;

– on actions and inactions of management personnel;

– on product originality of the organizational and economic mechanism in comparison with earlier fundamental and applied research.

The organizational and economic mechanism for selection of scientific and technical projects, in the first place, must satisfy the requirements of the legislation in the field of competitive procedures, in particular, the provisions of Federal Law No. 44-FZ «On the contract system in the procurement of goods, works, services for provision of state and municipal needs» [5].

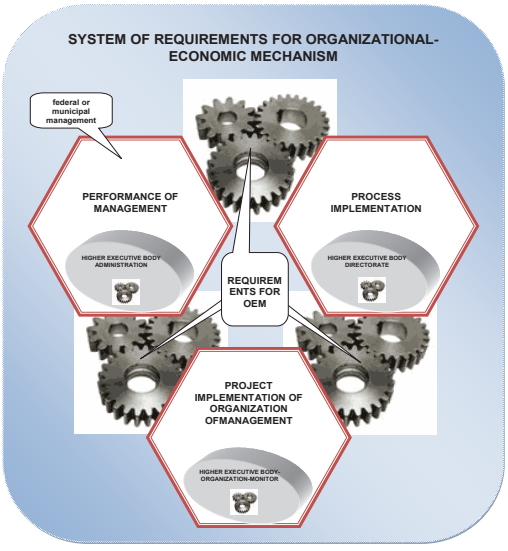


Pic. 2. Budgetary allocations for implementation of Government Resolution No. 218, billion rubles.

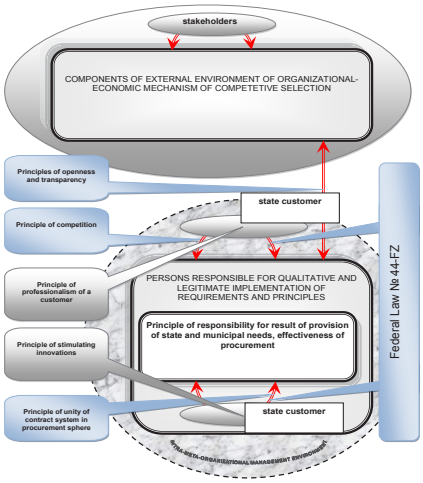
The contract system in the procurement sphere, according to this law (Pic. 4), is based on the principles of openness, transparency of information, ensuring competition, the professionalism of the customer, stimulating innovation, the unity of the contract system in the procurement sphere, responsibility for the effectiveness of providing state and municipal needs, the effectiveness of implementation of procurement.

The principle of openness and transparency.

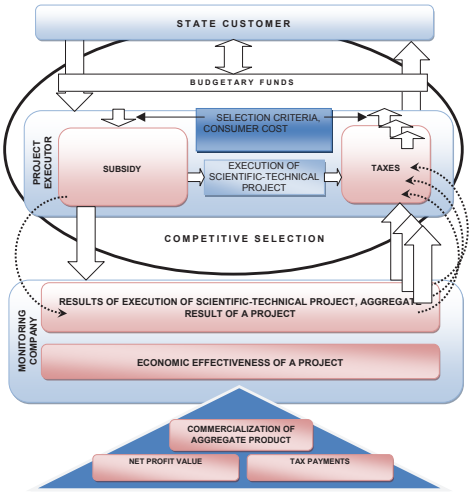
1) The Russian Federation provides free and unpaid access to information on the contract system in the procurement sphere.



Pic. 3. Conceptual appearance of the system of requirements for the OEM [4].



Pic. 4. Typological variety of principles governing the implementation of competitive selection in accordance with Law No. 44-FZ.



Pic. 5. The conceptual image of a specialized organizational and economic mechanism.

2) Openness and transparency of information are provided, in particular, by placing it in a single information system.

3) The information must be complete and reliable.

The principle of competition.

1) The contractual system in the field of procurement is aimed at creating equal conditions for ensuring competition between the participants in procurement. Any interested person has an opportunity to become a supplier (contractor, executor) in accordance with the legislation and other regulatory legal acts on the contract system in the field of procurement.

2) The competition in the procurement should be based on the observance of the principle of fair price and non-price competition in order to identify the best conditions for supply of goods, performance of work, provision of services. It is forbidden for customers, specialized organizations, their officials, procurement commissions, members of such commissions, participants in the procurement to conduct any actions that contradict the requirements of the law, including restricting competition, in particular to unreasonably limiting the number of participants in procurement.

The principle of the customer's professionalism.

1) The contract system provides for carrying out the activities of the customer, specialized organization and control body in the field of procurement on a professional basis with the involvement of qualified specialists with theoretical knowledge and skills in this field.

2) Customers, specialized organizations take measures to maintain and improve the level of skills and professional education of officials involved in procurement.

The principle of stimulating innovation.

Customers in planning and implementation of procurement should proceed from the priority of securing state and municipal needs through the procurement of innovative and high-tech products.

Principle of unity of the contract system in the field of procurement.

The contract system is based on common principles and approaches provided for by law and allowing to provide state and municipal needs through planning and implementation of procurement, their monitoring, audit, and control in the procurement sphere.

The principle of responsibility for the effectiveness of ensuring state and municipal needs, the effectiveness of procurement.

1) The state bodies, the management bodies of state extra-budgetary funds, municipal bodies, state institutions, other legal entities in cases prescribed by law should be guided by the need to achieve specified results in ensuring state and municipal needs when planning and implementing procurement.

2) The officials of the customers are personally liable for compliance with the requirements established by the legislation on the contract system in the field of procurement and regulatory legal acts.

The formed system of principles is based on a system of criteria developed in accordance with the requirements of the value orientation of the model for systematization and selection of socially significant projects, and on its basis the tool is offered presented by the procedure and the economic and mathematical apparatus for objectifying the processes of creating and selecting state projects and programs from the standpoint of their strategic Orientation and at the same time consumer effectiveness (Pic. 5).

Thus, by introducing changes in the structure of the mechanism for selecting scientific and technical projects by introducing the category of the aggregate product of the project and estimating its use value, the state customer obviously stimulates the potential contractor to identify intermediate, collateral and final product forms of the project at the stage of preparation of the competitive bid, technical and economic justification and project planning.

An application that meets the relevant requirements will have objective preferences in relation to competitors. Accordingly, the probability of winning the contest increases.

Moscow Aviation Institute (National Research University) is a direct participant in the implementation of Government Resolution No. 218 as the leading executor of R & D. During the period from 2010 to 2015, the university successfully completed five projects with a total funding of 794,5 million rubles.

One of the main executors of the projects became the scientific center of special radio electronic systems and management, created in 2008 to

intensify the scientific and production and innovation activities of MAI in development and production of modern radio electronic products.

Thus, in 2010–2013, the Center developed a multifunctional on-board radar system (MBRS) for various carriers of economic and operational-tactical designation, which became a unique product in Russia of this kind by the order of the Fazotron-NIIR Corporation and allows further obtaining a unified series of BRS of new generation radar.

The victory in 2015 in the sixth stage of the open competition of the Ministry of Education and Science allowed the center to open a joint project with «Oktyabr» enterprise to develop and organize a high-tech production of the small-scale multi-mode on-board Ku-band radar system (SMBRS) for equipping promising unmanned and helicopter systems [6].

During the implementation of the project, the following should be developed:

– prototype and design documentation of SMBRS for equipping atmospheric aircraft of various types (helicopter, unmanned aerial vehicle) for the purpose of monitoring the earth's surface during search and rescue and special operations in cooperation with innovative enterprises engaged in the development of science-intensive products;

– comprehensive project to organize the production of SMBRS;

– high technologies for creation of miniature radars and their constituent subsystems, as well as the functional devices of SMBRS.

One of the key tasks in implementation of this project for enterprises is to obtain the final product, which has to be commercialized, through its sale to receive financial resources, and directly for the customer – the return of subsidies through taxes and fees. As the final product in this case, SMBRS is considered, and as intermediate goods, for example, the antenna module, the receiving-transmitting and transmitting modules.

The result of the implementation of the scientific and technical project at the «secondary» level is a set of technologies, by-products and intermediates, the market or target demand for which should be evaluated and forecasted together with the evaluation of the demand for the final product of the project.

The proposed project evaluation tool provides for bringing to the practical use all scientific and technical innovations both for the final product and for possible other options in the form of intermediate and by-products. This is natural, since we are considering a project consisting of a set of subprojects, united by a single systemic concept [7].

Conclusions. *State financing of scientific and technical projects carried out with the participation of universities requires an appropriate return, in particular, by transferring taxes and fees to the serial products sold by enterprises. At the same time, one should consider the possibility of commercializing not only the final product, but also possible intermediate products at different stages of the life cycle of R & D. In the course of implementing R & D, cooperation is being created between the co-executors to develop separate units and modules, which in turn are finished products. This is also accompanied by the fact that higher educational institutions organize scientific and educational centers capable of teaching students breakthrough technologies within the framework of the announced projects, and to make obtained patents, know-how, innovative models and methods an independent product.*

REFERENCES

1. Kanashchenkov, A. I., Novikov, S. V. Program-target instruments of state management of high-tech scientific and technical projects [*Programmno-celevye instrumenty gosudarstvennogo upravlenija vysokotehnologichnymi nauchno-tehnicheskimi proektami*]. Vysshaja shkola, 2016, Iss. 11, pp. 17–19.

2. Resolution of the Government of the Russian Federation dated April 9, 2010 № 218 «On measures of state support for development of cooperation of Russian higher educational institutions and organizations implementing complex projects for creation of high-tech production» [*Postanovlenie pravitel'stva RF ot 9 aprelja 2010 goda № 218 «O merah gosudarstvennoj podderzhki razvitija kooperacii rossijskih vysshih uchebnyh zavedenij i organizacij, realizujushhih kompleksnye proekty po sozdaniju vysokotehnologichnogo proizvodstva»*].

3. Tikhonov, A. I., Novikov, S. V. Improvement of competitive procedures for selecting high-tech projects under conditions of import substitution [*Sovershenstvovanie konkursnyh procedur otbora vysokotehnologichnyh proektov v uslovijah importozameshhenija*]. *Vysshaja shkola*, 2016, Iss. 12, pp. 22–25.

4. Novikov, S. V., Zamkovoy, A. A. Generation of requirements for a specialized mechanism for competitive selection of high-tech projects [*Generirovanie trebovanij k specializirovannomu mehanizmu konkursnogo otbora vysokotehnologichnyh proektov*]. *Vysshaja shkola*, 2016, Iss. 13, pp. 4–9.

5. Federal Law No. 44-FZ of April 5, 2013 (as amended on July 13, 2015) «On the contract system in the sphere of procurement of goods, works and services for provision of state and municipal needs» [*Federal'nyj zakon ot 5 aprelja 2013 goda № 44-FZ (red. ot 13.07.2015) «O kontraktnoj sisteme v sfere zakupok tovarov, rabot, uslug dlja obespechenija gosudarstvennyh i municipal'nyh nuzhd»*].

6. Novikov, S. V., Kulakova, D. S. Implementation of complex projects for the creation of high-tech production [*Realizacija kompleksnyh proektov po sozdaniju vysokotehnologichnogo proizvodstvam*]. *Nauchnaja diskussija: innovacii v sovremennom mire*, 2016, Iss. 6–1, pp. 73–77.

7. Kulakova, D. S., Novikov, S. V. Forecasts of commercialization of the results of a complex project [*Prognozy kommercializacii rezul'tatov kompleksnogo proekta*]. *Nauchnaja diskussija: voprosy ekonomiki i upravlenija,* 2016, Iss. 6, pp. 50–56.

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