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**FINANCIAL SOURCE SELECTION OF HIGH-TECH
ENTERPRISES OF SPACE-ROCKET INDUSTRY**

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Abstract

Nowadays, in the Russian Federation much attention is paid to a perspective of improving efficient management of the space-rocket industry. The state pays close attention to the high-tech enterprises of the space-rocket industry, demanding from them the accelerated innovative development for overcoming lagging in a space industry behind the advanced countries of the world. The diffusion of innovation aims to increase the international competitiveness of enterprises from related industries. A significant role in this process is played by efficiency of innovative potential reproduction. In turn, the development of innovative potential is closely connected with the effective use of resources. The analysis of sources of financing for innovative capacity of the high-tech enterprises of the space-rocket industry is carried out in this research. The model of a source selection of financing for innovative potential, depending on a target orientation of the produced missile and space equipment is provided as the results of the study.

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Keywords: Financial resources; high-tech enterprises; innovative development; innovative potential; space-rocket industry of the Russian Federation.

1. Introduction

Analyzing current trends in development of world economy, it should be noted that economic growth most often is determined by achievements of scientific and technical progress. In the most developed countries, due to scientific and technical progress, about 90% of economic growth is provided. As a result, at the present stage of development of the economic relations, the main role is played by the industries and the separate enterprises, producing the knowledge-intensive and high-tech products. They



create demand for scientific and practical developments which actively stimulate development of basic and applied researches. In such developments, the latest technologies as well as advanced forms of enterprise management and manufacturing organization are realized. The knowledge-intensive and high-tech enterprises initiate development of economy through implementation of innovations, thus, determining the structure and parameters of the national innovative system. Through them, there is a distribution of innovations in the national economy due to presentation of increased requirements for technical parameters of products which are produced by the adjacent enterprises and industries, and also changes in competences by training engineering and managerial personnel. Among productions and the industries of the national economy in the Russian Federation, which kept a certain potential for growth, there were generally enterprises of the defense industry complex (DIC) and, first of all, the enterprises of the space-rocket industry (SRI). This situation has arisen generally due to specifics of the tasks solved by them, aimed at providing defense capability of the country. Considering the objects set for SRI and the tasks on creation of principally new military, civil and scientific products, on the basis of essential reorganization of production capacities, creation of breakthrough technologies with their subsequent transfer to allied industries of the national economy, the enterprises of SRI can act as the basis which will allow one to provide technological upgrade and innovative development of national economy in general. However, in comparison with the leading global manufacturers (Office of Commercial Space Transportation; Spacenews) of the missile and space equipment (MSE), products made by the Russian high-tech SRI often possess lower tactical and technical characteristics (TTC). Thus, relying on the opinion, fixed in the state program on development of a space industry (Portal of mechanical engineering), it is possible to conclude that the main problem facing the enterprises of SRI consists in discrepancies between opportunities of a space industry and new requirements of the state and the world space market. A decrease in a negative impact of the tendencies given above on innovative activities and development of the high-tech enterprises of SRI can occur due to the accelerated reproduction of innovative potential that in turn will allow this organization type to overcome the main problem facing it in the medium term. In the work, authors adhere to the following determination of innovative capacity of the high-tech enterprise of SRI – "it is offered to understand it as a capability of the enterprise to create perspective samples of the missile and space equipment, expressed in availability of: special competences in carrying out researches, design, technological works; a backlog of scientific and technical developments, the developed material and technical resources for working off, testing and production of SRT; qualified personnel; a modern management system of innovative activity" (Beljakov, & Ereemeeva, 2016). Intensive development of innovative potential will allow the high-tech enterprises of SRI to expand significantly production amounts through the improvement of its TTC, in case of a decrease in a specific expense of the available resources and fulfillment of requirements of environmental standards that will allow competing on equal terms in the world market with the SRT leading producers. Therefore, development of innovative potential is the first-priority direction in case of achievement of the set strategic tasks of development of the high-tech enterprises of SRI. This process in the basis relies on the available and/or easily available resources and is directed to the solution of the problems facing the industrial enterprises in the long-term and medium term. One of main types of resources necessary for effective development of the high-tech enterprises of SRI and a rather fast increase in competitiveness of the made products are financial resources.

2. Problem definition

Need and sufficiency of financial resources cause development of such components of innovative potential as a level of competences, a potential of researches and developments, a technological level of the experienced and experimental base and production, a level of the organization and management of innovative activities, a personnel potential. In essence, effective development of these components reflects quality of the innovative solutions made at the high-tech enterprises of SRI that promotes further forming of adequate assessment of innovative activity of all organizations. Receipt of necessary financial resources for development of innovative capacity of the high-tech enterprises of SRI comes from different sources. This situation is connected with the fact that in the course of attraction of financial investments to this kind of organizations, the versatile purposes can be posed and solved simultaneously. When enumerating such tasks, aimed at the development of innovative potential components, it is possible to carry out the following: development of production and material and technical base, creating a backlog of competitive scientific-technical and technological developments, creation of the effective mechanism of the use of space technologies and results of space activities in the national economy, performance improvement of work of employees of the enterprises of SRI, deep upgrading and modernization of fixed assets etc. However, during this period for the high-tech enterprises of SRI, the following financial situation arose: if the organization produces various types of spacecrafts (military or scientific appointment), then its development and release is financed by the state. But at the same time, there is an open question about financing of researches and development for future reserve of perspective samples of SRT. In addition, there is a question about long-term financing of developments of innovative potential if the high-tech enterprise makes spacecrafts of dual or social and economic purpose.

3. Research objective

Relevance and debatability of the questions announced above, insufficient scientific readiness and the high scientific and practical importance have defined the choice of the purpose of the present research. Authors, as well as the purpose of this research, offer the following: to advance theoretical justification and development of an algorithm of the choice of parameters for financial sources of development of innovative capacity of the high-tech enterprises of the space-rocket industry.

4. Research methods

For the solution of an effective objective in the provided scientific research, authors used methods of the system analysis, scientific analysis and synthesis, generalization, the comparative analysis, economical and statistical methods. Application of these methods has allowed providing valid and reliable conclusions by results of the conducted research.

5. Results and discussions

Basing on researches (Belousov, 2010; Kochetkov, 2011; Eremeeva, 2015; Shapovalova, 2010), the flowchart of the choice of financial resources, depending on a target orientation of the produced missile and space equipment is offered in article.

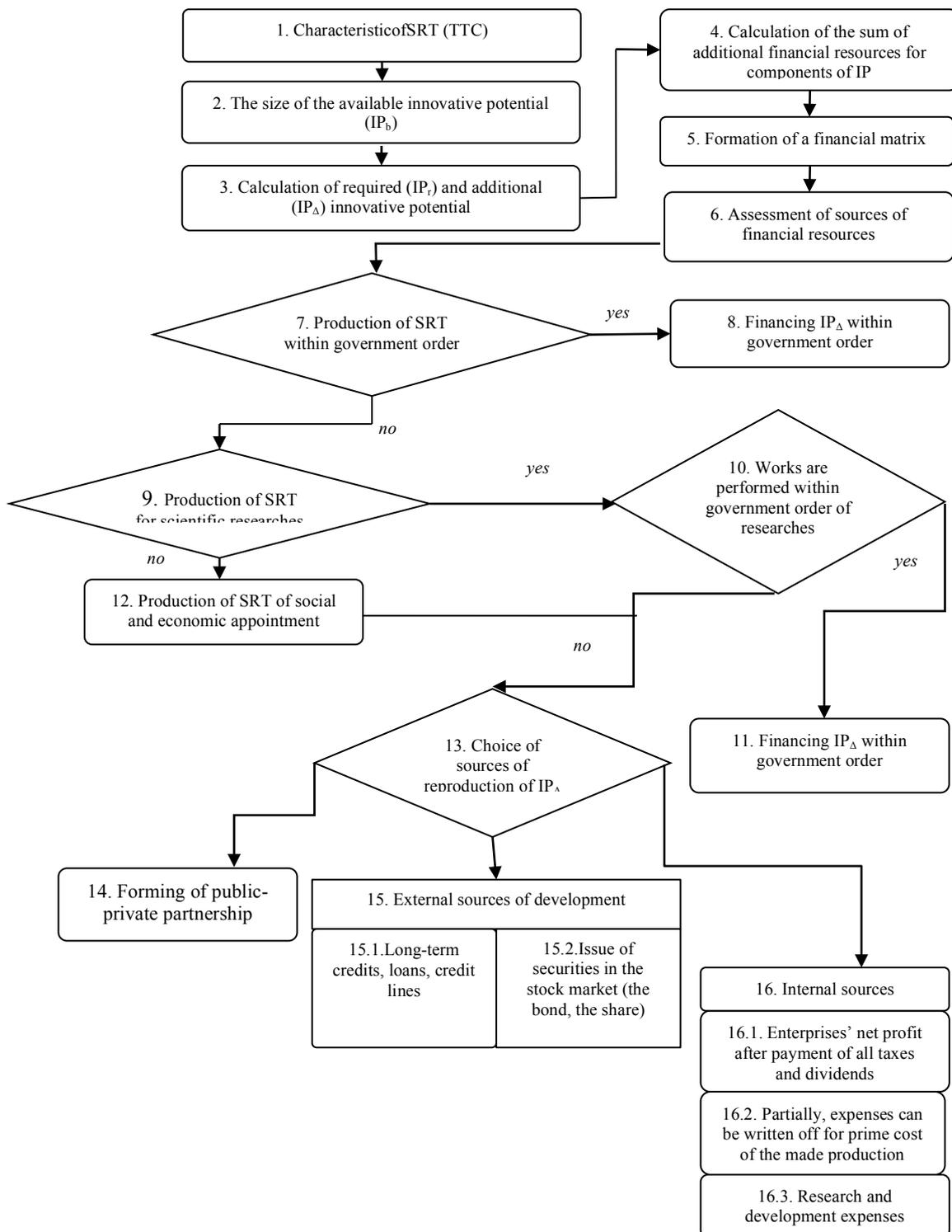


Fig. 1. Model of development financing of innovative capacity of high-tech enterprises of SRI

It is possible to assume complex consideration of possible options of development financing of innovative potential at the expense of various external and internal sources (figure 1). At the first stage, the analysis of TTC of products (missile and space equipment) of the high-tech enterprises of SRI is carried out. In addition, terms of release and payment, manufacturing cost, and also other conditions, influencing the financial aspects, provided in the public or commercial contracts are considered. At the

following stage - assessment of innovative capacity of the high-tech enterprises of SRI, reached on acceptance date of participation in the tender (contract). The received size is considered in further calculations as basic (IP_b). At the third stage, the required innovative potential (IP_r) for order fulfillment on production of SRT is calculated. If necessary, the size of an additional surplus of innovative potential IP_Δ is calculated. Such calculation is made if IP_b < IP_r, then IP_Δ = IP_r - IP_b. The fourth stage is one of key stages as it determines the size of minimum necessary financial resources for shifting the size of innovative potential to the necessary minimum level. The additional size of financial resources is predicted for each of five components: the level of competences, the potential of researches and developments, the technological level of the experienced and experimental base and production, the level of the organization and management of innovative activities, personnel potential. At the fifth stage, the financial matrix is formed. The format of representation of material in this matrix is shown in table 1.

Table 1. Financial matrix

Name of a component	Time interval							Total	
	T ₁	T ₂	T ₃	T _n		
1. Level of competences	∑11	∑12	∑13					∑1 _n	∑1
2. Potential of researches and developments	∑21	∑22	∑23					∑2 _n	∑2
3. Technological level of skilled and experimental base and production	∑31	∑32	∑33					∑3 _n	∑3
4. Level of organization and management of innovative activity	∑41	∑42	∑43					∑4 _n	∑4
5. Personnel potential	∑51	∑52	∑53					∑5 _n	∑5
Total	∑T1	∑T2	∑T2					∑T _n	∑

The time period is separated into n-intervals which cover the whole process of design and production of SRT. The quantity of n-intervals is defined by an expert way, taking into account the schedule of financing of the order. Horizontally, the total amount shows how many financial resources are necessary for promoting each component to a necessary level. In general, indicator ∑ specifies how much money is necessary for financing IP_Δ. Total values on vertical (∑T1, ∑T2, etc.) show how much money is necessary to attract during the time of T1, T2, etc. In addition, it would be desirable to emphasize that when forming financial requirement at a specific time point (for example ∑11, ∑23, etc.), monetary costs of expanded reproduction of separate elements of components are considered. The authors of this research, relying on Belyakov G.P. opinion (Beljakov, & Eremeeva, 2014), consider that separate elements of components of innovative capacity of the high-tech enterprises, which perhaps will need financing, can be classified as follows:

1. The level of competences: the duration of a process of development of a new product; the amount of the created new technologies; the use of modern information technologies when developing SRT; existence of internal standard documentation of the process of development of SRT, reflecting knowledge and experience; the level of integration functions (the number of suppliers, scientific research institute, higher education institutions participating in researches and developments); the quantity of the created centers of competences of the branch level; specific weight of intangible assets in the total cost of assets;
2. The potential of researches and developments: general costs of development of a new sample of SRT; a share of costs of researches and developments in % of sales revenue from production; costs of the

researches and developments executed by one's own forces; costs of the researches and developments which are carried out by the third-party organizations; the share of costs of prospective developments in the general costs of researches and developments; the number of the taken-out patents for developments (the total of the supported patents, the number of the patents for inventions which are taken out over the last three years, the coefficient of the used patents in production); the available reserve of researches and developments; participation in federal target programs and technological platforms;

3. The technological level of skilled and experimental testing facilities and production: the amount of the introduced advanced technologies over the last 5 years; the volume of costs of technological innovations; the share of the equipment (no more than 10 years); the level of automation of production, tests, control; specific weight of technologies and the equipment (more than 5 technological ways); the share of highly technological equipment; the share of high-performance jobs in the total amount of jobs;

4. The level of the organization and management of innovative activity: existence of the special divisions, providing innovative activity (research, design, technological, and etc.); the introduction of modern standards of corporate management; certification of conformity to the international quality standards; the number of innovative developments, the technologies transferred from the government order to civil production;

5. The personnel potential: the number of the personnel involved in researches and developments; specific weight of the workers having an academic degree of the candidate and/or doctor of science relatively the number of the personnel involved in researches and developments; the number of the doctoral and master's theses defended by the staff of the enterprise over the last 5 years.

At the following stage, the search of source (according to the chosen classification) of additional financing of development of innovative potential is carried out. Authors of this research offer the following classification, proceeding from the purpose of release of SRT:

1. Development and production of SRT for the needs of defense capability of the country. A financing source - the state defensive order (SDO);

2. Development and production of SRT for scientific researches. There are two financial sources: a) budgetary and/or intergovernmental financing of the contract; b) conclusion of the commercial contract for implementation of the order;

3. Development and production of SRT of social and economic appointment. In that case, financing can be made using: a) internal sources of the enterprise; b) received external resources on a commercial basis; or c) within the public-private partnership (PPP).

At the seventh and eighth stages, receiving financing by the government defense order is carried out. This type of financing is the most demanded among SRT producers. At the ninth and tenth stages, there is a choice of financing of innovative potential by production of SRT of scientific appointment. If works are performed within the government defense order, then financing joins in the state contract (the 11th stage). Otherwise, the enterprise seeks independently missing financial resources (stage 13). At the twelfth and thirteenth stages, financing sources by production of SRT of social and economic appointment are chosen. If government is interested in the services provided by enterprises of SRI, then financing within public-private partnership, according to the current legislation of the Russian Federation (stage 14), is possible. Otherwise, the high-tech enterprises of SRI independently seek financial resources. Today, external financial sources (stage 15) include:

1. receiving borrowings on a commercial basis – the long-term credits, loans or a credit line with parameters (sum, term), received at the 5th stage;

2. securities issue in the stock market and, first of all, release of bonded debts. Issue of shares for the high-tech enterprises of SRI is complicated by the fact that in the Russian Federation, the controlling stake of such organizations is in state hands.

Internal financial sources (stage 16) for receiving IPΔ, according to the current legislation, include:

1. enterprises' net profit after payment of all taxes and dividends;
2. partially, expenses can be written off for prime cost of the made production. For example, the expenses, received during development of personnel potential;
3. research and development expenses (research and development).

6. Conclusion

The offered model promotes formation and the use of financial instruments for development of innovative potential and allows solving the problems of strategic development facing the Russian high-tech enterprises of the space-rocket industry.

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