
Unique technological competencies and requests for external innovation - new diversification mechanisms and management objects in the innovation sphere

A.I. KASHIRIN¹, P.A. KASHIRIN²

¹Peoples' Friendship University of Russia, 117198, Moscow, st. Miklukho-Maklay, 6

Abstract: The study of trends in the development of the world economy showed that the formation in the near future of new global markets in the research and production sphere and the corporate sector, actively interact with each other. That can be named as the market of technological competencies and the market of problems and tasks. The role and place of technological competencies, as well as problems and tasks, as new objects of management in the innovation sphere are determined. The concepts of “unique technological competencies” and “requests for external innovations” are formulated. The basis of the latter are the problems and tasks of business. In addition to the term “key competencies of a company” that has become established in modern scientific literature, a new “unique technological competence of a team of specialists” has been introduced, in addition, a new concept is proposed in the form of “owner of a problem or task”, which together represent new subjects of management in the innovation sphere. It has been established that “unique technological competencies of teams” are the essential basis of the Centers of Global Excellence and Centers of Global Competitiveness, and measuring organizations in terms of the number and quality of such centers they have is a new approach to assessing the potential for innovative development. On the basis of practical examples, it is shown that the creation of management systems for these objects and entities opens up new, previously almost never used, ways of diversification and commercialization.

Keywords: innovation, start-up, competency, unique technological competency

INTRODUCTION

The fastest and most effective methods of diversification that are actively used at the moment, as practice shows, are the purchase (merger and acquisition) of innovative companies, the attraction of external teams to the company's contour, as well as the more efficient use of their own teams with innovative competencies. This is because, during a merger and acquisition, there is a purchase of its existing competencies and the entire previous path that it has gone from idea to product and market. In the process of mergers and acquisitions, competent teams are involved, which have experience in creating and launching innovative products to the market, which was accumulated by this team earlier. In this article, the authors explore new diversification mechanisms based on unique technological competencies and requests for external innovation.

NEW OPPORTUNITIES FOR DIVERSIFICATION

To identify new opportunities for diversification, we will analyze the existing trends in the development of the world economy. Among the most important trends, we note the following:

- acceleration of the processes of creating new knowledge, the emergence of new competencies and, on the basis of this, the acceleration of the processes of development, production and launch of new products, technologies, the desire of economic entities to achieve global superiority, maintaining global competitiveness
- development of advanced production technologies (computer design and modeling, additive manufacturing, new materials and structures, robotics, automated process control systems), which radically change the development, production and consumption processes, in particular, the trends of individualization (personalization, customization) of these processes are developing, the transition of the development and production of innovative

products to the service sector, including through the development of additive centers for collective use (3D production) (Advanced production technologies are a complex of design, modeling and manufacturing processes at a modern technological level of customized (individualized) material objects (goods) of varying complexity, the cost of which is comparable to the cost of mass-produced goods).

- significant expansion of the number of new players in the development and production processes in the person of individual developers, universities, research organizations, small innovative companies
- use by large companies and other organizations of the model of "open innovation" to solve their current scientific and technical problems and promising tasks by involving external specialists with the necessary competencies in these processes
- acceleration of the emergence and development of new competencies, competencies become a key factor in competitiveness, diversification of activities and sustainable development of organizations and businesses, and for defense industry enterprises, the commercialization of competencies can become one of the main approaches that contribute to the growth of civilian innovative products brought to the market
- development of a new sector in the global economy - the sector of small innovative companies based on venture capital, which are dynamically developing and often become competitors to large companies, which increases the need for the latter to use mechanisms of "open innovation"
- increased competition and cooperation, there are structural changes in cooperation processes, trends towards the enlargement of supplied products, systems, a reduction in the number of suppliers and an increase in the volume of external supplies in the final product
- a significant increase in the role of management in the creation, production, and promotion of products and a change in approaches to managing the company, business in general, the use of new business models, network and matrix structures for organizing processes, reliance on the leadership of employees and empowering them in decision-making, knowledge, competencies, and changes in the external environment become objects of management.

These trends, actively interacting with each other, lead to a synergistic effect in innovative development. For example, the individualization of development, production and consumption processes takes place on the basis of the capabilities of advanced production technologies, which also determines the transition of production to the service sector, a significant increase in the role of technological competencies that can create innovative technologies and products in different areas of application, allows solving individual problems and tasks of consumers (active development of open innovation mechanisms by corporations ensures the search, development, use and attraction of third-party technological competencies and businesses).

Analysis of these trends and their further development in interaction with each other show that in the near future, the corporate sector should expect the active formation of new global markets that are adjacent and complementary to each other, namely, the market for problems and tasks and the market for technological competencies that solve them.

Accordingly, those organizations that will start working in new markets earlier will win and ensure their advanced development based on diversification and growth in the volume of civilian innovative products. For a deeper understanding of new markets, and, consequently, new objects of management, it is necessary to understand in more detail what competencies, problems and tasks are, and their place in innovation processes.

These markets already exist and are actively developing, for example, in the field of healthcare and services. When a person has some kind of health problem, for example, a stomach or a tooth is ill, he goes to see the appropriate specialist, in this case, a gastroenterologist or dentist, who have the necessary competencies to understand the problem and solve it. When a difficult case, for example, a heart transplant is required, a person looks for a specialist with unique competencies. There may be only a few dozen such specialists in the world.

However, such markets are not yet developed in the scientific, technical and industrial spheres, there are only a few examples. This study is devoted to how to form these markets, what problems exist along this path and how to most effectively manage technological competencies (TC), problems and tasks (TP) at the company level. The markets are illustrated in the diagram.

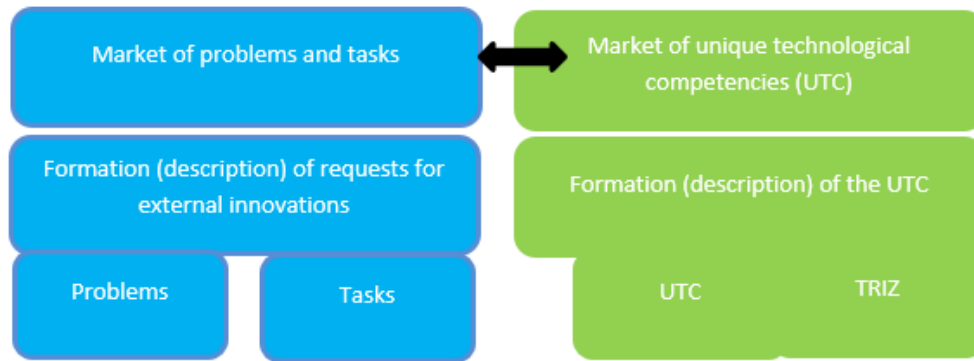


Fig.1: Formation of new markets and their interaction

The analysis of the presented scheme shows that these markets will gradually be created on the basis of formalized descriptions of the problems and tasks existing in organizations, as well as existing technological competencies. However, as practice shows, the presence of descriptions and understanding of their competencies, problems and tasks allows organizations to use them immediately in improving the efficiency of their own activities, without waiting for the formed markets, including the processes of commercialization.

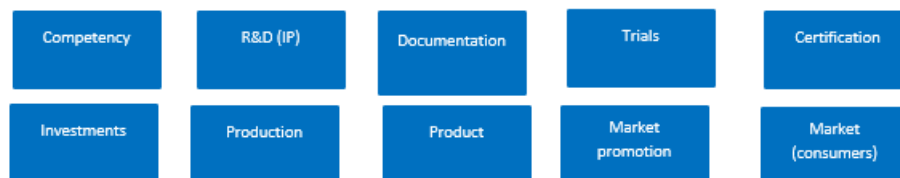
As for TRIZ (the Theory of inventive problem solving), the founder of which is the Soviet scientist G.S. Altshuler, then this tool in itself is a competency that allows specialists with TRIZ methods to successfully solve complex scientific and technical problems and tasks. The topic of TRIZ has been sufficiently worked out in theoretical and practical terms, therefore, in this study we will not dwell on it in detail. We only note that the organizations of the Russian defense industry do not actively use this extremely effective tool, in contrast to a number of foreign companies.

The formation of new markets will lead to changes in innovation processes, as new objects and subjects of management appear. In fact, we are talking about a new paradigm of innovative development, built on the interaction of technological competencies (TC) with problems and tasks presented in the form of requests for external innovations (competencies), as well as the formation of new investment transactions based on the nature of this interaction.

Here you should pay attention to the fact that the new paradigm does not change the currently existing models and mechanisms for the development of an innovative economy and business, which the authors conventionally call the “product” approach, but creates new ones in addition to the existing ones. Within the framework of the “product” approach, the main object of management and the purpose of the activity is the product that is introduced to the market. The product must have a competitive advantage over its peers in order to gain a share of the market. This approach has been studied well enough and has been successfully applied in practice. It is especially successfully used in the development of innovative business based on venture capital investments.

The objects of management within the framework of the new paradigm are scientific and technical problems and tasks and technological competencies that are aimed at solving them. The diagram below illustrates the differences in approach.

Today: the market of products (services) and consumers



Tomorrow: markets and problems, tasks and competencies that solve them



Fig.2: Today the market for consumer products and services

The sequence of actions of participants in the processes includes:

1. Formation (description) of TC and requests for external innovations and their presentation on the market
2. Search for partners in the use of TC, that is, the search for problems and tasks, and, on the other hand, the search for TC to solve their own problems and tasks
3. Formation of technical requirements or technical specifications for the required product, which must be created on the basis of the TC, and the signing of a contract for its development, manufacture and supply
4. Attraction of third-party financing for the execution of the contract, including development (R&D), purchase of components, testing and delivery
5. Development, production and delivery of the required product (no sample captions).

Now, let us take a closer look at the new concepts.

WHAT ARE COMPETENCIES?

For the first time, the topic of competencies was formed in the book by K. Prahalad and G. Hamel "Key competencies of a corporation", where the authors of which showed that not just any, but only key competencies can create a real and sustainable competitive advantage for a company. The result is a "competent" approach. The authors not only introduced a new concept of "core competency", but also identified its main characteristics:

- Value for the consumer. The core competency should make the greatest contribution to the perceived value of the consumer, increase the significance of the product in the perception of the consumer. Just because a core competency should make a significant contribution to customer value does not mean that the client is able to understand the essence of the core competency. Buyers perceive the benefits, convenience, benefits themselves, and not the technical and organizational aspects that create them.

- Differentiation among competitors. To have the qualities of a core competence, it must be different from normal practice.

- Breadth of application. Empowerment. Key competencies allow the company to expand significantly its presence in world markets by using the available unique knowledge and experience to create and launch new products and services that are fundamentally different in characteristics from those already created.

To achieve this, it is necessary to abstract from the already created product or service and direct the key competency to the formation of the concept of a new product or a new approach to using the product. Thus, the company can ensure the acquisition of competitive positions not in one, but in several new industry markets for it, and thereby increase its resistance to possible fluctuations in the global environment.

The key competency has a powerful strategic potential for the development of the company, based on which the company can no longer be perceived as a collection of its constituent business units, but as a combination of key competencies: knowledge, skills, and abilities that allow creating unique consumer values.

Key competence allows you to create innovative products, provides a company with superiority in entering global markets in a highly competitive environment. With this approach, the new product has technical parameters that no one can reproduce. Its price, even if it is relatively high, is not decisive for the consumer, since there is no analogue of this product on the market.

In the expert literature, the concepts of "core competencies", "distinctive competences", "sphere of competences" and others have appeared. They began to distinguish between competencies by areas of activity: marketing, organizational, managerial, technological, etc.

In recent years, in foreign scientific literature, increased attention is paid to the study of technological competencies. Many foreign experts believe that the knowledge, skills and abilities gained in the field of technology in the development of one product can be useful in the future in the development of other products.

At the same time, research areas close to those indicated in content are developing, which study the issues of reuse of created technologies and the internal content of "technological platforms", the use of which in this study is shown on the examples of 3M and DuPont. In this regard, of interest is the article by Daniel Stig from Chalmers University of Technology (Gothenburg, Sweden), in which the author presented the results of a study by the Swedish company "GKN Aerospace Sweden AB1 (GKNA)", which manufactures components for aircraft and space engines, on the organization of knowledge for the reuse of technology. D. Stig's article highlighted a number of problems in the organization and use of technological knowledge, including:

- Companies underinvest the repeat use of technologies.
- There is little awareness of the technological knowledge available in the company.

- Weak incentives to prepare documentation, taking into account its possible future demand by other users.
- Technological knowledge has a very significant non-formalized (in the documentation) component that makes contact with people who know the technology necessary to ensure the successful reuse of this technology.
- Technologies for reuse can be considered mistakenly to be of high “availability” when they have not yet been validated in the context of this new application and a number of others.

Based on the research results, the author gives practical advice on the formation of a more effective technological knowledge management system, in particular:

- If the company as a whole is successful in creating a specific culture, processes and infrastructure for knowledge management, then it will be well prepared to reuse technology.
- Different types of users need different knowledge of technology.
- Publication of general technology knowledge should be organized.
- It is necessary to allow employees of the company with similar problems to come into contact with each other.
- A distinction needs to be made between publicly available information and information with limited access.
- Use a searchable directory to present basic technology information in an organized manner and provide links to experts and overview information in official reports.
- Basic general technology information should be made available to a wider audience within the company to raise awareness of the existence of this information and provide a starting point for accessing of more detailed reports.
- Intrinsic motivation alone is usually not enough to stimulate the additional work required to create descriptions of knowledge that promote technology reuse.
- The decision on how much effort should be made to prepare a description of knowledge for technology reuse depends on the technology and the nature of the knowledge available. In some cases, it is sufficient that these descriptions are just a by-product of the current work, while in others there is a need for specific guidance or software applications to facilitate technology reuse.
- A digital “technology catalog” could be a viable solution to expand sharing to reuse technology across the company. It would allow users to search for technologies according to the hierarchy established by the company, read summaries of their capabilities, and find links to detailed knowledge descriptions, as well as contact information for experts related to these technologies.

D. Stig's article contains a lot of useful information on technology reuse. However, talking about the reuse of technology and technological knowledge, he acknowledges that the mere transfer of technology documentation to produce a new product is not sufficient. This work requires the participation of specialists with this technological knowledge.

On the other hand, knowledge, according to the overwhelming majority of experts, including K. Prahalad and G. Hamel, is only an integral part of competencies. In addition to knowledge, competencies are also characterized by abilities, skills and, most importantly, skills, which together represent a completely different object of study and management.

It can be seen from the presented materials that in world science and practice, a single conceptual apparatus has not yet been formed concerning such concepts as technological knowledge, technological competencies, technological platforms, which leads to difficulties in understanding the processes occurring in this area.

The authors of this study believe that it is technological competencies that represent a mechanism that opens up new opportunities for creating a variety of innovative products in different fields of application, in different markets, that is, to promote the diversification of enterprises.

At the same time, despite some progress in this issue, in economic theory there is still no description of the technological competency management system (TC), including an algorithm for their identification, description and commercialization.

In this regard, in order to have a clearer focus in this study, the authors analyze not even technological, but only unique technological competencies (UTC), which represent the highest level of TC. The appeal to the UTC is primarily due to the fact that, as a rule, new unique products are created on the basis of the UTC. Conventional competencies create conventional products.

The authors of this study define UTC as follows.

Unique technological competencies (UTC) or the application of knowledge in practice is a combination of knowledge, skills, abilities, abilities of a team of scientists, specialists, which allows them to create innovative technologies and products for various fields of application, the technical characteristics of which meet the criteria

of global excellence (exceed the characteristics of the best world analogues) or global competitiveness (comparable to the characteristics of the best world analogues). The formulated UTCs are the basis for their widespread use in terms of commercialization and diversification.

In essence, we are talking about the creation and development of centers of global excellence and global competitiveness in defense industry organizations on the basis of the UTC based on previously unused internal intellectual capital in the form of UTC or the attraction of external competencies to the perimeter of the organization.

It is necessary to pay attention to the fact that in the above definition of the UTC, the authors of this study for the first time talk about the competencies of a team of specialists. The overwhelming majority of the concepts of competency existing in scientific and business literature are associated with companies and enterprises. From our point of view, this does not reflect real innovation processes, since competencies are possessed by specific people who bring them to companies. Only after the arrival or presence in the company of a team with a certain competency, the company can talk about its ownership. The term "company competency" certainly has the right to exist, but does not reflect the essence of the phenomenon.

It is important to note that the bearers of competencies in a company are specific employees (groups of employees) who are specialists in their field of activity (marketing, management, design, engineering, production, etc.). Therefore, the term "competence of the company", strictly speaking means "the competency of a certain team in the company" or as an integral concept the sum of "competency of teams". This allows us to clarify the new objects and subjects of management that are used in this study - these are, respectively, the UTC and teams of specialists who are carriers of the UTC at the enterprise (the UTC teams), and not the enterprise as a whole.

Based on the analysis of the development and creation of high-tech products and based on existing practice, including the "technological platforms" of 3M and DuPont, it is possible to determine the place of the UTC in the innovation process, which is presented in the diagram.

Thus, in the innovation process: knowledge - UTC - technology - product / work / service - market, the place of UTC is between knowledge, being a derivative of them, and technologies. For a deeper understanding of the new term, the authors analyzed the concepts of "technology" and "competency" and the differences between them, the results of which are presented in the table.

Table 1: Comparison of the concepts of "Technology and Technological competence"

Criterion	Technological competency	Technology
Definition	Ability (ability) to perform specific actions in a specific technical area, as well as the ability to create new technologies and products in various fields of application, including development, design, design, engineering and production	A set and sequence of methods and processes for converting raw materials that allow you to obtain products with specified parameters, a method for converting matter, energy, information in the process of manufacturing products, processing and processing materials, assembling finished products, quality control, management Two types of technologies are distinguished: "product" is aimed at creating a product, product, part, and "process" is aimed at performing the technical process (hardening, heat treatment, etc.)
Generic dependence	Mother	Daughter derived from competency
Maturity stage	Formed in the process of solving non-standard tasks	It is formed in the process of formalizing the developed solution to the problem, description of the technology
Carrier	Development team Competency is an inherent property of its carriers	Company Technology is depersonalized, documented and can be alienated, sold
Broadcast	Through learning	Through alienation
Intellectual capital	Human capital and its competencies, knowhow	Intellectual property, intangible assets

Owner, owner	Team of specialists	Patentee (company)
Disclosure level, detail of description	Only the wording (what exactly the team is able to do) of the description of the competency, without disclosing commercial or other secrets	Complete, sufficient for the implementation of technological actions on a material object, a certain sequence of operations, indicating the materials used, equipment and conditions (modes)

The authors believe that the separation of the UTC into an independent control object creates an opportunity to form a control system for them. At the same time, the new subjects of management are teams that have the UTC. Hence, it seems obvious that managing the UTC is possible only on the basis of managing the UTC teams, which, in fact, own them, and are the main performers in the development and production of innovative products based on the UTC. In this regard, there is a need to motivate the UTC teams to work on identifying, describing and commercializing competencies. However, in this study we will not dwell on this important aspect of the UTC management system. We will return to this in the following publications.

Problems of working with UTC. Experience shows that there are problems in identifying and formulating (describing) their own competencies on the part of their owners. This is because this approach is new, not yet mastered, there are no methods, there are difficulties in the multi-level and multivariate formulation of competencies, the existing “product” approach interferes with understanding the new.

Practice has shown that mentally it is better for UTC teams to start identifying and describing UTC with existing unique products that have been created on the basis of UTC and meet the criteria of global superiority or global competitiveness. Further, within the framework of the thought process, one should answer the question: what did we, the carriers of the UTC, specifically did so unique, which made it possible to create unique products? And then formulate a text describing the UTC.

It is pertinent to note here that our analysis showed that UTC are created (formed) by teams of specialists in solving non-standard scientific and technical problems and tasks aimed at developing the necessary technologies and products. In the course of these processes, skills, abilities, approaches to solving not only a specific, already implemented topic are developed, but also a potential opportunity opens up for this team of specialists to solve many new problems / tasks based on the repeated use of UTC in order to create new products / technologies in various fields application.

The current practice shows that a team of specialists, having solved the problem / task and having received the required result in the form of a product / technology, does not even think about the fact that in the course of this work they have created a UTC, which can be widely used to solve many other problems / tasks. Thus, on the surface, in the information and market spaces, there is a product / technology, and the UTC remains hidden both for the team itself and for the market. In this regard, further development of the UTC does not occur. Hence, we can conclude that an adequately formulated description of the UTC and its promotion on the market will significantly expand the possibility of its application in solving new problems / problems of consumers and creating new products / technologies on their orders. On the other hand, the development of the market for problems and tasks, that is, in essence, their reproduction, can become a catalyst for the development of the market for technological competencies, including the UTC. From the above, it follows that the UTC is both created and developed on the basis of solutions to previously unsolved problems and tasks.

How to formulate information about the available UTC, understandable to potential consumers? As practice shows, competencies can be described both at the sectoral or cross-sectoral level, which is more understandable for the perception of UTC teams by specialists, which we call the upper-level UTC, and at the level of physical processes. In both cases, the description can be multivariate, revealing different sides of the UTC team's abilities. Here are some examples of descriptions of different C

Example 1.

Products: Non-contact lie detectors and potentially dangerous people in a crowd based on vibration parameters of subjects based on video images.

Top-level competencies, options:

a) development of systems for real-time assessment of the physiological (normal or abnormal functioning of internal and external organs and systems) and psychoemotional (aggression, stress, peace, anxiety, consent - not consent, truth - a lie, like it or not) state human based on the measurement and interpretation of human vibration

parameters from the video image (signal). The level (parameters) of vibration is an objective reflection of the ongoing processes and the state of a person and his individual organs at a given time.

b) identification of dependencies between the psychophysiological state, including the state (including deviation from the norm) of individual organs and systems of a person in real time and vibration parameters at the macro- and micro-levels of the human body and skin.

Competencies of the lower level, physical processes: registration, measurement and interpretation in real time of vibration parameters (amplitude, frequency, etc.) of living, inanimate and technical systems based on video image (signal).

Possible applications and products: medicine, security, trade, mechanical engineering, agriculture and others, devices for express diagnostics of human and animal diseases, devices for determining harmful substances in products, vibration sensors for a wide range of applications.

Example 2.

Existing Products: Electric motors, generators, drives, permanent magnet couplings

Top-level competencies: Development and production of electric machines with high specific power (up to 100 kW / kg) and various configurations on permanent magnets

Competency of the lower level, physical processes: Creation of rotational and reciprocating movements of objects based on the control of the field of permanent magnets

Possible applications and products: mechanical engineering, medicine, safety and others.

Example 3.

Existing Products: Helicopter Blades

Top Level Competencies: Ability to put metal to composite with specified technical parameters.

Possible applications and products: electronics, mechanical engineering and others.

From the examples presented, it can be concluded that the product, its tactical and technical characteristics, especially in the case of military use, as well as the technologies used to create this product, represent a commercial, and possibly state, secret, while competencies may not appear.

Thus, the competencies available in the organization are a new asset that can be used in terms of commercialization in two main directions.

As can be seen, it is initially necessary to identify and describe the UTC available in the organization. The "competent" approach provides two possible options for commercialization. First, within the framework of the existing "product" approach based on the UTC, it is possible to create a new competitive market product in another area of consumption and ensure its promotion to the market, as 3M is successfully doing. The second opens up a new opportunity for the commercialization of the UTC on the basis of the provision of unique technological services by the orders of consumers, thus solving their problems and tasks.

PROBLEMS AND CHALLENGES?

In this study, we share the current scientific and technical problems, the solution of which is required at the present time, since they can slow down production, the creation of new products, and promising problems, the solution of which is required in the future, for example, to create a future product. In both cases, we are talking about those problems and tasks, the solution of which the organization gives to external performers for various reasons, but the main one, from our point of view, is the lack of the required competencies within the organization to solve these problems and tasks. Thus, problems and challenges collectively represent the needs or requests of an organization for external innovation or competencies.

Concept. Requests for external innovation are formulated as scientific and technical promising and current tasks and problems that exist in the organization at a given time, the solution of which is offered to external performers who have the competencies and are able to solve these problems and tasks, that is, they are essentially formulated needs for procurement external innovations throughout the cycle: R&D-R&D-licenses for R&D-competencies-products / services-companies / business.

Place of requests in the innovation process: problems and tasks - technical requirements / technical task - requests for innovations - innovative solutions based on UTC - procurement of innovations.

Similarly with the UTC, the management of problems and tasks as an object is also possible through their "owners", that is, specialists who have the necessary knowledge in a given topic, which allow them to formulate the appropriate technical requirements, technical specifications for solving a specific problem or task, and accept

the completed work. If the customer does not understand the way of solving the problem, the problem itself is formulated, which is proposed to be solved using external UTK without specifying a specific approach.

Let us give an example for illustration. **United Engine Corporation** has formulated “requests for external innovation” in the form of tasks, the solution of which is proposed to external contractors. Below are the queries and some results to solve them:

- Drastic reduction of the cost of production of gas turbine engines (GTE)
- Structural materials with enhanced or unique performance characteristics, technologies and equipment for the production of parts based on new principles (several contracts are being implemented for the development and supply of 3D heterophase powder metallurgy plants according to the customer's specifications)
- Electric machines on superstrong permanent magnets in the design of a gas turbine engine (more than 20 contracts are being implemented for the development and supply of electrical machines according to the customer's technical requirements, at the stage of creating an innovative enterprise jointly with one of the holdings of the Corporation, a business based on external technological competencies)
- New types of fuel with more energy, intensification of combustion of traditional fuels
- New design solutions for a gas turbine engine (GTE) for hypersonic jet engine. Engines based on previously unused physical principles (a prototype has been created and a fundamentally new engine is being tested)
- Complete design physical model of a GTE operating in various conditions

Within the framework of the 33rd conference of the International Association of Science Parks and Innovation Development Zones, held in Moscow in September 2016, one of the requests, namely "New technologies for manufacturing parts for industrial production (additive technologies)", was presented at the competition. In response to the request, 48 proposals were received, representing various solutions, including 22 from Russian and 26 from foreign companies. During the competition, five nominees were selected and the winner was chosen, which turned out to be LLC «Institute of Laser and Welding Technologies» from St. Petersburg. A special prize in this nomination was received by the company from Spain "Eurecat". This example is a clear evidence that this mechanism is working successfully and it should be actively used by organizations in order to improve the efficiency of their activities and innovative development.

However, the work with requests for external innovations is not yet systematic and requires its development. Currently, there are problems of forming requests for external innovations, since this requires formulating a new subject for interaction between the innovative, design and technological blocks, this approach is also new, not mastered, there are no methods.

Based on the foregoing, the authors come to the conclusion that “requests for external innovation” and “unique technological competencies” are tools for creating a new mechanism of commercialization and diversification, which is characterized by the following features:

- operates with new concepts, processes, approaches;
- introduces new objects and subjects of management in the innovation sphere;
- forms new markets: UTC and needs (problems and tasks);
- differs in its approaches from the venture mechanism, which is based on the "product" approach;
- shortens the path to the market and changes the vector of movement when the consumer (market) himself comes to the owner of the UTC;
- actively uses and develops (creates new) advanced production technologies;
- allows you to widely involve inventors and developers with UTC in the processes of creating products at the request of consumers, the market;
- adequately responds to the development trends of the world economy - individualization of consumption and development, the transition of production to the service sector;
- creates more favorable, less risky conditions for investors by investing in projects with a ready-made market.

In addition, it should be noted that the active development of new markets for problems / tasks and UTC, based on the management of these processes at the level of the state, organizations and groups of specialists will contribute to the acceleration of innovative development.

This approach has additional capabilities. In particular, based on the understanding that UTC is the essential basis of centers of global excellence and competitiveness, it seems appropriate to introduce new criteria for assessing the level of technological development of companies as well as universities, scientific organizations, start-ups and other subjects of the innovation sphere, in the form of quantitative and qualitative indicators for the presence of

these centers. In this case, if, for example, one organization has 5 centers of excellence and 10 centers of competitiveness, and in the other 2 centers of competitiveness, it seems obvious which of them has the greatest potential for innovative development.

According to the authors, the introduction of these proposals into practice will create a real opportunity to create conditions for the advanced technological development of Russia as a whole.

NEW OPPORTUNITIES FOR DIVERSIFICATION

Within the framework of the new mechanism, there are two approaches to diversification that should be used by companies.

Interior. Using UTC for:

- creation of new products in other areas of application and their introduction to the market, including on the basis of the integration of existing UTC in the organization,
- provision of unique services based on UTC for third-party consumers to solve their problems and tasks, including the creation of new products.

External. Using Innovation Requests to:

- accelerating the solution of own problems and tasks based on the use of third-party technological competencies, including UTC,
- attracting competent teams to the staff of the organization - carriers of TC or UTC, which are absent in the organization,
- purchases (mergers and acquisitions) of innovative businesses, companies that have the necessary TC or UTC.

Thus, working with UTC and requests opens up new opportunities for commercialization processes, increasing the level of diversification and increasing the volume of innovative products.

It is also obvious that in the near future new educational and research programs in universities will be required to form new specialists in the field of management of UTC and requests for innovation.

What to do?

Create and develop management systems for new management objects - problems and tasks (requests for external innovations) and UTC, and the subjects of management represented by the owners of requests for innovation and UTC teams.

These control systems should include:

- new business processes and functionality, new key performance indicators,
- partial, minor changes in the business model and organizational structure of the organization,
- identified and formalized requests and technical requirements for them, UTC, presentation materials, request owners, UTC teams,
- staff trained in new business processes,
- new regulatory and methodological materials, including the format for describing requests and UTC, the procedure for making decisions,
- a program for the implementation of requests and commercialization of the UTC, as an integral part of the diversification program,
- mechanisms for integrating UTC and requests and communication mechanisms for participants in these processes to exchange experience and establish interaction,
- a system of internal motivation for owners of requests and UTC teams, as well as a system of external motivation for brokers and agents to search for executors of inquiries and consumers of UTC,
- new section of the organization's website page.

A few words about the organizational and functional structure of the UTK management systems and requests for innovation. From the point of view of goals and objectives, new business processes and functionality, the most effective organizational and functional model of such management systems, according to the authors, is a cross-functional one. The basis of this management structure is the organization of work by groups, in our case with the UTK teams and request owners. The main principles of such a management organization are:

- independent work of teams to a certain level of decision-making and coordination of their activities horizontally,
- replacement of rigid managerial ties of bureaucratic and hierarchical type with flexible ties,
- involvement of UTC teams and owners of requests from employees of different departments to solve problems.

Within this organizational structure, the functional units, which include the UTC teams and request owners, remain the same. Changes are taking place in the functionality of departments and employees, which relate to their activities in the development and commercialization of UTC, promotion of requests. The UTC team and the owner of the request in this case are under double subordination - administrative (the head of the functional unit in which the team and the owner work) and functional (managers and employees of the UTC group and the request group within the innovation unit).

The advantages of a cross-functional structure are:

- improvement of management efficiency, quick decision-making within a certain field of activity, reduction of the management staff,
- flexible use of personnel, their knowledge and competencies,
- creating conditions for self-improvement,
- the ability to apply effective planning and management methods,
- the ability to work for the future in terms of creating new projects.

The disadvantages of a cross-functional framework are that it requires:

- highly qualified and responsible personnel,
- high requirements for communications.

Practice shows that such an organizational structure is most effective for working with employees with a high level of qualifications. This is one of the types of organizational structures in which the ideas of modern management approaches associated with the development of network and matrix structures for organizing processes, relying on the leadership of employees and empowering them in decision-making are most effectively embodied.

An important point in these management systems is that they practically do not change the organizational structures existing at enterprises, but only slightly supplement them, mainly in terms of new functionality of working employees and departments.

This structure does not provide for the creation of new staff units, since the carriers of the UTC and the owners of requests are already working in the organization. In the case of creation of control systems for UTC and requests, they are endowed with additional functionality. The UTC and Query group in the innovation division may also consist of existing employees who are assigned new functions.

The introduction of this organizational structure will allow:

- to raise the level of independence and responsibility of the TC teams, request owners and other participants in management systems to a certain level of decision-making;
- to combine the experience of project and functional managers;
- to establish an effective process of internal communications between various specialists;
- to reduce the amount of approvals required for decision-making;
- to eliminate duplication of functions;
- to create opportunities for the integration of existing UTC.

Our experience shows that the creation of these management systems in companies presents significant difficulties, since there are no specialists working in the field of UTC and requests for innovation. Companies need help with this work.

Attention should also be paid to the fact that UTC teams and owners of inquiries are the scientific and technical elite of the organization, talents, based on which it is possible to solve the issues of technological superiority and advanced development.

The work was carried out under the grant "Development of fundamental basis and scientific and methodological support for the management of creating new competences for modern Russian corporation of the machine-building industry and the formation of requests for competencies ", funded by the Russian Foundation for Basic Research (project number 20-010-00572 A).

CONCLUSION. SCIENTIFIC NOVELTY

Let us dwell on the conclusions of this study.

- They are developing towards each other, namely the market of problems and tasks and the market of technological competencies, including unique technological competencies that solve the problems and tasks facing consumers

- It has been established that the essential basis, the inner content of the centers of global excellence and centers of global competitiveness are the unique technological competencies of teams of specialists, the creation and development of which occurs on the basis of solving non-standard problems and tasks
- New objects of research and management have been formulated in the form of unique technological competencies and requests for external innovations, as well as subjects of management in the form of UTK teams and request owners
- The place and role in the innovation process has been determined
 - technological competencies in the following sequence: knowledge - competencies - technologies - products - market
 - problems, tasks and requests for innovation in the following sequence: problems and tasks - technical requirements - requests for innovation - procurement of innovations
- The concept of "unique technological competencies of a team of specialists" has been formulated in contrast to the concept of "key competencies of a company", which, in accordance with the conclusions of the authors of this study, are the sum of the competences of teams working in the company.
- Formulated the concept of "requests for external innovation", which are based on existing scientific and technical problems and promising tasks
- Identified new opportunities for commercialization and diversification based on the use of UTC, which are implemented by creating and launching new products and providing services for the execution of external orders, and based on requests for external innovations, as a tool for solving existing problems and tasks, attracting external technological competencies into the organization, as well as the purchase of innovative companies
- The need for the creation and development of management systems in organizations for new objects and management subjects in the form of the UTC, commands of the UTC, requests for external innovations and their owners, which ensure their more effective use in matters of commercialization and diversification, is proposed, a variant of the most effective organizational and functional structure as a cross-functional model
- A proposal was made on the feasibility of introducing new criteria for assessing the level of technological development of companies, universities, scientific organizations, start-ups and other subjects of the innovation sphere by the presence of centers of global excellence and centers of global competitiveness
- A comparative analysis of the concepts of "technology" and "technological competency" was carried out, as a result of which the differences existing between them were formulated and their interdependence was established, in accordance with which technology is a derivative of competency.

REFERENCES

1. Michael Porter. Competitive strategy. Methodology for analyzing competitors' industries. - Moscow: Alpina Publisher, 2011. – 454 p.
2. Gary Hamel, Prahalad KK Competing for the Future. Building the markets of tomorrow. - M.: Olymp-business, 2002. – ISBN 5-901028-26-0.
3. Chan Kim, Renee Mauborgne. Blue ocean strategy. How to create a free market niche and stop being afraid of competitors. M.: Alpina Publisher, 2016.
4. Diversification, competencies, problems and tasks. New opportunities / S.V. Chemezov, N.A. Volobuev, Yu.N. Koptev, A.I. Kashirin // Innovations. - 2017. - No. 4 (222). - pp 3–27.
5. Modern approach to competence management in high-tech corporations / A.I. Kashirin, A.S. Semenov, V.V. Strenalyuk // Bulletin of the Academy of Military Sciences. - 2016. - No. 4. - pp 104-111.