Diversification mechanisms and their effectiveness

A. Kashirin[1*], *P.* Kashirin[1], and *A.* Semenov[1]

[1]Peoples' Friendship University of Russia (RUDN University), 6, Miklukho-Maklaya str., 117198 Moscow, Russian Federation

Abstract. The work is devoted to finding effective mechanisms for the implementation of diversification and commercialization in large companies. World practice outlines that big are quite actively use the purchase (mergers and acquisitions) of other companies as a powerful diversification tool. Mergers and acquisitions allow companies - buyers quickly increasing the number of new products and services in their portfolio. This mechanism is used in the military and civilian sectors simultaneously. Boeing, Northrop Grumman, Raytheon Corp., Intel, Google, NEC and others are constantly buying third-party companies and sell their own assets. Based on the analysis of domestic and foreign experience in this area, it is concluded that, among currently used, the most optimal diversification mechanisms are the purchase of innovative companies, the involvement of external teams in the organization. Also among these mechanisms are buying the specialists with innovative technological competencies, the acquisition (purchase) of external innovative technologies and competences. Keywords: innovations, diversification, competence, industry, business

1 Introduction

Diversification of large companies is always on the agenda, since the optimal level of diversification ensures sustainable business development.

In this regard, it seems interesting to consider the existing diversification mechanisms, assess their effectiveness and propose new mechanisms for business development in different directions [1,2].

2 Methods

At first example of the world's experience and methods we can see US Pentagon's Strategic Investment and Innovation Initiative, which consists of three main issues:

1. A high technology has civil, military and, possibly, criminal application.
2. No separation is present for civilian and military sectors, the entire science and technology work for the country's security as a unique thing.

* Corresponding author: alexkashirin@mail.ru

3. In military programs civilian companies such as Google, IBM, and most importantly universities and start-ups, must be involved.

World practice outlines that big are quite actively use the purchase (mergers and acquisitions) of other companies as a diversification tool. Mergers and acquisitions allow companies - buyers to quickly increase the number of new products and services in portfolio. This mechanism is used in the military and civilian sectors simultaneously. Boeing, Northrop Grumman, Raytheon Corp., MBDA Missile Systems and others are constantly buying third-party companies and sell their own assets.

Consider a case. Raytheon Corp. completed acquisitions of E-System, Texas Instruments, Hughes Aircraft for a total of $ 14 billion, as a result of which it acquired 16 new competencies and expanded its product line. Lockheed Martin bought SIM Industries in 2011, opening a new line of business in the form of civilian weapons. In the same year, General Dynamics acquired Vangent, a medical IT systems company. L3 Communications acquired Thales Training and acquired a new line of business in the form of simulators and simulators. According to a survey conducted by KPMG in 2011, more than 60% of defense companies in the United States planned to acquire new companies in the near future, and 10% to sell their assets.

Facts show that large international companies in order to ensure their own global competitiveness and sustainable development, are forced to diversify their business in different areas of application, in different markets. Diversification is aimed at reducing the risks of business development.

The business model and the accumulated experience of 3M are of exceptional interest in terms of original approaches to diversification. The company's business is based on 47 "technology platforms", on the basis of which innovative products are created in various fields of application. The number of products launched by the company during its existence amounted to more than 55 thousand, that is, on average, more than 1000 for each technology.

To understand the "kitchen" of the company's activities, we will give a specific example. In the 1950s, the company mastered the production of thermal copy machines for creating color images, for what 3M spent three years and $ 1 million developing. For several decades, the company remained the only leader in this market. Then other companies began to produce copiers and 3M left the market. But the technological platform was not closed and in 1964 the technology "micro-replication" appeared.

The essence of the technology described was to apply three-dimensional high-precision cuts, which radically, depending on the shape and number of cuts per millimeter or even nanometer, change the properties of materials. Initially, micro-replication was intended for the lenses production in different projectors, on its basis the technology for the production of reflective materials and diamond films was created. A line of films for mobile displays, LCD monitors and television sets was created. They not only provide high definition and brightness of the image, but also consume less power than cathode ray tubes. Thermal copying technology is still alive today and pays economical dividends. For example, it is used in healthcare in the creation of patches with microscopic needles for painless injection.

This technology is a vivid example of how, after the end of the product's life cycle, its technological platform does not die, but becomes the basis for a new product.

An important strategic direction of the company's activity is the integration of existing technological platforms to create innovative products that surpass world analogues in terms of technical characteristics and consumer properties.

A good example of such an innovative product, in which several of the company's technology platforms were involved, is the high-voltage transmission cable.

It can be seen from the diagram that when creating a new generation cable, 3M used 5 of its own technology platforms, which indicates good internal corporate communications of the company's specialists and the integration of technologies.

The 3M company finds applications for technical developments in various fields and, accordingly, more actively develops those technologies that provide opportunities for creating products in different markets. The main slogan of the 3M company is: "We do only what no one else but 3M can do"

A similar approach is practiced by the DuPont company. Consolidation, internal integration of various technology platforms in materials science, chemistry, biology, and engineering creates a synergistic effect and ensures the development of new types of products in energy, food and other areas.

The above diagrams and figures clearly show that the experience of building and managing technology platforms at 3M and DuPont provides a high level of diversification and sustainable development.

The Institute of Chemical Physics of the USSR Academy of Sciences (IChF) is a striking domestic example of the implementation of diversification in the scientific field, which was subsequently implemented in the industry of different countries of the world. According to the definition of the first director of the institute N.N. Semenov, three times Hero of Socialist Labor of the USSR, Nobel Prize Laureate, "chemical physics is a science that describes the foundations of chemical transformations and related issues of the structure of matter." The formulation itself contains an indication of the all-encompassing nature of this direction of science.

In the course of development at the IChF, two central scientific directions were formed:

- thermally activated reactions
- chain and branched-chain reactions and their applications to combustion and explosion processes, as well as to nuclear fission reactions.

These directions laid the foundation for a number of derived areas of research, which are presented in the figure 1.

The diagram shows how, on the basis of the basic scientific directions of the IChF, new additional areas of research were formed, as a result of which many new products and technological processes were created in various fields of application.

In this work, we will dwell in more detail on the results of the development of the technology of self-propagating high-temperature synthesis (SHS-process), which is a special type of combustion of solids. It was called "solid flame" (without the formation of gases), since the initial reagents and end products of the reaction, even at very high temperatures of this process, remained in a solid state. As a result of such combustion, a large amount (more than a thousand) of valuable substances and materials were obtained, which have various applications in almost all industries. In mechanical engineering, these are abrasives, hard alloys and tool materials, in metallurgy there are refractory compounds and ferroalloys, in electrical engineering and electronics there are high-temperature superconducting ceramics (HTSC) and high-thermal conductivity ceramic materials, adhesives, sealants and heating elements, in medicine there is a new class of implants based on alloys exhibiting the so-called shape memory effect. The advantages of SHS in the creation of valuable materials in comparison with traditional furnace technologies are obvious. The synthesis process itself takes place in a few seconds (instead of hours), without the use of external energy sources. At the same time, the technology is greatly simplified and there is no need for complex and expensive equipment.

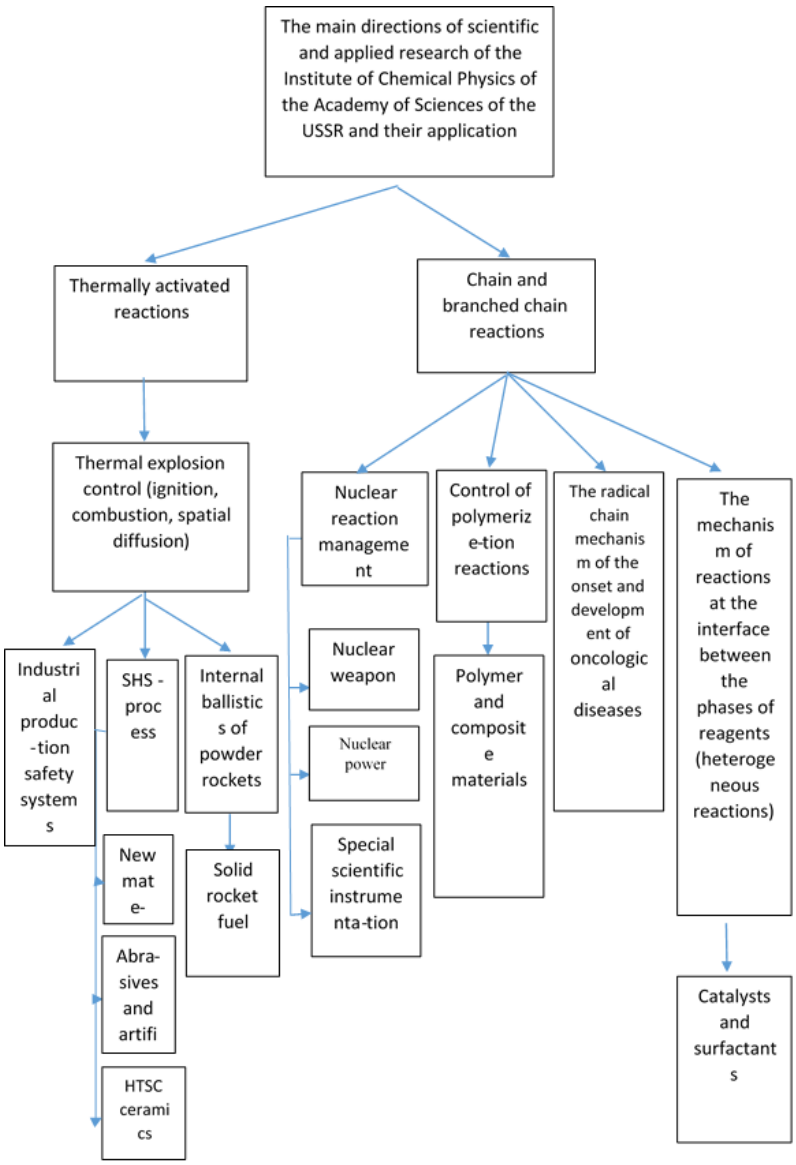

Fig. 1. Areas of research as derivatives of scientific areas of the Institute of Chemical Physics of the Academy of Sciences of the USSR (Designed by the authors).

3 Results

The analysis by the authors has shown that diversification is a derivative of commercialization. These mechanisms have different goals, but they are strongly interconnected.

The goal of diversification is to ensure business sustainability through the development, production and sale of various types of competitive products / services sold in different markets.

The purpose of commercialization is the creation and launch of specific competitive products / services on the market based on our own or external development, technology,

and competence. Thus, the more areas of commercialization there are, the more diversified the company's activities will be.

In this regard, a question arises. And what objects of innovation are the most effective in terms of commercialization? Actually, this study is aimed at determining the most effective objects for commercialization, based on the available internal resources of enterprises and external capabilities. To determine these objects, consider the entire innovation cycle.

Analysis of modern markets shows that all objects of the innovation cycle are being bought: from idea to business (company). At the same time, it should be noted that the price of these objects on the market grows depending on the stage at which the object is located. This is clearly illustrated in the graph below.

The economics shows that the price (investment, capitalization) grows along with the stage of development of innovations, while at the same time the risks of investments and investments decrease. The most expensive on the market are finished products (works, services) and ready-made businesses (operating companies). Thus, if an enterprise starts working at the “idea” stage in order to develop a product and sell it on the market, it means that the path to the market will be long, and the risks of not entering the market are high.

At the same time, it is obvious that, in addition to products and businesses, the market also sells ideas, patents, technologies, services for R&D, R&D. It is important to note here that companies act as both sellers and buyers at the same time.

In this regard, the management of organizations, depending on the strategic development goals, areas of activity, available resources, the effectiveness of the mechanisms used, as well as other factors, need to select priority areas of commercialization and diversification, which reflect specific objects of sale and purchase by stages of the innovation cycle.

Let us dwell on a brief analysis of the mechanisms currently used by organizations for commercialization and diversification, carried out by the authors on the basis of existing practice. In the presented analysis, the target objects of the study are large companies, among which the authors include organizations of the Russian machine-building industry. Based on the results of the analysis, it is planned to formulate recommendations for the heads of Russian machine-building industry enterprises on priority areas of commercialization and diversification.

The analysis examines the objects of the innovation cycle from the point of view of the efficiency of their commercialization in order to diversify large companies in three main directions: purchase, sale, development of objects of the innovation cycle of early stages to the level of innovative products / services and their introduction to the market.

Efficiency criteria in this case are understood as the accelerated growth in the volume of new types of innovative products, short implementation times for individual projects, the optimal parameters of the invested resources (financial, material, organizational, human) and their quick return. At the same time, only those objects of the innovation cycle that create new market opportunities are considered, and objects of the early stages (ideas, research and development, research and development) that create new knowledge and products for the modernization of existing products are not taken into account.

Let us dwell on the objects of research and their potential efficiency in terms of commercialization, taking into account the above approach.

Idea. Selling an idea is very difficult, and its price on the market, if sold, is very low. Currently, there are isolated examples of selling ideas. For example, brokerage company Innocentive is looking for ideas to solve problems faced by various organizations with their orders. Especially for this, a corporate community, distributed all over the world, has been created, the so-called "solvers", who are the first to receive requests for an idea. The price of the idea, which was accepted by the organization - customer, costs 5-50 thousand US

dollars. This example indicates that it is possible to buy an idea, but it is difficult, because first you need to decide on the problems, you need to solve and form a mechanism for finding the necessary ideas, the costs of which are unlikely to pay off. As you know, creating a new product based on an idea is a long and risky process. So, the idea cannot be considered as an object, the commercialization of which is capable of ensuring the achievement of the criteria of the effectiveness of commercialization and diversification adopted in this study.

R&D The sale (execution) of R&D and R&D for third-party customers seems to be relatively promising, since in this case the competencies of design and technological departments are used and an additional source of income appears. The purchase of external and the development of own R&D and R&D for the purpose of their subsequent commercialization is possible, but hardly advisable, based on the accepted efficiency criteria, due to the long terms of product creation and its launching to the market and high risks. In addition, the creation of new, non-core products for the organization, without the presence of the necessary competencies, and their promotion to a competitive market often leads to problems associated with the low competitiveness of such products, low sales and often the loss of investment. Suffice it to recall the "conversion" problems of the 1990s. So, R&D can be viewed as a possible way to diversify the company in terms of organizing their implementation (sales) for third-party customers. However, to consider this area of activity as one of the main in terms of diversification, perhaps, most likely only for research institutes and design bureaus.

Patents and licenses (IP). Practice shows that this mechanism does not and is unlikely to give a noticeable economic effect, since the price for patent or license is extremely low in comparison with income from the sale of innovative products or businesses. Numerous attempts to create IP management systems in organizations have not yielded any significant results in terms of income growth. The purchase of licenses, as well as the use of our own IP, patents for the purpose of creating new products based on them and bringing them to the market are associated with the same disadvantages that relate to R&D case. The use of IP, as the main objects for solving the problems of accelerated diversification is not effective.

Technology. The purchase of external technologies associated with the production of globally competitive goods, for example, within the framework of the approaches of "localization of production", "franchising", "import substitution", testify to the high efficiency of their use. Selling proprietary technologies on the market is fraught with significant difficulties both on the part of the seller and the buyer. The technology can be "product", that is, the technology for the production of a specific product, and "process", that is, the technology of a specific process, for example, hardening, painting. An important point for buying and selling a technology is its novelty and uniqueness. Sellers are actively selling innovative products, but they are in no hurry to sell the new technologies on the basis of which they are created. Buyers, on the other hand, are willing to buy new technologies and have little interest in outdated ones. Therefore, by selling new technology, an organization creates competitors for itself either in the production and sale of innovative products on the market, or in the provision of new services. In addition, the revenue from the sale of technology is also low compared to the revenue from the sale of innovative products or businesses. In this regard, the sale and commercialization of our own technologies does not and is unlikely to give a noticeable economic effect. The failure of repeated attempts to develop technology transfer centers confirms this. Conclusion. The acquisition of external modern technologies for the production of globally competitive products is of interest from the point of view of increasing the level of diversification of organizations, however, each time one should carefully research the market and the conditions under which the technology will be used.

Competencies and companies (business). As world experience shows, the attraction (purchase) of external teams of specialists with innovative competencies or the purchase of innovative companies (mergers and acquisitions) that have innovative competencies demonstrate high efficiency. Just look at the world's leading high-tech corporations, which thus create new products / services and diversify. In Russia, these mechanisms are used, but not enough, although the potential for diversification here seems to be one of the most significant. Therefore, these mechanisms should be used more widely, and favorable economic and legal conditions should be created for these processes.

As practice shows, the high cost of M&A transactions is offset by a quick effect on diversification issues, since the acquired company is already producing a marketable product.

As for the sale of its own competencies available in the organization, the analysis shows that competencies (knowledge, skills, skills of specific specialists) are not directly sold, since the competencies themselves do not exist without specialists who possess them. Such specialists will leave the organization and these competencies will leave with them. This circumstance once again confirms the well-established opinion that it is necessary for valuable personnel with innovative competencies to create favorable conditions, that is, to motivate them to reveal their potential in the more effective use of their competencies within the organization. Using innovative competencies to create new products in new markets and services to fulfill third-party orders seems to be a very effective mechanism for diversification.

4 Conclusion

Buying innovative companies, attracting external teams to the organization, as well as more efficient use of their own teams with innovative competencies seem to be the fastest and most effective ways to diversify. Here it is necessary to pay attention to the fact that when buying an innovative company, an organization buys its existing competencies and the entire previous path that it has gone from idea to product and market. By attracting competent teams, the organization gains all the experience in creating and launching innovative products on the market, which this team has accumulated earlier. Harnessing the potential of our own competent teams to create innovative products and provide services to external customers opens up new opportunities for commercialization and diversification. In this regard, it is important that both competences and companies are at the stages of actual presence in the market, which minimizes the risks of implementing these projects.

Acknowledgments

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).

References

1. Journal of Contemporary Issues in Business and Government **26(1)**, 205-216 (2021) doi: 10.47750/cibg.2020.26.01.026
2. Journal of Contemporary Issues in Business and Government **26(1)**, 200-204 (2021) doi: 10.47750/cibg.2020.26.01.025