Journal of Contemporary Issues in Business and Government Vol. 26, No. 1, 2020
https://cibg.org.au/

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2020.26.01.025

On new mechanisms for the formation of technological superiority in modern conditions of innovative development

OSTROVSKAYA A.A.[1], STRENALYUK V.V.[1], SEMENOV A.S.[1]

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

Abstract: The study of trends in the development of the world economy showed the importance of innovations. In modern conditions of increasing competition in the high-tech markets, the role of management approaches and mechanisms used by players in these markets for a successful competitive struggle is increasing. The methods and approaches developed in the framework of strategic marketing have not lost their relevance at the present time. This paper shows the principal approach to reach the excellence in innovation development. World experience is presented in this work in the way to search the solution. Outsourcing approach is shown as a primary method of technology advance achievement.

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

INTRODUCTION

In modern conditions of increasing competition in the high-tech markets, the role of management approaches and mechanisms used by players in these markets for a successful competitive struggle is increasing. The well-known works of M. Porter,G. Hamel and Prahalad, Tracy and Wiersem, W. Chan Kim and Rene Maubornwere the methodological basis for solving the problems of developing competitivestrategies and gaining market leadership [1-7]. The methods and approaches developed in the framework of strategic marketing have not lost their relevance at the present time.

At the same time, today in science-intensive sectors of the economy, in order to achieve leadership positions, along with the development and implementation of a competitive strategy, the role of the factor of technological superiority is increasing. All market participants have to deal with the fact of technological superiority in terms of the key characteristics of the product, even in conditions of sanctions and political pressure. This factor is of particular importance for defense products. These circumstances lead to the need to develop and systematically apply new mechanisms for managing technological superiority. In a highly competitive environment, businesses need to build permanent system of innovation reproduction, which ensures the innovative and technological development of the company itself, its divisions, employees, as well as equipment and even cooperation partners. Superiority is the possession of characteristics inaccessible to the opponent. Technological superiority is based on the possession of a combination of technological advantages unattainable by others. Consequently, technological superiority is based on anticipating technological development. In turn, anticipating technological development is based on the accumulation of technological knowledge to predict technological development. Technological superiority is the ability to advance technological development sustainably.

Advanced business development (strategy) is the planned phased development of the company, aimed at constant (long-term) outstripping competitors, each stage of which:

- is aimed at achieving a global technological and / or market superiority by the company in terms of key characteristics of a product or its production technology, which, in turn,
- is a base (milestone, springboard) for the next such stage and provides a competitive advantage due to the lack of this base among competitors.

At the same time, three stages can be distinguished in achieving technological superiority:

- technological breakthrough,
- technological gap,
- the actual formation of technological superiority.

The approach implemented by Tesla Motors - Tesla Energy - SpaceX can be cited as an illustrative example of a strategy for systematic long-term outstripping of competitors. Let us briefly consider a fragment of the strategic concept and the consistent formation of the advanced technological superiority of the Ilona Mask group of companies.

The transition of personal vehicles to environmentally friendly solutions has become an urgent challenge of the time. Electric drive was chosen as the technology of such a solution. The use of an electric drive in a car led to the acquisition of new properties (for example, sports dynamics) and formed new requirements for AB units, ensuring their fire safety and for solar panels. The use of an electric drive instead of the internal combustion engine and transmission requiring lubricating oils enabled (ultimately) the elimination of regular maintenance, long machine life and a low cost of ownership. Together with full autopilot, this will allow you to benefit completely and unattainably from the cost price for offering taxi services and practically conquer this entire market. In turn, with more than a million vehicles in real operation on the roads of the world, the company can use an unprecedented training base of road situations for deep learning of the autopilot neural network. To provide information traffic, SpaceX is using a high-speed Internet system with a low cost and the largest coverage area. At the same time, a system for delivering goods to orbit with a minimum cost (due to reusable carriers) and a commercial Internet access network are being built and debugged. At the same time, related innovative businesses are being created for home and industrial storage systems for electricity, roofs with solar panels, etc. We are seeing the implementation of the principle that each technological achievement of the company, which in itself represents a breakthrough innovation and scientific and technical superiority, is used as a competitive advantage for further systematically outstripping potential competitors.

To use this experience for domestic enterprises, it is necessary to develop new methods and mechanisms for managing advanced innovative development, to build a complex of control systems for these mechanisms. Figure 1 shows a proposed scheme for managing advanced innovation and technological excellence. In addition to the well-known, traditional mechanisms of innovative development, including open innovation mechanisms, it is proposed to use three new mechanisms with appropriate management systems:

- management of unique technological competencies that form the basis of the technological superiority of knowledge-intensive enterprises;
- management of scientific and technological cooperation based on requests for external innovations;
- modern management of solving scientific and technical problems and tasks.

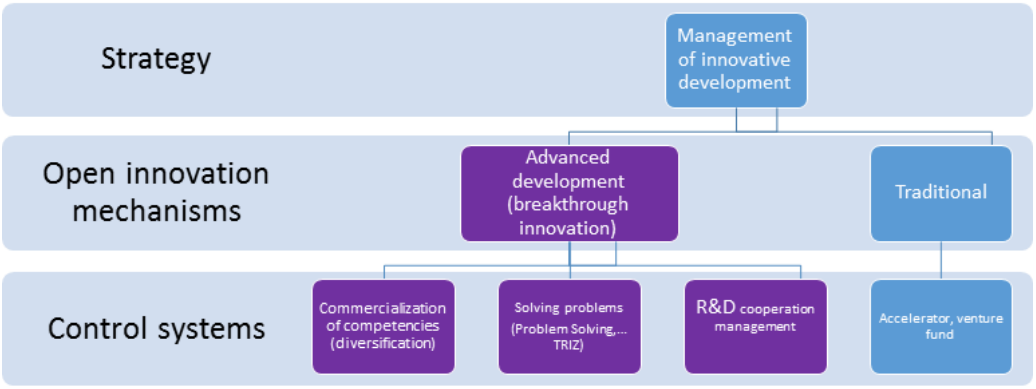

Fig.1: Management of advanced innovative development and technological superiority

Each of these mechanisms should include an appropriate management system, including:

- Regulatory documents (organizational structure, business processes, functional responsibilities of employees, key performance indicators, decision-making system, regulations);
- Techniques of innovative development;
- Training of specialists (teaching materials and technical seminars);
- Motivation;
- Measures for the implementation of the management system.

The issues of organizing the management of unique technological competencies are considered in works [8, 9, 10].

In this work, we will dwell in more detail on organizational issues by solving scientific and technical problems and tasks by attracting external competencies for this purpose, i.e. on a system for managing requests for external innovation.

A modern competitive product is characterized by versatility and complexity, which is provided by a large number of elements, each of which includes several levels of innovation in various subject areas and technologies. The development and support of such products requires the interaction of a large (and changing) number of different technology competencies, developing in parallel, which cannot be combined within a single company. This leads to the need for the formation of network structures of cooperation of various depth and duration of cooperation, embodying the paradigm of open innovation. At the same time, the issues of requirements management (system engineering), the choice of a solution and a "solver", contracting, etc., arise.

The transfer of solutions to scientific and technical problems and tasks to external performers is one of the types of outsourcing, which has become widespread due to the development of science and technology, the division of labor and the deepening of the specialization of activities.

There are various definitions of outsourcing in the scientific literature. Often, outsourcing is understood as the transfer by an organization, on the basis of an agreement, of certain types or functions of production and business activities to another company operating in the required area. However, recently the definition of the International Association of Outsourcing Professionals (IAOP) has become more widespread, in which outsourcing is generally interpreted as a long-term and result-oriented business cooperation with an external specialized service provider [11].

For the purposes of this study, a generalized definition of outsourcing seems to be more acceptable, since, as will be seen further from the analysis, the relationship between the customer and the contractor is not limited to the service agreement, but can also take other forms of cooperation (partnership agreement, scientific and technical cooperation, joint research agreements, etc.).

In the early 1960 of the last century, outsourcing became widespread in the United States, and later spread throughout the world. According to available estimates, in the United States alone in 2017, the outsourcing services market was $ 88.9 billion, and in 2022 it will reach $ 140.3 billion. The bulk of American outsourcing services are carried out by India and the Philippines. It was expected that in 2018-2021 the geography of outsourcing from the United States will expand to include Bulgaria, Romania, Egypt, Mexico and Colombia [12].

In the literature, as a rule, Information Technology Outsourcing, Business Process Outsourcing and Knowledge Outsourcing or, as it is also called, Knowledge Process Outsourcing, are highlighted [13].

The global outsourcing services market is growing steadily and will soon reach $ 1 trillion dollars, of which about 60% is the IT outsourcing sector with a growth rate of 5% per year, more than 32% is business process outsourcing (7.5% growth per year), and more than 5% is the outsourcing of knowledge-intensive processes (more than 12% growth per year). [14] Knowledge outsourcing, in turn, is subdivided into a number of business operations (financial, investment, etc.), which includes R&D Outsourcing [15].

Outsourcing of R&D, in contrast to the contract (subcontracting) for the performance of R&D, involves the transfer of the function of research and development in a certain area on a long-term basis, aimed at continuously achieving new levels of key characteristics and maintaining competitiveness. This is a new, growing form of cooperation in the field of high technology production.

In the face of fierce market competition, outsourcing R&D is becoming a critical tool for maintaining competitiveness and maintaining technological and scientific superiority. Outsourcing allows you to:

- reduce production costs,
- reduce the time for R&D,
- avoid long-term investment in research and development,
- gain access to unique technological competencies (UTC), which are not currently available in the company.

In this research work, outsourcing is considered primarily from the point of view of gaining access to the UTC for solving scientific and technical problems and tasks.

R&D outsourcing began to develop actively at the end of the 20th century. Thus, in Germany, expenditures on external R&D increased from 3.9 billion marks in 1987 to 9.6 billion marks in 1997, and their share in the total expenditures of German firms on R&D increased from 9% to 15%, respectively. A similar trend was observed in the UK, where spending on external R&D grew at a pace that outstripped the growth in spending on internal R&D

[16]. The global R&D outsourcing market continues to expand and, according to existing estimates, between 2019 and 2023 it will grow at an annual rate of 8% [17].

The widespread use of R&D outsourcing has led to the fact that in many countries, research organizations began to specialize in the provision of this type of service. In Europe, the European Association of Research and Technology Organizations (EARTO) was established in 1999, bringing together 350 research organizations from 23 countries and 150,000 scientists and engineers specializing in a wide range of innovations. The services of the companies included in the Association are annually used by 100 thousand companies [18].

While outsourcing has been dynamically developing on the global market for over 30 years, in Russia and post-Soviet countries it began to take its first steps a little over 15 years ago. Outsourcing experts point to several reasons for this lag:

— the practice of using outdated approaches by Russian business: “if you want to do well, do it yourself”,

— priority of tactical, short-term business decisions, while outsourcing is a strategic decision and, as a rule, is of a long-term nature,

— lack of systematized professional knowledge and practical experience in outsourcing, lack of specialized business literature in Russian [19].

To this can also be added a high degree of monopolization and the absence of serious competition in the Russian market, which, in general, does not stimulate companies to introduce innovations, and, consequently, to use outsourcing as a strategic tool for achieving and maintaining competitive advantage.

Outsourcing requires close attention to management processes, especially if more than 15% of all R&D is being outsourced. [20] In practice, the apparent benefits often overshadow the complexity of outsourcing decision making and management, with the result that, with an average R&D outsourcing agreement of 7.53 years, 50% of agreements expire within 4 years [21]. This is mainly due to the fact that company leaders do not pay attention to outsourcing management issues, do not take into account possible risks, and they lack a strategic vision of R&D outsourcing as a way to maintain a competitive advantage in the market. Outsourcing can be effective only if it is based on an equal strategic partnership, when the parties are united by a common goal and act in accordance with a jointly developed plan, regardless of the form of possible cooperation.

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).

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