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MANAGEMENT MODEL FOR A SCIENCE INTENSIVE ENTERPRISE WITH A GAS TURBINE SCIENTIFIC RESEARCH AND PRODUCTION COMPLEX TAKEN AS AN EXAMPLE

Scientific research work is a complicated process of innovation ideas transformation into the economic relations object. An innovation idea introduction into practice at the science intensive enterprises leads to the new products development or to the existing products or technologies improvement.
Key words: *management, enterprise, innovations, globalization, scientific research, investments, new technologies.*

Introduction

A problem of science intensive production and scientific research work management appeared as a natural integration of two objectively existing and complementary activities, namely:

- economy globalization on the base of nonprice competition (as to products and services quality);
- spontaneous scientific and technical advance, priority growth rates of science intensive sector in the world economy.

These streams interlace and feed each other, which brought to global strategic innovation activity of transnational corporations.

Global companies' innovation practice analysis confirmed appropriateness of the technological management shifting to the area of scientific research management, necessity of the accumulated knowledge defending, its development scientific prognostication and the competitors' volume of information monitoring.

Scientific research activity at the enterprise sometimes has the aims, which in the great degree do not coincide with the finite aims of the production system whose aims are as follows: defending or enlarging of its sector of the market; penetration into the new market or a new market /sector of market creation.

A new product ultimate consumer in his turn estimates functioning, quality and cost of the product, that is a grade of satisfaction with the new product, and it is his feedback to the scientific research product. Scientific research work is a complicated process of innovation ideas transformation into the economic relations object. An innovation idea introduction into practice at the science intensive enterprises leads to the new products development or to the existing products or technologies improvement.

Scientific research work of a science intensive enterprise is a base for competitive advantage of an enterprise. Everyday practice of the global companies confirms the necessity of the science intensive industry restructuring, especially in the power industry of Ukraine.

The essence and results of the work

The tendency of scientific research work organization and management in the West European countries, in the USA and Japan [1, 4, 2, 3] is characterized, first of all, by fundamental research concentration mainly in the higher education institutions; secondly, by concentration of applied technology development at the industrial enterprises. The process intensifies with competition

aggravation at the markets. As a result, scientific research structures amalgamate with production systems.

Despite of scarce natural resources, in 1996 Japan, for example, could allocate $82 billion for scientific research compared to the USA ($180 billion) and Russia ($5.5 billion).

The data are given in recalculated in dollars national currency according to purchasing-power parity [5]. But the Japanese government is not the main source for scientific research work financing. The state investment constituted 21.7% of the whole sum, but with the civilized methods applied the extra-budgetary funds were attracted and constituted the greater part of investments. As a result, private firms gave the main part of investments (73%), the rest (5.2%) came from private higher schools, colleges, research institutions. The smallest sum was allocated by foreign customers (0.1%).

The next aspect is the scientific research executors. In Japan situation is as follows: 71% of research is conducted by the companies' laboratories, 14% are done by the higher schools and colleges, 5% are fulfilled by private Research institutions, and just 10% of the total research work volume is conducted by the state research institutions.

Though, such scientific personnel distribution by no means shows that the works are aimed at just pragmatic problems solving. Yearly up to 15% are allocated for fundamental research and it is understandable. The fundamental research demands expensive equipment, so they are expensive, and they are even risky sometimes. But everything is compensated by the highest output.

Advanced countries practice showed effectiveness of such organizational decisions in the field of research work, though its precise copying in Ukraine is problematic due to the following reasons:

- the main resource potential for new products serial production was traditionally formed in applied research institutions and academic scientific research institutes;
- applied research institutions privatization was conducted and has being conducted up till now without production enterprises including into the number of innovation consumers;
- situation at the Ukrainian enterprises and production firms shows no reason to suppose that they will be able to organize scientific research laboratories within their production structure at the near future.

The most effective means of innovation potential enlargement will be the centers of scientific research including into the science intensive production enterprises either as juridically independent innovation units or as a structural unit of an enterprise. In each case the innovation division should be optimum one.

Original model was created in the research and production complex "Zorya"-"Mashproekt" (Nikolaev city), in which a production structure and an innovation center are harmonically combined, whose main task is scientific research work conducting on the base of project management. The enterprise is a typical science intensive production system with a closed production cycle.

As a rule, scientific research is not the main aim for any production system. Its main task is profit-making. In the innovation structure "Scientific Research and Production Complex "Zorya"-"Mashproekt" (further – Innovation Center, IC) scientific research work becomes a linear production function. Its fulfillment has straight influence on the finite financial result of the whole science intensive production system. It is necessary to bear in mind when defining the types of reaction to the environment change, which is one of the main IC organizational structure principles.

Alongside with the main for IC innovation activity, production, competition and strategic planning should be present as the most important means of its activity.

The base of all kinds of activity is the innovation strategy of the production system as the most full and comprehensive plan of research and innovation.

Methods and means of IC organizational structure forming is oriented to the optimum combination of rights and responsibility of the offices in which innovations are being developed. It

allows strategic tasks fulfilling and special mechanisms of the personnel motivation application, which intensifies effectiveness of innovation activity [6].

When developing IC structure within the Scientific Research and Production Complex ”Zorya”-“Mashproekt” there were the following stages:

- innovational strategy of the production system development;
- IC variants of organizational strategy development;
- analysis of factors which influence effectiveness of variants, strategy and type of the organizational structure choosing;
- strategic directions of commercial activity choosing, zones of responsibility distributing.
- resources structuring, technological chains forming, their authority and responsibility level defining;
- the necessary functions defining which are necessary for the main structural units supporting, the functional services structuring;
- strategic responsibility distribution among the managers of different levels;
- accounting policy forming and a center of expenditures and analysis of financial activity organizing;
- administrative projects development aimed at the organizational structure realization and their support by the firm personnel;
- the structure realization, results analysis and correction;

The basic precondition consists of necessity to unite resource potential and strategic flexibility, based on the principle of effective cooperation, which is a characteristic feature of a science intensive enterprise.

Organizational structure of innovation center should guarantee effective functioning of two mutually complementary spheres of activity: strategic, aimed at the future potential development, and operational, for the present potential realization. A process of an innovation development is a discrete one; it constantly recommences and is oriented to the unstable, from the point of demand, market. Therefore, there are special requirements to the management system and to the organization structure of an innovation center. First of all, it is ability for adaptation to the constantly changing market of innovations without gaps in profits getting. It supposes effective and flexible management in the following directions as it is organized at the Research and Production Complex:

- strategic control of the “innovation-market” situation, which allows detecting the main spots of resources and capital concentration;
- project management system development, projects’ portfolio coordination and control according to the enterprise’s strategy and planned schedule;
- active innovation strategy constant support, which is characterized by predicting reaction to the customers of innovations requirements and also by the constant search for the new scientific ideas and perspective innovations;
- innovative management climate creation, that means constant search for anything new, cultivates “inside view”, expels ambitious projects, which demand own enormous capital investments;
- maximum decentralization of management powers with integrated connections preserving;

From the above mentioned it is clear that a subdivision oriented for a commercial innovation development can be organized as a mono-structure with integrated resource and muli-aspect management potential, which gives possibility to manage it as an integrated unit (Fig. 1).

At the Scientific Research and Production Complex the innovation center consists of five blocks:

- managerial subdivision of the innovation center, which organizes strategic development of the production system and compulsory checking of the existing potential conversion into profit;

- strategic directions block, developing innovations as goods for sale, it is also a center of profit;
- block of production and commercial structures, which do not bear strategic responsibility, but they are the centers of profit, having their own resources;
- block of matrix substructures of the projects, oriented to investigations aiming at scientific/technical groundwork creation and administrative projects fulfillment (for instance, automatic control systems and quality control systems development, etc.);
- block of subdivisions with support functions for technology processes, profit centers and project subdivisions (finances and accounting, personnel development, a general for the whole company quality control system, marketing support, engineering infrastructure maintaining).

The suggested structure contains technological chains as the centers of profit, servicing concrete activity directions.

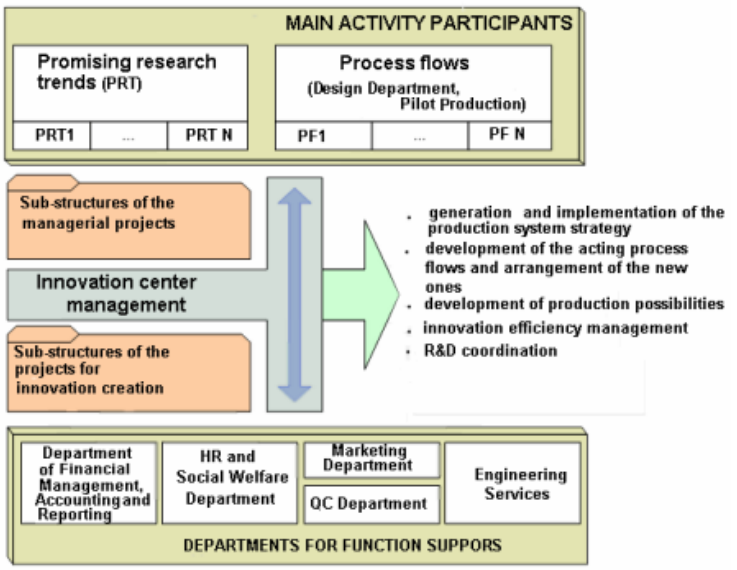

Fig.1. Innovation center organizational structure

The top-management functions in such company are as follows:

- adequate reaction of the innovation center to the strategic problems ensuring, aims and tasks formulation;
- strategic number of structures formation which play the part of financial responsibility centers (FRC), these structures balancing for strategic flexibility of the company ensuring;
- strategic resources of the company distribution, including finances redistribution among FRC;
- functions and structures development, ensuring FRC effectiveness;
- results of FRC activity integration for the benefit of an enterprise;
- existing FRC control for its potential into the profit conversion.

Technology chain management in the above structure stipulates the following strategic and operative functions:

- search for new markets and development of already existing ones for introducing innovations there;
- strategic plans of the innovation center activity development;
- new products creation process direct management;
- disposal of material, labor and financial resources of the innovation center;
- full responsibility for quality and terms of the innovations introduction;
- planned financial results, got from the innovation center activity ensuring.

It is necessary to underline, that one of the most important components of the innovation center activity is a search for new technological decisions, which are far off the innovation centers interests. Such kind of activity creates a scientific and technical backlog for the science intensive production system, broadens its potential market and resources.

As a rule, the mentioned activity does not bring the straight commercial result and is fulfilled at the expense of the innovation center itself. According to the adopted terminology, such activity is “an oriented to research activity” and it should be conducted for a concrete strategic task fulfillment.

Research and development functions should be concentrated in the matrix substructures of a project. The activity results could be transferred from the innovation center to one of the functioning technological chains for a specific market searching and the innovation commercialization.

A new technological chain creation can be another variant of activity on the base of matrix substructures of a project. Both methods are used in the model applied at the gas turbine research and production complex "Zorya"-"Mashproekt".

Conclusion

Science intensive enterprises formation which have innovation centers in their structure, is a result of technology evolution, when ever-growing expenditures for science demanded creation of closed-loop production cycles, which can guarantee refunding of investments for research work intensifying and education improvement.

Besides, investigations showed functional connection between investments into science development and scientific/technical level of production. Science intensive production profitability is always higher than in the industry branches with conservative way of development.

Discussed above model of an innovation center introduced at a large science intensive enterprise, showed its efficiency in the field of information and resource exchange between the structures of the Complex and recommended itself as the most optimum management instrument for new products and services creation.

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МОДЕЛЬ УПРАВЛЕНИЯ НАУКОЕМКИМ ПРЕДПРИЯТИЕМ НА ПРИМЕРЕ НАУЧНО-ПРОИЗВОДСТВЕННОГО КОМПЛЕКСА ГАЗОТУРБОСТРОЕНИЯ

Научно-производственная деятельность представляет собой сложный процесс трансформации инновационных идей в объект экономических отношений. Практическое использование инновационной идеи наукоёмкими предприятиями приводит к созданию новых или улучшенных изделий и технологий.

Ключевые слова: *управление, предприятие, инновации, глобализация, научные исследования, инвестиции, новые технологии.*

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МОДЕЛЬ КЕРУВАННЯ НАУКОЄМНИМ ПІДПРИЄМСТВОМ НА ПРИКЛАДІ НАУКОВО-ВИРОБНИЧОГО КОМПЛЕКСУ ГАЗОТУРБОБУДУВАННЯ

Науково-виробнича діяльність є складним процесом трансформації інноваційних ідей в об'єкт економічних відносин. Практичне використання інноваційної ідеї наукоємним підприємством веде до створення нових або вдосконалення існуючих виробів і технологій.

Ключові слова: *управління, підприємство, інновації, глобалізація, наукові дослідження, інвестиції, нові технології.*