Methods for managing integration and innovation processes in large and small enterprises

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Abstract. The purpose of this paper is to develop practical recommendations for managing the innovation activities of small and large enterprises in the face of increasing competition. As a result of the study, the peculiarities of managing the innovation activity of a small manufacturing enterprise based on the application of the diffusion of innovation method for such management functions as management, production, marketing, and human resources have been identified and generalized. A mechanism has been developed to implement the scientific and technical policy of small manufacturing enterprises, the key feature of which is the possibility of introducing innovations. An algorithm for the formation of the most optimal program for the innovative development of a small manufacturing enterprise is proposed, within the framework of which the innovation process is proposed to be considered in the form of logically indivisible organizational, managerial and technological operations, taking into account the assessment of the size and form of the required resource support for each operation, as well as its economic efficiency. As a result of the study, a technique was obtained that allows determining the most optimal program of innovative development based on the analysis and comparison of their necessary resource support and economic effect from implementation.

1 Introduction

The development, analysis and application of new, effective methods of innovation management plays a decisive role in achieving the goals of economic development of enterprises. In current market conditions, the advantage remains for small enterprises that are open to innovation, which allow them to significantly increase the efficiency of business management.

To achieve the goals of modernization of the Russian economy related to the transition to an innovative type of development, it is necessary to transform existing institutional forms and structures for managing innovative activities of enterprises. The development of new organizational forms for the implementation of innovative activities should become a

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priority in the economic practice of enterprises and include a transition to the organization of R&D on business processes with their further isolation [1].

The innovative development of an enterprise is traditionally described as a transition from one state to another. A transition is a change in the economic system of an enterprise that needs to be managed. One of the relevant forms of innovation management is organizational development in the field of innovation through outsourcing.

2 Materials and Methods

Increasing competition, a dynamic and uncertain market environment necessitate the search and implementation of innovatively oriented tools for managing economic systems in order to adapt enterprises to external and internal economic conditions. In this context, the reserves of the integration interaction of Russian enterprises are especially important. Outsourcing is one of the alternatives to traditional management methods. One of the modern tools for developing and improving institutional forms, structures and systems for managing innovative activities is the method of business process reengineering (Figure 1).

Fig. 1. Innovation management based on business process reengineering.

When using the business process reengineering method, there is a need to study changes in individual elements of the innovation management system in conjunction with the distribution of the stages of the innovation process between the customer and outsourcers [2]. For this purpose, a three-dimensional model is proposed (Figure 2), which reflects the change in the subsystems for managing the customer enterprise in the process of outsourcing and reveals the sequence of stages of the innovation process for the conditions of a particular enterprise.

Fig. 2. Three-dimensional model for studying changes in the system of innovation management of small and large enterprises.

In this model, the *XOY* plane characterizes the operations and activities carried out as part of the reengineering of innovative activities in the subsystems of the customer enterprise.

The *XOZ* plane displays the operations and activities related to the transfer of the stages of the innovation process to outside organizations (outsourcers).

The *YOZ* plane shows a new structure of internal and external interconnections between the subjects of the innovation process implemented on the basis of scientific and technical outsourcing.

The proposed model provides the opportunity for the rational management of innovation in the implementation of scientific and technical outsourcing by enterprises:

- in determining the functions, tasks and structure of elements of the innovation management system;
- in improving the principles and methods of scientific and technical outsourcing;
- in the development of technologies for managing the innovative potential of enterprises, as well as increasing the level of their innovative activity.

The paper shows the use of outsourcing as the basis for the formation of network organizational structures for the implementation of the innovation process, when the customer company forms a pool of developers in the field of innovation (research network).

The organization of the innovation process based on the method of reengineering business processes forms the prerequisites for accelerating and increasing the efficiency of innovative development of small enterprises through the combination of science and production [3].

3 Results

In order to implement a systematic approach to the study of the processes of managing the innovation activity of the customer enterprise based on the reengineering of business

processes, innovation activity is presented in separate stages, for which the following sequence of actions has been performed:

- the process of implementing innovative projects is divided into separate operations in the form of unambiguous, homogeneous and logically indivisible parts;
- operations are coordinated in order to ensure their strict consistency and progression;
- individual operations are grouped in stages so that a specific commercial product appears at the end of each stage, which has material and cost indicators that increase the liquidity of the innovation project.

As a result of the proposed procedure, it becomes possible to create a linear implementation plan for the realization of innovative projects. Thus, obtained implementation plan allows accurately determining the boundaries of the implementation of each stage.

Since in such a model for the development of innovative projects, each of the operations is an unambiguous, homogeneous, and logically indivisible part of the process, the execution of any operation involves attracting a resource of a certain functional orientation. To perform all possible operations, four such resources have been allocated: informational, organizational, material, and legal [4].

Reengineering of business processes in the field of innovation by outsourcing this line of business is carried out according to the criterion of optimizing the costs of the customer enterprise, but using outsourcers requires the introduction of measures to ensure legal information security in relations with them.

The universal sequence of operations is presented in the form of a chain of stages, such as: the birth of the idea of innovation - basic and applied research - design development - marketing - production - sales.

Thus, the implementation plan of the realization of innovative projects can be presented in two-dimensional form as a matrix for the decomposition of the processes of implementing innovative projects (formula 1).

The vertical of this matrix reflects the sequence of implementation of the stages of the innovation project, and the horizontal - the sum of investments (costs) in attracting each type of resource. As a result of applying this approach, it becomes possible to separate managerial and executive functions of participants in the innovation process, and to form new forms of cooperation between the customer and outsourcers in the implementation of projects in the field of innovation.

$$D = \sum d_{1.1}, d_{1.2}, \dots d_{1.i}; d_{2.1}, d_{2.2}, \dots d_{2.i}; d_{n.1}, d_{n.2}, \dots d_{j.i}, \quad (1)$$

where d_{ji} – the value of costs (investments) in attracting the i -th type of resources at the j -th stage of the implementation of an innovative project.

The indicator characterizing the effectiveness of changes in the structure and functions of managing the innovation activity of the customer enterprise is presented in the form of the formula:

$$P_m = E_f / \sum I_i \quad (2)$$

where E_f – the economic effect of the implementation of an innovative project based on the use of scientific and technical outsourcing;

I_i – the total amount of costs (investments) at the i -th stage of the implementation of the innovation project;

i – stage number (subprocess) of the innovation project, $i = 1 \dots k$.

Thus, the construction of a decomposition matrix for the process of implementing innovative projects allows:

- seeing that the process of managing innovative projects is not homogeneous and monolithic, but consists of sequential and parallel subprocesses, which should be divided into main and service ones;
- managing both the process as a whole and its individual subprocesses;
- understanding that each subprocess makes it possible to attract certain special resources and narrowly specialized specialists to a project in a specific time interval (t);
- presenting the process in the form of sequentially attracted resources, necessary and sufficient to perform specific operations, which makes network planning possible.

As shown by the study of the structure of innovation management of small manufacturing enterprises, the quality of resource support is one of the key aspects of the efficiency of reengineering of innovative processes [5].

It is possible to present the formation of the most optimal program for innovative development of a small manufacturing enterprise based on the application of business process reengineering in the form of the following algorithm (Figure 3 on the next page).

Using the principle of decomposition of resource support allows achieving the following features and advantages:

1. To use the available resources simultaneously in several parallel projects with maximum efficiency;
2. To ration and plan costs for the implementation of individual parts of the project and the process as a whole;
3. To monitor and assess the results of subprocesses;
4. To ensure the consistency and progression of the whole process;
5. To take into account the possibility of adjusting processes and organize feedbacks within each of the stages;
6. To present the result of each stage in the form of specific products with material value indicators;
7. To link the technological process both to sources of financing (grants, funds, loans, subsidies, etc.) and to sites for the implementation of processes, including the transfer of work to scientific and technical outsourcing.

This approach gives specialists and project managers a tool for planning and implementing innovative projects, which is especially important at the initial stage of work, when neither the business object itself, nor the team, nor the conditions for sustainable and directed business development are formulated [6].

In the framework of the proposed model, it is necessary to form regional strategies for the development of construction industry enterprises of the building materials, structures and industrial housing, within the framework of which new materials, structures and technologies for the construction of municipal housing, social facilities, road transport projects, etc. should be developed and mastered.

The result of the implementation of the cluster approach should be an increase in the productivity and innovative activity of enterprises included in the cluster, as well as an increase in the intensity of development of small and medium-sized businesses, which will help to significantly strengthen the innovative component of their activities [7, 8].

Fig. 3. Algorithm for the formation of a program for innovative development of a small and large manufacturing enterprise.

The effect of enterprises using outsourcing in the field of innovation includes two components:

1. The synergistic effect in the field of innovation, expressed by the increment of innovative potential in the joint functioning of economic entities over the sum of their individual innovative potentials.

2. The increase in the economic effect of the innovative development of a small enterprise.

To quantify the innovative synergetic effect, the methodology for analyzing economic value added related to the activities of an integrated research and production association

consisting of a customer enterprise and a pool of developers in the field of innovation (research network) was adjusted [9, 10]. The criterion of economic value added is one of the most effective methods for assessing the performance of enterprises and their cash flows. Economic Value Added (EVA) is an indicator of the quality of management decisions and is calculated by the formula:

$$\text{EVA} = \text{NOPAT} - C = \text{NOPAT} - \text{WACC} \cdot \text{CE}, \quad (3)$$

where NOPAT - Net Operating Profit After Tax;

C - Cost Of Capital);

WACC - Weight Average Cost of Capital;

CE - Capital Employed.

According to this approach, the innovative component of the integration effect, characterized by an increment of innovative potential, is a kind of multiplier for the economic effect of integration. The use of these indicators to analyze the activities of scientific and production associations allows, regardless of the specifics and structure of each scientific and production association, to determine their effectiveness and contribution to the formation of innovative potential.

4 Discussion

Thus, the proposed approach allows determining the contribution of individual business entities to the formation of added value of a single innovative production entity. The analysis of the synergistic effect allows enterprises to assess the feasibility of their transition to the management of innovative activities based on the reengineering of business processes at the decision-making stage.

5 Conclusion

As a result of the study, a mechanism has been developed for the implementation of scientific and technical policy in industry, a distinctive feature of which is the reengineering of innovative processes based on technology of the diffusion of innovations in order to improve the structure and functions of innovation management.

The formed methodology for choosing the most optimal form of innovative activity of a small manufacturing enterprise is based on the analysis of resource support, which allows increasing the cost-effectiveness of the customer enterprise in the field of innovation by using the proposed innovation process decomposition matrix in managing investment resources.

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