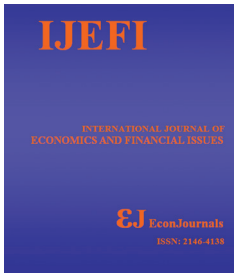

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The Model of Innovative Activities Management in a Competitive Market Conditions

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ABSTRACT

Market competition in all sectors of the economy calls for maximum use, activation, optimal implementation of the results of scientific and technical progress - innovations. This is necessary not discrete implementation of innovative projects and development of a new system of interaction of innovative processes in all areas. Purpose of the article is modeling of innovative activities' processes management and development of recommendations to improve its productivity. The authors analyzed the theoretical and methodological aspects of innovative activities' implementation, revealed the structure of innovative activities and the parameters of its implementation. A mathematical model for innovative activities' managing, defining the hierarchy of its connections is proposed. This article is intended for regional leaders, top managers of enterprises, scientists and researchers involved in the innovative development of an economic sector.

Keywords: Innovations, Innovative Activities, Management, Modeling, Investment
JEL Classifications: C15, C51, O31

1. INTRODUCTION

1.1. Background

Currently, domestic enterprises operate in a competitive environment conditions related to, among other things, the consequences' minimization of the global economic crisis. Market competition in all sectors of the economy calls for maximum use, activation, optimal implementation of the results of scientific and technical progress - innovations. The priority of economic policy is the development of innovative activity in all areas of the economy, the organization of effective interaction of the main participants in the innovation process, the definition of the place and role of each link in the innovation system, funding sources and mechanisms of innovations' financing. Justification of managerial decisions on the implementation of innovative activities in terms of available intellectual, material, labor and financial resources, the assessment of possible impact of external factors and the need to predict when the dynamic development of the market economy raises puts forward the need to use the apparatus of economic and mathematical modeling for managerial decision-making.

1.2. Status of a Problem

Various aspects of the impact of scientific and technological progress on economic development and as well as the peculiarities of management of innovation processes were considered by many foreign scientists, among which are the works of Drucker (1998), Mensch (1979), Rothwell (1994) and Schumpeter (1934) and others.

General theoretical and methodological approaches to the development of innovative type of economic development, innovation management are described in scientific works of: Porter

(2005), Hargadon (2007), Dundon and Ilina (2008), Fatkhutdinov (2013) and others.

Analysis of the results of modern research of domestic and foreign scholars on this issue has shown that a number of theoretical and methodological and organizational problems of common methodological approach remains still to the study of innovative activities, monitoring of its implementation, the development of quantitative indicators and the development of economic and mathematical models of innovative activities' management in the branches of the economy.

1.3. The Research Hypothesis

The aim of the research is the development of theoretical and methodological approaches to modeling and forecasting of processes of innovative activities' management, and recommendations to improve its effectiveness.

This will be facilitated by:

- Determination of the characteristics of innovative activities in the current economic situation
- Modeling of innovative activities' management
- Determination of the parameters, conditions, boundaries of innovative activities' implementation at the mezzo and micro levels.

2. METHODOLOGICAL FRAMEWORK

2.1. Classification of Innovations in the Industrial Sector

An innovative way of development is the determining factor in the growth of living standards, the transition to modern standards of life quality, state and the environmental security ensuring. The main properties of innovation are: Novelty; practical applicability (the ability to meet the specific needs and demands of consumers); marketability, i.e., (possibility of implementation).

The need to improve the efficiency of innovations is identified with respect to existing solutions within the existing operating conditions. Also it is necessary to allocate such classification criteria of innovations as:

- The type of implementation, among which the traditional and pioneer ones can be allocated
- Source of funding: Involving foreign investments, with the involvement of domestic investment s and joint ones
- The type of the effect of the implementation: Point and multiplicative
- The nature of regulation - state-regulated and non-regulated
- Possibility of results' evaluation - estimated by quantities indicators and not quantifiable, but only by expert or quality indicators.

For the effective implementation of innovative activities the conditions of this activities' implementation must be taken into account, as well as its multi-step and multi-stage character. Important is the research, personnel, financial, logistical, organizational - structural capacities of the enterprise and the degree of their conjugation.

2.2. Identifying of Innovative Activities' Risks in Modern Times

Currently, objects of innovative activities are recognized:

1. The results of intellectual activities, containing technical and other relevant information
2. Objects of exclusive rights relating to the creation of innovative products
3. Innovation and investment projects, programs, services and activities related to the creation, development and distribution of innovative products
4. Innovative products
5. Financial assets, securities of innovative organizations.

The effectiveness of innovation activities is affected by the following internal factors: Overcoming the technological barriers that arise during their deployment, ensuring the coupling effectiveness of the input and operating production, management of multi-element structure of manufactured products by finding the optimal ratio of purchased and actually manufactured components, organization of quality training and retraining of staff due to innovative changes, the organization of quality management system of produced innovative products. In this regard, a particular relevance belongs to the effectiveness of preventions in the process of innovative production activities of risks and threats' emerging, called innovative production risks.

Components of the risk of innovative activities can be described as:

- A high degree of uncertainty of technical, technological and commercial parameters
- Deadlines for investigations, the size of future cash flows
- Taking into account of the time factor in all financial and economic calculations, the possibilities for projects' orientation on long-term, distant in time results due to the complexity of the solution of scientific and technical problems
- Involvement in the project implementation of highly qualified specialists, unique materials, development of new technological documents, regulations
- Low inertia at the design stage of the project
- The possibility in the framework of the project implementation of the intermediate results' receiving contributing to a change in the parameters of the project, or transfer into a completely new sphere, which requires flexible management.

2.3. Features of Innovative Activities in Industrial Sectors (For Example, a Building Complex)

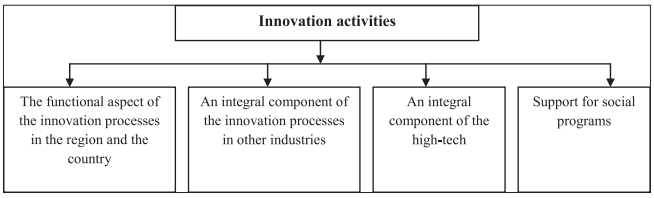
Innovations in building, according to the source, is "the process of implementation in the system of building production of scientific and technological progress results in the field of new technology, design development of advanced methods of organization and construction management, providing increased efficiency of building, improvement of the quality of construction products and increase of its competitiveness" (Fedorovsky, 2009). Besides, innovative changes in building provoke changes in the development of innovations in other sectors of the economy (Figure 1).

It is important to consider the kinds of innovations in building (Table 1), complementing the given in reference (Denisov and Kamenetskii, 2003) classification.

Table 1: The classification of the final products of innovative activities in the building industry

Output (end) product of innovation activities process	The need in the product (targets of innovative and building process)	Type of innovation
Innovations in the design of process objects	Improving the quality of projects, optimization of design time	The innovativeness of the construction industry
Innovative buildings and structures: Houses, social facilities industrial construction, transportation systems and communication	Improving the living conditions of citizens, solving social problems by increasing the volume and quality of social construction, the introduction of new production technologies, meeting the needs of the population and the production sector in the transport and communication services	
Innovative methods, technology, organization of management	Improving of the quality, reducing of the time and cost optimization of the final product of the innovative construction process	
Innovative construction materials	Improving of technical and economic characteristics of buildings and structures, cost reducing and time efficiency	Innovations imported from other industries
Innovative equipment	The growth of labor productivity, time efficiency, improving of the quality of the final product	
Information technology	Time optimization of project development, information support of innovative building process's management	

Figure 1: The components of innovative process in the building industry



3. RESULTS

3.1. The Control Algorithm of Innovation Life Cycle's Phases

Taking into account the life cycle of innovation may provide additional information to make informed management decisions. We have developed an algorithm for the analysis of the phases' management of innovations' life cycle, including the following steps:

- Step 1: Statistical regression analysis of the life cycle of innovations in this area in order to determine with some accuracy the forecast of the life cycle.
- Step 2: Determination of the parameters affecting the value of the life cycle, finding of the critical points of the process to identify the ways to eliminate them.
- Step 3: Development of adequate management solutions designed to determine the strategy for managing the innovation process for its effective functioning.
- Step 4: The allocation of resources of innovation process according to the phases of life-cycle, taking into account statistical forecasts.
- Step 5: Creation of the monitoring system of all parameters of the innovation process based on information flows and mathematical modeling methods for the process objective parameters' obtaining.

The use of this algorithm in the implementation of innovative activities' process will ensure the transparency of its economic indicators and identify the time period of maximum efficiency of the process, the balance's state of the costs and impact, cost-effective implementation. The study of extreme values of the process makes it possible to construct mathematical models, which in turn will reveal the effects of delay of the life cycle stages, the proportionality of the process, its inertia and provide a prediction of the process course.

Such processes' management is associated with the environment organization for functioning of hierarchical innovation processes within established organizational structure, which aims to achieve economic efficiency in the form of profit and competitive advantage.

3.2. Model of Innovative Activities Management

The formalization of relations between the entities of the process (the investment (financial), innovation and production) would formulate the condition of effective functioning of the enterprises in the building sector. This condition takes into account both as internal (endogenous) effect formed during the process so external (exogenous) effect in relation to the process and resulting from the use in economics of the final product of innovation and building process.

To describe the model the representation of an object, its properties and relationships are used. They are divided into manageable - process resources and unmanaged - external in relation to the process objects and properties. As the controlling object are selected the following set of elements: Indicators of the process resources, the functions of the process and the formation of purposes, elements of analysis and decision-making.

Using a mathematical model of the process (Suleymanov, 2004), it is possible to adapt it to the process of innovation and investment process in the building industry taking into account the limitations and conditions of implementation.

Let on the input process the following parameters are given:

- Existing knowledge Z (z1, z2,... zn)
- Acquired technology T (t1, t2,.... tm)

- Raw materials, equipment, human resources, investment S (s1, s2,.... sk)
- Information J (j1, j2,.... jl).

Resources of the process are estimated by vector R (r1, r2,... rp), and the innovative-investment process by a function of a plurality of resources Inv (R1, R2,... Rf). The output of the process, satisfying the customer's needs is denoted by the vector V = (v1,...vk). The parameter values of all vectors and sets are measurable units.

In the described model (Figure 2), the supplier that provides the resources of the process R (r1, r2,... rp), gies to the input parameters Z (z1, z2,... zn); T (t1, t2,... tm); S (s1, s2,... sk); J (j1, j2,... jl), they are also the conditions for the functioning of the innovation and investment process Inv (R1, R2,... Rf) - the ratio between the inputs and the outputs (method of process implementation).

The process feedback goes through the evaluation of monitoring parameters D (d1, d2... dc) and the process risk assessment Q (q1, q2... qp), the process outpit is the process customer's satisfaction degree, described by the vector V = (v1,...vk). Coefficients of innovative-investment process in the building industry yi k can be either constant or variable.

The function that describes the result of Inv fulfillment can be represented as follows: Vk = Inv (R (Z, T, S, J) * Q/*D*

Let's transform through the matrix form, where each element yi k = Δri/Δvk. Then the transformation of inputs of innovation and investment process in the building industry into its outputs can be determined by a system of linear equations of the form:

$$\Delta v1=y11\Delta r1+y12\Delta v2+\ldots. + y1k\Delta vk$$
$$\Delta v2=y21\Delta r2+y22\Delta v2+\ldots. + y2k\Delta vk$$
$$\Delta vk=yk1\Delta rk+yk2\Delta vk+\ldots. + ykk\Delta vk$$

There are the following ways to address implementation of the process Inv (R1, R2., Rf) (Draper, Smith, 2007).

- Definition of process outputs based on input's basis V = Y*R
- Reverse transformation, which allows on the basis of the outputs of the system to conclude its input resource R = T−1 (V)
- Changing the value of the coefficients of the innovation and investment process yi k to determine the necessary possible values' variation of the inputs R and outputs process V.

In the above mentioned mathematical description of innovation and investment process in the building sector, of course, there is a simplification consisting in the possible multiple inputs and outputs of the process. However, process's communication and operation are described accurately.

In the theoretical model developed, taking into account the laws of innovation and investment process is necessary to describe the process of choosing the best option of all possible solutions.

In our study, innovation and investment process the goal is optimization of the results of the process, i.e. the production of the final innovative product with the necessary conditions of quality, satisfying the customer of the process.

One can formulate the following objective function and optimization criterion.

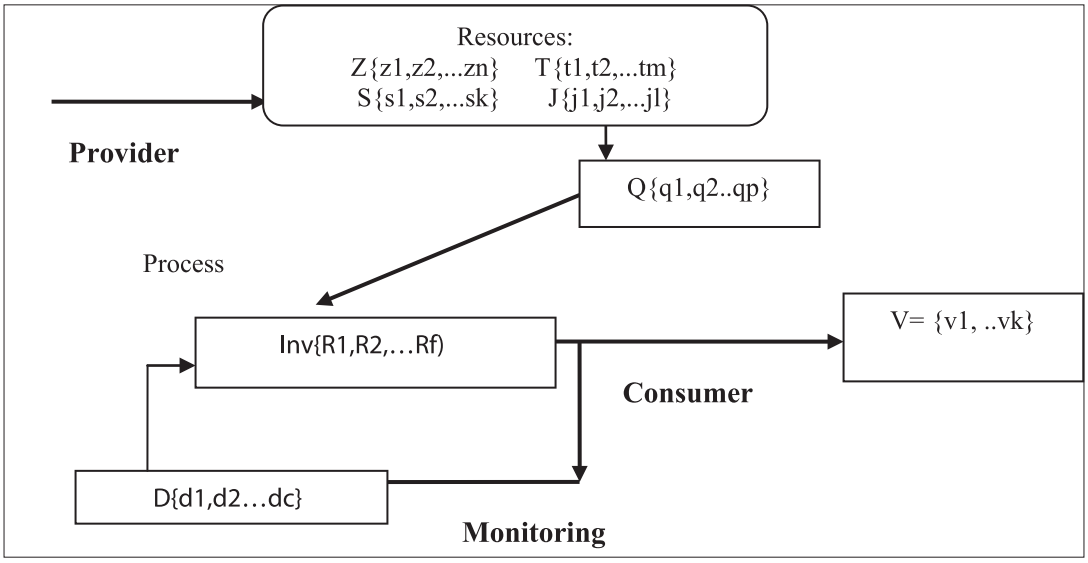
1. A maximum of innovative end products of the process
2. Minimization of the process risk
3. Minimization of the financial resources of the process and the conditions that restrict the possible values of the unknowns (conditions- limitation): Restrictions on the number of resources.

Then we see that innovation and investment process as a whole must meet the following models:

$$Vk = Inv (R (Z, T, S, J) * Q/D \rightarrow max$$

While minimizing its resources R (Z, T, S, J) and limitations on investments F: R (Z, T, S, J) ≤F

Figure 2: A mathematical model of innovation activities' management in the investment and building industry



Implementation of innovation and investment process in the building industry takes place against the background of the limited input financial, material and human resources, as well as external factors. Moreover, its exposure to mechanical, external, organizational and financial risks can be critical to the process. This feature becomes the main reason for a thorough analysis of all the parameters and characteristics of the innovation and investment process in the building industry and provides relevance of the modeling and forecasting process in competitive market conditions.

For companies implementing innovation and investment process, it is necessary to analyze all its parameters for sustainable development providing, maintaining a balance between economic benefits and costs. Variations of resources and of the environment in the process can yield both positive and negative effects, so the analysis of the sustainability of the innovation process's functioning is seemed to be necessary.

Under a positive sustainability of the innovation and investment process in the building industry is understood a positive difference in its incomes and expenses (including innovation, production and payments) for the implementation of innovation and building process. Transforming the model (Barkanov, 2005) on the functional implementation of innovation and investment building process, taking into account its limitations theoretically the stability condition at some time t, can be expressed by the inequality:

$$VIR(V(k))-ZAT(R(Z,T,S,J))-PLAT)\geq 0$$

Where: VIR (V(k)) - proceeds from the sale of the final product - building process of V(k)
ZAT (R(Z,T,S,J)) - the cost of purchasing and paying for the resources of the building process R(Z,T,S,J)
PLAT - fiscal charges, as well as the costs of development of innovative potential of the organization.

The stability condition includes an assessment of financial flows and reproduces parameters of the strategic management of innovation and the investment process in the building industry:

- Production activity (the cost of the process, the sales of the final product, the price of the final product)
- Investment activities as the possibility of new investments in the final product
- Financial activities - income, fixed capital, credit debt, dividends, and the development of innovative capacity.

The integration of these activities in the implementation of innovation and investment process provides the conditions for economic stability.

4. DISCUSSION

The basis of the paper are studies of Russian and foreign scientists in the field of economic and mathematical modeling, statistical methods and forecasting of the economy, including Ayvazyan (2008), Kantorovich (2003), Kendall and Stewart (1976), Novikov (1998), Orlov (2002) and others. Analysis of the results of modern research of domestic and foreign scholars on this problem has shown that it cannot be considered completely solved due to multi-variant nature of models and the lack of implementation of the simulation results in real economic activities.

The results of this study extend the theoretical and methodological understanding of innovative activities' modeling tools in the sphere of investment and building, as well as methods for constructing its development's predictive estimates. The practical significance of the work consists of the fact that the developed scientific positions, methodological approaches, economic and mathematical predictive models and recommendations contribute to the improvement of the investment activities' management and allow fulfill the monitoring of its implementation in the field of investment and building.

5. CONCLUSION

Thus, the authors have developed economic and mathematical model of innovation activities' management with an assessment of inputs resources and the parameters of its operation in the field of investment and building. Taking into account the achievements of management theory based on the above mentioned model one can identify several types of management trends: On input; on the resources of the innovation process; on the results of the monitoring process; on risks of the process; on the dynamics of the process.

Further parameters' detailing of innovation activities' processes on management method provides the obtaining of mathematically-based indicators to implement effective management of innovation and investment process. This study complements the theory of innovation activities' management and directed on the important tasks' solving of economic innovative renewal.

6. ACKNOWLEDGMENTS

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REFERENCES

Ayvazyan, S.A. (2008), Bayesian approach in econometric analysis. FPA "Synergy". p153.
Barkanov, A.S. (2005), Methods to Improve the Efficiency of Building Companies. Moscow: MGSU. p339.
Denisov, G.A., Kamenetskii, M.I. (2003), Organization of innovative activity in the construction industry. Problems of Forecasting, 3, 50-61.
Draper, H., Smith, H. (2007), Applied regression analysis. Moscow: Williams, Dialectics. 392.
Drucker, P. (1998), Effective Governance: Economic Problems and Optimal Solutions. Grand: Fair-Press. p285.
Dundon, E., Ilina, S.B. (2008), Innovation. How to identify trends and

extract benefits. Moscow: The Vertex. 234.
Fatkhutdinov, R.A. (2013), Innovation Management. St. Petersburg: Piter. p448.
Fedorovsky, A.Y. (2009), Develop methods to evaluate the economic efficiency of the innovative project management in the construction industry. Problems of Modern Economy, 1(29), 49-58.
Gratton, L.A. (2008), Boiling Point: How Organizations, Groups and Teams Create Energy for the Development of Innovation. Moscow: Best Business Books. p283.
Hargadon, A. (2007), How Breakthroughs Happen. The Surprising Truth About How Companies Innovate. Boston: Williams. p304.
Kantorovich, G.G. (2003), Time series analysis economic. Journal of the Higher School of Economics, 7(1), 79-102.
Kendall, M.J., Stewart, A.M. (1976), Multivariate Statistical Analyzes and Time Series. Moscow: Nauka. p736.
Mensch, G. (1979), Stalemate in Technology: Innovations Overcome the Depression. Cambridge: Ballinger. p241.
Novikov, D.A. (1998), Promote social and economic systems (basic mathematical models). Mascow: Institute of Control Sciences. p216.
Orlov, A.I. (2002), Econometrics. Mascow: Examination. p576.
Porter, M.E. (2005), Competition: Proceeding Allowance; per from English. Mascow: Williams. p608.
Rothwell, R. (1994), Towards the fifth-generation innovation process. International Marketing Review, 11(1), 7-31.
Schumpeter, J. (1934), The Theory of Economic Development. Cambridge: Harvard. p455.
Suleymanov, N.T. (2004), An innovative model of quality management system. Standards and Quality, 6, 58-60.