Theoretical and Methodological Bases of Forming the Operational and Innovation Program of the Company

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ABSTRACT
In the modern research dedicated to transfer of the Russian economics to the innovation way of development, there is full scientific development of problems of formation of tools and mechanisms for improvement of management over modern innovation and orientation corporation on the basis of new methodological and methodic approaches contained. It is offered to introduce the notion of operational and innovational program within the framework of which the total production process is considered in the integrity of the two main sub processes: operational and innovation. The theoretical and methodological principles of formation of operational and innovation program are provided and the key tasks are distinguished, which shall be resolved in the course of its planning.

INTRODUCTION

The world industrial development shows the strengthening of the role of the innovation production in the economics of the developed countries. Innovations become the key factor of the competitive capacity. Taking into account the growing falling behind of development of our industry from many countries, the energy measures are necessary on the scientifically substantiated system modernization of the national economics. Growth of the economics at the cost of the oil and gas industry has reached the limit and the prices on oil do not establish the dynamics of growth of gross domestic product.

Analysis of programs of transfer to the innovation way of development in Russia shows the insufficient theoretical development and violation of principles of system approach, in particular, in program documents the mechanism and the concept of «material media» of innovation transformation of the industry is not clearly written. Particular issues are considered: intellectual property, venture funds, support of young scientists and a number of others, it is important, but not so constructive as regards resolving the core problem of arrangement of mass production of scientific products (Kleyner, 2008; Kondratiev, 2009; Mezhov, 2012; Obolenskiy, 2008).

One of the most actual problems of management of modern corporation is the problem of constructing of its economics in the aspect of innovation production. In the national sphere it is insufficiency of methodological substantiation of the concept of constructing the innovation economy sensed. In connection with this there arises the necessity in formation of theoretical and methodological bases for organization and management of the modern innovation and oriented corporations in conditions of Russia.

Methodological aspects of this problem are reflected in the works on instrumental methods of research, in particular, research of evaluation of innovation potential, the economic and mathematics modeling of planning the innovations (Danilin, 2006; Sobolev, 2000; Rastova, 2011; Shmatko, 2009). Together with this there is no distinct understanding of the fact that the nucleus of the strategy of development is large industrial companies. Not sufficient attention is paid to the problem of effectiveness of innovations in the aspect of connection of the production and the innovation processes at the industrial company, which requires specification and development of methods of modeling the parameters of the corporation for performance of innovation programs, which could become the instrumental procurement for the planning.

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**Methodology:**

Production program is the most important element of planning the activity of the corporation. Therewith this task assumes rather exact formalization and implementing the program tools of resolution. Within the framework of production program the optimal provision with resources is determined and all technical and economic and financial indicators and parameters are calculated. However for the company, which constructs its competitive capacity on the basis of innovations, constant introduction of new products into production the task of production planning becomes significantly more complicated. The authors proceed from the fact that, firstly, it is necessary to include to the model of production program the task for planning and investment of innovations, secondly, evaluating the effectiveness of investments, also the simultaneous, or, more precisely, coordinated forecast of cash flows from all activities is necessary, thirdly, to resolve the task on formation of the production program for the longer perspective, considering it as the forecast.

The methodological basis for the research of production structures, possessing the innovation potential, allowing coverage of all stages of the innovation process and based on the constant renewal of products to obtain the rent during a long period of time states the introduced notion of the innovation and oriented corporation, summarizing and systemizing the most often in the scientific literature variants for determining companies, which are oriented at the innovation activity.

**Main Part:**

**The Role of a Large Corporation and the Economic Mechanism of its Steady Development:**

The leading industrial corporations at the end of the XX and at the beginning of the XXI century have performed a large scale reconstruction, following the new paradigm of organization of business and competition: a modern enterprise is a multilayer structure, within the framework of which integration in the environment is performed and in time of resources flow, in evolution with different speed (Kleyner, 2008; Kondratiev, 2009). Therewith the category «resource» significantly expands and is added with the notions of the «key competences», «dynamic abilities», «routines».

Therewith these corporations successfully combine the tactic and the strategic aspects of activity. What is the foundation on which the economics of the leading western or Japanese from is built? Naturally, it possesses sufficient amount of assets; technologies, corresponding with the level of development of the industry; the basis for performing research and technological development (RTD); share of the market and structure of costs, providing balanced production of goods and innovations with the set normative profitability of assets.

Our hypothesis is in the assumption that for such innovation and orientation corporation there shall be some functional relations between the key parameters performed, like the equity capital, the volume of production and sales, the production and innovation costs, the term of return on investment etc. If we speak about the innovations, it is necessary to understand how the task of their financing is resolved, how the strategic stability if provided and the initial costs and return are balanced.

Concentrated imagination of our view of the problems and approaches of the research works is contained in the following concept – if we speak about the innovations, first of all we see the result at the end of the process in the form of the revenue in monetary expression (Mezhov, 2012; Rastova, 2011; Shmatko, 2009). The innovation income is the return on capital: intellectual, technical, management. How shall this capital operate in the corporation?

A competitive production of a modern corporation consists of the innovation and production (operational) processes. The operational process is resolving current tasks of production and sales of the products. It is the source of financial resources for all forms of investments, including the innovation. The innovation process is resolving perspective tasks for future production (transfer from competition in the sphere of production to the sphere of innovations). The operational and the innovation processes have sequential and parallel logics of interaction and may be formally represented by the accumulation of living cycles (Mezhov, 2010; Mezhov, 2011; Mezhov, 2012) Consequently, for the economics of the modern corporation there are some proportions between the operational and the innovation processes. Such proportions shall be reflected in the production plan.

The company spends investment funds on both processes: operational and innovation, but the impression is created that the added value is generated by the capital only in the part of investment into the operational process. In fact in the investment oriented companies provide obtaining the added value with a certain delay in time. Taking into account the probable nature of this process, it is worth mentioning at once that namely here the most complicated task of the innovation planning in the company takes place.

**Model of Planning the Production of New Products in Conditions of Continuous Investments into Innovations:**

We offer a concept of the operational and innovation program (OIP), which means a single or balanced production plan in the stated period of time and realization of products and the innovation works on preparation for start-up of perspective products instead of the excluded from the production (Mezhov, 2010; Mezhov, 2013; Mezhov, 2011; Mezhov, 2012). The common task for formation of the program is in the necessity to synthesize models of innovation and production processes in such a way that to provide rational combination of limited
resources for production of goods and innovations, increasing or, at least, not losing the competitive capacity in the strategic perspective.

For this purpose modeling of OIP shall resolve the following:

- Forming the optimal program of production taking into account the demand, the available resources and the development strategies;
- Determining the suitable strategies of investments into innovations and evaluation of the return in the form of rent and profit;
- Determining the time of start-up of a new product and exclusion of production of the old one;
- Balancing the operational and the innovation part of the program, i.e. calculation of financial indices and forecast of balance and preparation of information to start-up of the following integration within the framework of the interval of planning.

The aggregative block structure of the model of operational and innovation program of the industrial corporation is shown in figure 1 (Mezhov, 2012). At this scheme it is reflected the approximate sequence of OIP modeling of the industrial corporation. In squares with the dash-dotted boundaries there are initial parameters of modeling shown. They may be set (for example, living cycles), or calculated (parameters of the innovation process).

This model includes blocks of forecasting the operational plan, choice of the strategy of realization of the innovation process and evaluation of the effectiveness of investment (fig. 1). Purpose of the model: determining the optimal structure of products production, oriented at the market demand, evaluation of strategies of innovations investments, consisting from the evaluation of the innovation potential and financing the RTD stages. Here the forecast of return of a new product is performed, calculation of the income and rent, for the purpose of which such data are used as: forecasting living cycles on each product, financial and economic characteristics of the company and a number of others, set by the information model in the thesis research. The balance of model calculations between the operational and the innovation parts of OIP are provided with the assistance of Higgins model, which shows how the assets and a number of other financial indices are to change in conditions of changing the volumes of sales and costs (Mezhov, 2010; Mezhov, 2011; Mezhov, 2012).

Fig 1: Block scheme of modeling the operational and the innovation program.

Forecast of the demand on products by way of playing N times under the method of Monte-Carlo of hits into the interval of the living cycle with the subsequent averaging. Therewith for a new product the forecasting values of the demand are set by the marketing department within the framework of the developed strategies for market development, and represent the exogenic parameters of modeling.

In the block «Functions Costs-Sales» the parameters of functions on each product are determined, 3 functions are formed for each product: sales volumes (based of forecasting demand), costs and profit, for which the
integral characteristics may be taken from the corporate reports. Based on these functions the criteria are formed, as well as limitations on costs, on the volumes of production, on the capacity for optimization model.

The optimization model is formed automatically. The results of optimization come to the block «Calculation of financial indices»; then the outgoing data of these two blocks come to the block «Calculation of innovation and investment indices»: NPV, term if return, correction of NPV, evaluation of rent» in which the outgoing parameters are finally determined and OIP variants are formed.

The modeling procedure of the operational and innovation program (fig. 2) is arranged in such a way that at each step of planning it is formed a separated optimization model with its own parameters and limitations, established by the current state of resources of the company at the moment t.

Modeling of balance values is detailed in the setting of the optimization model in (Titov, 2013). Calculation of financial indices is carried out based on balance calculations for each forecasting year.

In the block of calculation of the investment characteristics the following tasks are resolved: evaluation of effectiveness of RTD investment; calculation of the net present value; correction of the net present value taking into account the current state of innovation potential (with the use of expression (1), (4)); accounting of change of the innovation potential depending on the amount of investments; calculation of rent, received from production and sales of a new product.

The innovation potential, evaluated as the result of processing the results of questionnaire the experts, should not be taken as a constant value. The potential is a dynamic parameter, changeable depending on the value and the intensive nature of investments into innovations. Increase of the innovation potential under our methodology leads to reduction of the correction multiplier and reduction of terms of return of the innovation project on introduction of the new product.

Development and subsequent production of the new product presuppose obtaining entrepreneur rent, which is necessary to take into account in the process of modeling by way of changing the price for the new product. The price of a new product shall be changed depending on the growth of competitors influence at this market. For the strategies determined by the marketing department the rent is calculated, received from production and sales of the new product.

Based on our methodical provisions correction of the investment volume as to innovations is possible taking into account the terms of return and balanced growth rates.
Methods of Evaluation of the Investment Volumes for Realization of the Innovation Project within the Framework of the Operational and Innovation Program:

The model of the operational and innovation program resolves rather important problem in the theoretical and applied meaning, for accounting of the dependence of the volume of investments with characteristics of the innovation process and the level of the innovation potential of the corporation. Undoubtedly, the technological parameters and the innovation potential on the whole influence the effectiveness of the innovation project, but not that evidently. In order to evaluate the investment more precisely, the effectiveness and the time of return of the innovation project based on NPV it is necessary to find some methodical approach to the investment analysis of the innovation projects, which would take into account the technological and the organizational characteristics of the corporation.

For more certain determination of the investments into innovations and evaluation of their return it is worth specifying the basic concept of NPV in the part of dependence of the result on the complexity of the product, the deepness of the innovation process and the innovation potential of the company, having included these characteristics into the formula for calculation of the net present value.

The analysis shows that the methods of forecasting the costs on the innovation project do not have satisfactory substantiation both – in theoretical and in methodological aspect.

Total costs on the innovation process in the industrial corporation consist of the costs on purchase of scientific equipment, devices, software facilities, payment for the labor of the scientists and engineers, patent and informational facilities, financing outsourcing works and financing certain projects. As distinct from the classic investment project, in which the expected income, mainly, correlates with the amount of invested capital, profitability and risk, the innovation project is characterized by the complex system dependence first of all on the factors, being rather the technical and economic or the technological.

It is possible to show formally that the forecasting investment into the innovation project $I_n$ depend on some plurality of parameters and factors:

$$I_n = \Psi(c_{j^*}, X_{j^*}, \delta, \beta, \eta, \gamma, T^n)$$

where $c_{j^*}$ – is the offered price for the developed innovation product $j^*$, substituting the «old» product $j$;

$X_{j^*}$ – is the expected total volume of producing the new products, initially planned by the group of the project development;

$\delta$ – is the level of the planned profitability, including the risks and the requirements to profitability, set by the management of the corporation;

$\Psi$ – is the function type:

$\beta$ – is the constructive complexity of the product, may be evaluated by an expert or analytically based on comparison with the analogue;

$\eta$ – is the rate of deepness of the scientific work (theoretical, surveying, technological works), shows the level of costs on financing RTD stages;

$\gamma$ – is the index of integral evaluation of the scientific and production potential, reflects presence of the key competences, routines, the level of equipment of the laboratories etc., the deepness of industrial penetration, for example, the corporation as an average statistical representative of the industry, has the history, the stable market share, the innovation etc.;

$T^n$ – is the period of return, the essence of which shall be determined at the fixed value of investments.

We offer the procedures for evaluation of technological parameters and the innovation potential, which is reflected in a number of papers (Mezhov, 2010; Mezhov, 2013; Mezhov, 2011; Mezhov, 2012), in particular, the constructive complexity of the product, the deepness of the innovation process, the innovation potential of the company may be evaluated based on questionnaire of a number of qualified experts in the sphere of science and production.

Complex influence of the stated characteristic factors of the innovation project and the company itself may be taken into account, having introduced a special multiplier (correction multiplier), for example, with the use of the exponent function:

$$\sigma = e^{b \beta \eta \gamma}$$

where $\gamma$ – is evaluation of the innovation potential of the company;

$\beta$ – is evaluation of the constructive complexity of the product;
\( \eta \) – is the rate of deepness of scientific work;
\( b \) – is the rate, taking into account the accuracy of forecast of costs in the course of development of complex products.

Parameter \( b \) may reflect the extent of error of the planned investment solution as related to the actual and may be determined by an expert, for example, out of 10 planned investment solutions with the set parameters in the course of realization, on the average it turned out the 6 projects have significant deviations of the actual parameters from the planned, then the rate equals to 0.4. The rate \( b \) shall be determined by an expert by the employees of the planning services of the corporation, at that this is a parameter liable to adjusting.

For the integral evaluation of strategies of investment into the innovation project we apply the approach, based on adjustment of the procedure of calculation of the net discount value (Mezhov, 2011; Mezhov, 2012). Using the innovation potential of the company, the complexity of the product, the RTD deepness, including the multiplier into the formal correlations, we have got an equality of evaluation of the amount of initial investments for the innovation project depending on the characteristics of the innovation process:

1. Let us present the profitability of the current costs \( \rho_{j_*} \) on production \( x_{n,j_*} \) as the amount of the costs profitability \( R3_{j_*} \) and the additional profitability, providing the rent \( Ren_{j_*} \):

\[
\rho_{j_*} = R3_{j_*} + Ren_{j_*}
\]

2. The price for the product should be presented as the production of profitability and the costs \( S_t \) during the period \( t \):

\[
c_{j_*} = S_t + \rho_{j_*} S_t = (1 + \rho_{j_*}) S_t
\]

Let us write the formula of calculation of the net present value taking into account the adjustment in the form of:

\[
NPV = -L_n^n e^{\frac{b\eta}{r}} + \sum_{t=T_1+1}^{T_n} \frac{(1 - \tau)(R3_{j_*} S_{j_*} x_{j_*} + Ren_{j_*} S_{j_*} x_{j_*} - S_{fj_*})}{(1 + \Delta)^t}
\]

Let us transform the expression (4) into the equality for the case, when \( NPV = 0 \) and we get the equality of evaluation of the amount of initial investments for the innovation project depending on the characteristics of the innovation process:

\[
L_n^n = e^{\frac{b\eta}{r}} \sum_{t=1}^{T_n} \frac{(1 - \tau)(R3_{j_*} S_{j_*} x_{j_*} + Ren_{j_*} S_{j_*} x_{j_*} - S_{fj_*})}{(1 + \Delta)^t}
\]

where \( T_1 \) – is the time spent on RTD, \( r \) – is the rate of the income tax, \( S_{fj_*} \) – is the variable costs on one unit of the new product production, \( S_{fj_*} \) – is the part of constant costs, falling to a new product, \( L_n^n \) – is the planned amount of investments: fixed value for calculation of \( NPV \) (Mezhov, 2012).

Here the production \( R3_{j_*} S_{j_*} x_{j_*} \) represents the operational revenue, and \( Ren_{j_*} S_{j_*} x_{j_*} \) – is the rental income, stipulated by the competitive prevalence of the corporation. In conditions of the competitive struggle the corporations start mastering perspective products and gradually the profitability from it becomes leveled and average industrial.

This way, the amount of investments on complete development of the innovation product, including start of its production, is in the interval, where the lower threshold is the planned volume, the upper threshold is the adjusted amount of investments, taking into account the constructive complexity of the product, the number of stages of scientific work and scientific and production potential of the company. The upper threshold of the interval depend more on the innovation potential, the structure of which is determined by the factors of technological level, the human capital, RTD etc. When increasing the level of the innovation potential the length of the interval narrows, which leads to growth of the accuracy of the forecast of the actual amount of the investments into the innovations.

After preparation of the initial data and the and such calculation parameters as the innovation potential, the deepness of the innovation process, the forecasting values of the demand on the products, the prices and the costs of the products, formation of strategies for introducing the new product the evaluation of strategies on OIP model is performed and the optimal variant on the selected criteria is selected.
Results:
The offered theoretical and methodological provisions and recommendation are probated with the help of model calculations based on the real data and have shown the correctness and the constructive nature of their implementing in the course of planning the innovations. These recommendations may be introduced into the real practice of management of the Russian corporations.

Conclusions:
The developed original model of the operational and innovation program, uniting the formal representing of the operational and innovation processes of the enterprise allows forming the plan for products manufacture, carrying out the forecast of the demand based on the living cycles, forming the procedure of inclusion of a new product into the plan and exclusion of the old product out of the plan, evaluating different strategies of investment of RTD, its start-up into production and sales.

Simultaneously evaluation of the effectiveness of the innovation project is performed taking into account the innovation potential, the deepness of the innovation process and the complexity of the product, with the use of the method of inclusion of cash flow calculations into the procedure of the forecasting values of the operational constituent of OIP.

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