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Formulation of Development Strategies of Machinery Building Complex Enterprises and Estimation of Their Implementation Efficiency

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Abstract: The paper determines and analyzes basic contradicitons in the development of science-intensive machinery building complex of Russia. Special attention is paid to the analysis of lifecycle phases of a machinery building enterprise and its modification of condition of the development and implementation of the innovation-focused strategy. It suggest a methodology of integral estimation of the manufacturing enterpise development with the use of tempo coefficients that allows to define and estimate the influence of the most significant factors on the enteprise development as well as to rate enterprises according to the level and potential of development.

Key words: Science-intensive machinery building · Innovation-focused strategy · Strategic management · Organization lifecycle · Indefiniteness of the enterprise external environment · Industrial policy

INTRODUCTION

Implementation of deep transforming of the national economic system with the simultaneous activation of globalization processes stipulated restructuring and reorganization of the system of managing manufacturing complexes, formation of qualitatively new mechanisms of inter- and intra-industry interrelation adapted to keep turbulent environment [1].

The task of the state is to determine scientific and technical and technological priorities in the context of limitation of resources opportunities, development of industrial policy that allows to implement contradictory interests of manufacturers, investors, scientific and research and educational organizations, central and local authorities.

An integral element of industrial policy is the formation of the system of strategic management of innovation-based machinery building complex that is a significant condition of the structural reconstruction of a real economy sector, provision of an incremental dynamics of indicators of financial and business activity of separate business entities and national economic system as a whole.

RESULTS

Strategic management structure includes the following subsystems composing it: target, functional, providing and administrative ones.

The target subsystem implements functions on the determination of innovation goals and strategies of science-intensive machinery building development as well as on the coordination of priorities of the complex innovation development with priorities of social and economic development of separate business subjects, territories of their localization and the state in general. This subsystem forms innovation programs and projects directed to the achievement of goals related to the science-intensive machinery building development [2, 3].

The functional subsystem provides the implementation of special functions of managing the innovation development of the machinery building complex which content is stipulated by the specificity of the management subject–science-intensive innovation processes. They include: management of the innovation cycle including researching, technical and operational phases, phase of innovations diffusion in the customers' innovation environment, routinization phase; management

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Table 1: Specific gravity of innovation and active organizations in the industry, %

	2009	2010	2011	2012
Total	10.5	9.3	9.4	9.4
Exploitation of fossil fuels	7.4	5.7	8.0	6.6
Gas carbon, petroleum products manufacturing	29.8	31.4	29.4	27.1
Chemical manufacturing	22.8	23.5	24.2	24.7
Rubber and plastic articles manufacturing	10.2	10.7	11	10.1
Other nonmetallic mineral products manufacturing	9.1	9.3	8.3	8.4
Machines and equipment manufacturing	14.2	13.5	15.0	16.1

of the source assurance of science-intensive innovation processes; management of the state support of science-intensive innovation processes.

The providing subsystem stipulates the reasonableness, relevance, flexibility, objectivity, efficiency and timeliness of the management decisions on the development of the science-intensive machinery building complex. This subsystem includes information and analytical, statutory and regulatory, methodical and resource provision of managing the innovation development of the machinery building complex.

The administrative subsystem provides direct management of the science-intensive innovation processes implemented in the machinery building complex on the basis of the main management principles implementation and coordination of the activity of the target, functional and providing subsystems on each management level.

The management influence from the management subject's part includes goal-setting, strategizing and programming of the innovation development of the science-intensive machinery building complex; organization of the implementation of federal target programs and projects; coordination of participants' actions within the national innovation system on the development of innovation processes in the machinery building complex; stimulating innovation processes; control at the state of the machinery building complex and innovation processes taking place in it aimed to monitor the correspondence of the controlled state to the one that is desired and necessary and provided by the innovation program [5].

The research shows that the number of innovation and active Russian enterprises manufacturing machines and equipment decreases because this is where future tempos of scientific and technical progress in the whole national economy are put. Besides, there is little specific gravity of innovation and active enterprises in their total number (Table 1).

Various forms of innovations directly influence the content of the enterprise lifecycle stages.

The lifecycle of an enterprise being a member of the industrial complex is modified through including phases of formation and establishment of an innovative enterprise to it using in its activity science-intensive developments of various types based on the previous development experience of business entities through capitalization of parents' funds.

The main task of the enterprise functioning is stable positive dynamics of the subject development, i.e. the enterprise investing resources into manufacturing expects to receive results (return) exceeding initial investments in a definite period of time. Or, from the point of view of the enterprise owners, at the system output they must receive goods (products) that in monetary terms exceed the invested funds by the known value. We suppose that this process can be estimated only with the aid of the system of indicators that characterize all aspects of the manufacturing enterprise activity.

We have proposed a system including 33 indicators. It is theoretically clear that as a whole the enterprise development will be defined by the dynamics of the suggested indicators. The suggested methodology of the integral estimation of the manufacturing enterprise development is based on this. Practically the methodology implementation comprises several stages.

Stage 1: Goal-setting-the development of the methodology of the integral estimation of the enterprise development.

Stage 2: Development of the indicators system of the enterprise development estimate. The system of indicators characterizing all aspects of the enterprise activity is specified in Table 2 (column 1).

Stage 3: Determination of relative value of the indicators and their transformation into quantitative evaluation.

The indicators mentioned above are not equal according to the importance level; they must be given relevant coefficients. This task is solved by the expert way. To somehow simplify the comparison process, the

Table 2: Tempo coefficients of growth indicators

S #.	Indicator	Weight (points)	Growth factors: Absolute factors indicators 2nd year	Growth factors: Absolute factors indicators 3rd year	Growth factors: Measured factors indicators 2nd year	Growth factors: Measured factors indicators 3rd year
1	2	3	4	5	6	7
1	Income from selling products (excluding excise duties and VAT)	55	1.0883	1.0262	59.86	56.44
2	Production of basic types of products	47	1.1428	1.1064	53.71	52.0
3	Cost of the sold products	42	1.1624	1.1021	-48.82	-46.29
4	Expenses for products production	40	1.1975	1.0551	-47.9	-42.2
5	Profit from selling products	59	0.8984	0.7609	53.0	44.89
6	Profit before taxation	53	0.9113	0.5805	48.3	30.77
7	Net profit	61	0.8306	0.5865	50.67	35.78
8	Labor productivity	41	1.0768	1.0197	44.15	41.81
9	Expense for a ruble of market products	45	1.0674	1.0739	-48.03	-48.33
10	Material content of a product unit	36	1.123	1.0032	-40.43	-36.12
11	Economic Value Added (EVA)	24	3.086	0.335	74.06	8.04
12	Average monthly salary of moderately staff strength	20	1.2421	1.1953	24.84	23.91
13	Average monthly salary of industrial production personnel	22	1.2233	1.1963	26.91	26.32
14	General ROA (on the initial cost)	29	0.9624	0.9141	27.91	26.51
15	ROA of active part of basic funds (on initial cost)	34	0.9518	0.9241	32.36	31.42
16	Profitability of basic funds	30	0.8026	0.5202	24.08	15.61
17	Growth of average salary for 1 % of the workforce productivity growth	24	1.1112	1.1357	26.67	27.25
Integral assessment of the enterprise development					12.85	10.48

indicators were pairwise compared and the experts had to answer the question: "Which of the two indicators is more important for the estimation of the enterprise economic development?" However, such simple questions cannot be answered categorically, that's why the expert operation provides the answer containing equivalence and incommensurability. Besides, pairs of the indicators under comparison were offered at random that allowed to avoid "speed of response" in answers.

Stage 4: Transformation of experts' quality value into quantitative values of indicators.

For this on the basis of the results of the experts polling the matrix of pair comparison sized 33 * 33 is filled out. The matrix a i j elements were defined:

a_{ij} = 2, if the *i-th* indicator is more valuable than *j-th* indicator;
a_{ij} = 0, if *i-th* indicator is less valuable than *j-th* indicator;
a i j = 1, if indicators are equal or incommensurable.

To calculatethe value (weight) of each indicator, the elements of the pair comparison were summarized line by line. The results are displayed in Table 2 (column 2).

Stage 5: Calculation of tempo coefficients of the economic indicators growth characterizing the enterprise development.

To calculate the growth coefficients, the activity of the "K" manufacturing enterprise in years 1, 2 and 3 was analyzed. Then the tempo growth coefficients in the 2nd year were calculated in comparison with the 1st year and those in the 3rd year in comparison with those of the 2nd year (columns 4 and 5 of Table 2). The numbers of indicators for which the decreasing tendency is normal are parenthesized.

Stage 6: Calculation of the integral estimation of the enterprise development.

To receive the integral estimation of the enterprise development, the values of the tempo coefficients of the growth indicators (columns 4 and 5 of Table 2) were weighed (multiplied) by the weight (value) of each indicator. Herewith, the weighed estimation of the indicators (Пi) for which the decreasing tendency is normal and their absolute values were really decreased, was calculated in accordance with the following formula

$$П_i=(1-K_{II})*k_i \quad (2)$$

where K_n is a tempo coefficient of the growth indicator under analysis;

k_i is weight (value) of the indicator.

The value of indicators for which the decreasing tendency is normal, but in fact absolute values of indicators increased, were taken with the minus sign. The obtained results are shown in Table 2 (columns 6 and 7).

The integral estimation of the enterprise development was received on the basis of the calculation of the weighted estimates arithmetic average received per each year. For the second year the integral estimate was 12.85; for the third it was 10.48. Consequently, in the third year, in comparison with the second year, the development slowed down (worsened) by 18.4%.

CONCLUSIONS

As a conclusion, we will emphasize some advantages of the suggested methodology of integral estimation of a manufacturing enterprise development:

Firstly, the suggested methodology is based on the system approach to the enterprise development estimate;

Secondly, the integral estimation of the enterprise development is made on the basis of the internal information and public reporting. It allows to cover all aspects of the enterprise operation;

Thirdly, the integral estimate is comparative. It takes into account all changes in the financial and business activity of the enterprise according to the years. If additional information is available, it can be used to estimate basic competitors;

Fourthly, it does not require any complicated mathematical computations. It is simple to be used at the enterprise;

Fifthly, the integral estimate can be used to estimate the investment attractiveness of the enterprise.

The implementation of the suggested recommendations will allow to develop and implement the effective strategy of the machinery building enterprise development.

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