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**Irina Androsova**

PhD (Economics), Associate Professor,  
Regional Economy and Management Department,  
Southwest State University, Kursk, Russia  
94, 50 Let Oktyabrya Str., 305040, Kursk, Russia  
androsova.irina@rambler.ru

**Elena Simonenko**

PhD (Economics), Associate Professor,  
Regional Economy and Management Department,  
Southwest State University, Kursk, Russia  
94, 50 Let Oktyabrya Str., 305040, Kursk, Russia  
simonenkol@mail.ru

## Innovative approach to strategic management of machine-building enterprises

**Abstract. Introduction.** The article covers the issues of innovative approach to the national machine-building industry development. National economic success is predicated upon the ability of national enterprises to manufacture high technology products competitive on a global scale. The advance of Western European economies rests foremost on the up-to-date material and technical basis as well as innovative technologies involved; those are the first order conditions ensuring economic efficiency growth. The state of national machine-building complex is one of the key indicators to evaluate social and economic growth of a country. It ensures sustainable performance of the main national economic sectors. As a part of the current economic reforms, active advancement of innovative processes leads to dramatic changeover in technical, administrative and economic policy of economic entity development, and therefore directly affects the performance of machine-building enterprises. **Purpose.** To contribute to solving the problems of machine-building enterprise's innovative capacity assessing. **Results.** The authors give an overview of innovative development rates in different countries. They present an algorithm to assess the rate of innovative development of a machine-building company which is instrumental to estimate its innovative capability. Innovation-centric management strategies of machine-building enterprise have been proposed. **Conclusion.** Machine-building enterprise management is deemed to be focused on innovative approaches implementation. That shall improve the main national measures which allow elaborating various strategic scenarios of national machine-building sustainable development.

**Key words:** Innovations; Management; Machine Building; Industrial Enterprise; Algorithm; Innovative Development

**JEL Classification:** F4

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**Андросова І. В.**

кандидат економічних наук, доцент кафедри регіональної економіки та менеджменту,  
ФГБОУ ВО «Південно-Західний державний університет», Курськ, Російська Федерація

**Симоненко О. С.**

кандидат економічних наук, доцент, доцент кафедри регіональної економіки та менеджменту,  
ФГБОУ ВО «Південно-Західний державний університет», Курськ, Російська Федерація

**Інноваційний підхід у стратегічному управлінні підприємством машинобудівного комплексу**

**Анотація.** Стаття присвячена питанню інноваційного розвитку підприємств машинобудівного комплексу. Авторами запропоновано алгоритм оцінки рівня інноваційного розвитку підприємств машинобудування, що дозволяє визначити здатність підприємства здійснювати інноваційну діяльність. Результати дослідження показують, що інноваційно орієнтована політика підприємств сприяє підвищенню стратегічної конкурентоспроможності машинобудівної галузі. Застосування інноваційного підходу до управління підприємствами вплине на ефективність основних показників національної економіки, що дозволить вибудувати різні сценарії стратегічного розвитку машинобудівного комплексу.

**Ключові слова:** інновації; управління; машинобудування; підприємство; алгоритм; інноваційний розвиток.

**Андросова И. В.**

кандидат экономических наук, доцент кафедры региональной экономики и менеджмента,  
ФГБОУ ВО «Юго-Западный государственный университет», Курск, Российская Федерация

**Симоненко Е. С.**

кандидат экономических наук, доцент, доцент кафедры региональной экономики и менеджмента,  
ФГБОУ ВО «Юго-Западный государственный университет», Курск, Российская Федерация

**Инновационный подход в стратегическом управлении предприятиями машиностроительного комплекса**

**Аннотация.** Статья посвящена вопросу инновационного развития предприятий машиностроительного комплекса. Целью статьи является разработка алгоритма для оценки уровня инновационного развития предприятий машиностроения, позволяющего определить способность предприятия осуществлять инновационную деятельность. В статье рассмотрены основные показатели машиностроения на мировом промышленном рынке. Авторами предложен алгоритм оценки уровня инновационного развития предприятий машиностроения, позволяющий определить способность предприятия осуществлять инновационную деятельность. Результаты исследования показывают, что инновационно ориентированная политика предприятий способствует повышению стратегической конкурентоспособности машиностроительной отрасли. Применение инновационного подхода к управлению предприятиями повлияет на эффективность основных показателей национальной экономики, что позволит выстраивать различные сценарии стратегического развития машиностроительного комплекса.

**Ключевые слова:** инновации; управление; машиностроение; предприятие; алгоритм; инновационное развитие.

**1. Introduction.** It is regrettable to admit that industrial structure of Russian economy exhibits poor rates of research and development intensity and labour productivity, serious lag in technology as well as considerable fixed capital consumption. In order to meet the problems it is essential to upgrade the innovation management system and to elaborate a complex

of measures that are intended to raise the competitiveness of the national economy branches [1]. Innovative approach to upgrading the system of management inside the branch of machine-building shall respond to this challenge and ensure the improvement of the branch key figures. The rate of machine-building industry development directly determines the rates of

gross domestic product, national productive capacity, defence capability and environmental safety and compliance, since machine-building accounts for 60% of enterprises within the structure of manufacturing industries which provide a base for the stepped-up innovation advancement [2].

At present, the national machine-building complex is unable to compete in the global market. The leading positions in the global scale belong to the machine-building enterprises of the US, Japan, Germany, Switzerland and the UK, primarily due to timely implementation of innovative production management (which is understood as operations management, planning and control of industrial processes). The key figures to indicate the current state of the world machine-building are given in Table 1.

Thus, the EU holds the top position by its gross output value; whereas China leads in manpower, which accounts for its minimum performance rate. Japan has the highest rate of productive capability.

Within the paradigm of sustainable socio-economic development, the issue of enhancing the economic efficiency in the national machine-building industry is of crucial importance. The objective can be achieved by boosting innovative activity in enterprises and thus establishing conditions for successful implementation of innovative technologies and solutions.

**2. Rationale.** As a result of critical fixed capital consumption, as well as lack of innovative capability, Russian manufacturing companies have been suffering considerable loss of competitive advantages in global market. To get over the challenge, the overall modernization of innovation management concept is necessary. An upgrade in innovation managing process is especially urgent for machine-building which is the kernel of national industry's technological development.

**3. Brief literature review.** The present study refers to the results of fundamental and applied research in the field of machine-building production, economy and management.

The studies of D. Aaker (2004) [3], I. Ansoff (1984) [4], S. J. Andriole (2006) [5], J. Gerber (2007) [6], M. Hitt (2014) [7], J. Riggs (1983) [8], R. Rothwell (1994) [9], A. A. Thompson (2010) [10] cover a scope of problems related to industrial enterprise's strategic management with a special focus on innovative aspect of strategic decision-making. Specific issues of industrial company's management in Russia are addressed in the research works of L. Abalkin (2011) [11], M. Bendikova (2006) [12], Yu. Vertakova (2013) [13], M. Zakharova (2014) [14], O. Lakyushina (2013) [15], D. Lvov (2005) [16], V. Plotnikov (2014) [17], who considered possible innovative approaches to the national machine-building industry developing.

Both foreign and Russian scientists attempted to specify main innovation-focused strategies for advanced management in machine-building industry.

**4. Purpose.** The research was intended to elaborate an algorithm for assessing the rate of innovation-driven growth of a machine-building company.

**5. Results.** Strong interdependence and interrelatedness of machine-building with other branches of the national economy is manifest. Consequently, innovative development of the industry is considered to be a core driver for sustainable progress of the whole country and innovative advancement in a national scale.

It is essential that development of innovative infrastructure for machine-building enterprises follows the prospective reform stages and focuses on implementation of innovative solutions [18]. Therefore, it is to meet the trends of the do-

Tab. 1: Key figures to indicate the current state of machine-building industry in the world market, 2014

Indicator	EU	China	US	Japan
Gross output value, milliard USD	502.1	480.6	221.6	151.9
Labour human resources, thousand people	2,900	6,113	1,130	685
Productive capability rate, USD	54,290	26,399	91,125	96,700
Performance rate, USD	0.61	0.14	0.44	0.34

Source: Compiled by the authors based on the data of Eurostat, National Statistical Bureau, IFO Institute

mestic machine-building market development which are geared to launch national machine-building enterprises into world market. The process also involves taking the specific aspects of power generating, distribution as well as performance of retail and engineering companies into account.

An algorithm to assess the level of machine-building enterprise's innovative development is presented in Figure 1. The algorithm design rests on methodology proposed by A. Batashova (2012) [19] and A. Chaplina (2010) [20] in their research works.

As an example of practical application of the algorithm, we used it as a tool to evaluate the rate of innovative development of «Industrial Machinery Plant» Ltd (<http://prommashzavod.ru>) which is among the leading regional machine-building enterprises in Kursk region.

As a result of the assessment involving steps 1, 2 and 3 of the algorithm, we revealed and studied the key factors which condition the environment for innovative changes at

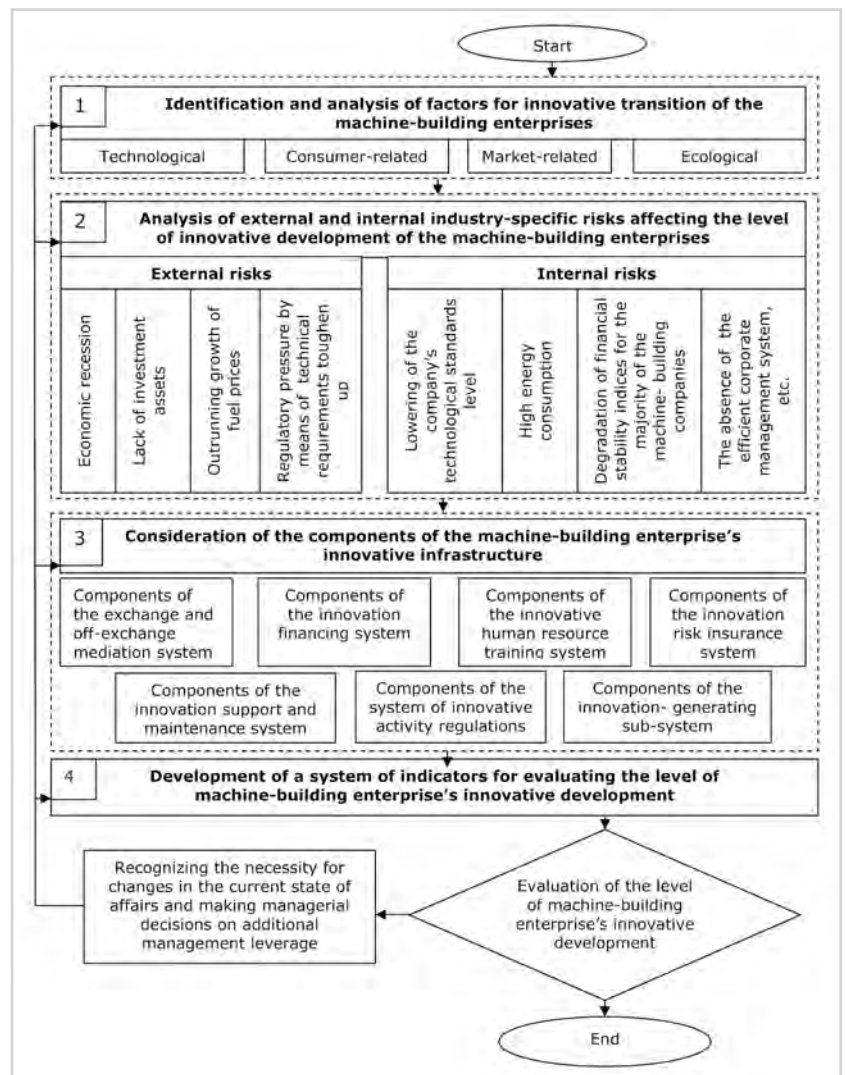


Fig. 1: Algorithm for the level of machine-building enterprise's innovative development evaluating

Source: Compiled by the authors

the enterprise (high level of fixed capital consumption, the possibilities and obstacles to entrance into market, high labour consumption of the product). The external risks are the following: low investment attractiveness of the enterprise and outstripping growth of fuel prices, which has aggravated the main internal risk for machine-building companies, that is, high energy consumption.

The fourth step of the algorithm proposes a system of indicators which allows us to evaluate the level of innovative development of the enterprise studied (Table 2).

The overall evaluation of readiness to implement an innovation-boosting business strategy is presented as a weighted average score calculated according to the following formula:

$$\bar{s} = \frac{1}{m \cdot n} \sum_{i=1}^m k_i \sum_{j=1}^n s_{ij}$$

where  $S_{ij}$  is a score given by a  $j$ -th expert according to his/her evaluation of the degree of  $i$ -th indicator manifestation;  $n$  is the number of experts;  $m$  is the number of indicators considered;  $k_i$  is the coefficient of  $i$ -th indicator significance.

The value obtained (0.3867) lies within the 0-0.5 interval and refers to a moderate rate of readiness to implement an innovation-boosting business strategy. Thus, it is possible to come to a conclusion that «Industrial Machinery Plant» Ltd is

ready for implementation of innovative strategies, which, in turn, will foster its market competitiveness.

The algorithm is deemed to allow estimating of innovative capacity of a machine-building enterprise and also makes it possible for a prospective investor to compare rates of innovative capacity within a pool of different enterprises.

Enterprise-scale assessment gives an insight in both strengths and weaknesses of enterprise's innovative capacity and provides a basis for discerning possible strategies for its enhancement [21].

Advancement of innovative approach to enterprise management fosters the efficiency of the national economy and raises its key indicators. It allows working out of various scenarios for strategic machine-building complex development [22].

The analysis of the current state of affairs in national machine-building revealed a number of problems within the industry which involve low investment attractiveness, broken or disrupted branch-wide ties among the participants of the integration process and insufficient state support. All the factors taken together determine the need to implement the concepts of strategic innovative enterprise management into the framework of the national machine-building industry.

**6. Conclusion.** The rate of machine-building industry innovative development is determinant to ensure growth of its competitiveness in both foreign and domestic markets. Due innovative capacity fulfilment fosters strengthening competitive advantages of an enterprise.

The article proposes an algorithm to assess a rate of machine-building enterprise's innovative development. It is deemed to be instrumental to evaluating innovative capacity of an enterprise, which is an essential prerequisite in order to ascertain its growth prospects and elaborate a strategy for innovation implementation.

In the authors' opinion, most prospective lines of innovative management of a machine-building enterprise are the following:

- well-reasoned and conscious selection of objectives and goals of enterprise development;
- establishing of well-balanced correlation between an enterprise and its external environment, controlling and controlled subsystems, which shapes optimum conditions for enterprise performance and development;
- individual approach to working out strategy business models.

Tab. 2: The rate of readiness of a machine-building company to implement an innovation-boosting business strategy (by the example of «Industrial Machinery Plant» Ltd)

Indicators of innovative development rate	Score $S_{ij}$	Coefficient $k_i$	Evaluation result (S)
The main company mission	4	1	Is not fully manifested
Distinctness of company strategies and goals	3	2	Is weakly manifested
Availability of a reliable vehicle for collecting, analyzing and processing information	3	1	Is weakly manifested
Activities towards enhancement of innovative attractiveness of the company	4	3	Is not fully manifested
Adaptability of the company to potentialities	3	2	Is weakly manifested
Focus on fulfilment of the company strategic goals within its current management framework	2	1	Is not manifested
Index of work process automation	3	1	Is weakly manifested
Production process automation	4	3	Is not fully manifested
Level of mechanization	3	2	Is weakly manifested
High standards of corporate culture	4	1	Is not fully manifested
Summarized rate (score)	X	X	0.3867

Source: Authors' own research and calculation

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