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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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.

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

<table>
<thead>
<tr>
<th>Indicator</th>
<th>EU</th>
<th>China</th>
<th>US</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross output value, milliard USD</td>
<td>520.1</td>
<td>480.6</td>
<td>223.6</td>
<td>151.9</td>
</tr>
<tr>
<td>Labour human resources, thousand people</td>
<td>2,900</td>
<td>6,113</td>
<td>1,130</td>
<td>685</td>
</tr>
<tr>
<td>Productive capability rate, USD</td>
<td>54,290</td>
<td>26,399</td>
<td>91,125</td>
<td>96,700</td>
</tr>
<tr>
<td>Performance rate, USD</td>
<td>0.61</td>
<td>0.14</td>
<td>0.44</td>
<td>0.34</td>
</tr>
</tbody>
</table>

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

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.


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 domestic 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. Batašhova (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...
the enterprise (high level of fixed capital consumption, the possibilities and obstacles to entrance into market, high labor productivity 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:

\[ S = \frac{1}{m - n} \sum_{i=1}^{m} k \sum_{j=1}^{n} s_{ij} \]

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; \( k \) 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-wise 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 fulfillment 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 enterprise to implement an innovation-boosting business strategy (by the example of «Industrial Machinery Plant» Ltd)

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

Source: Authors’ own research and calculation

Reference