DEVELOPMENT OF HIGH-TECH ENGINEERING COMPANIES IN RUSSIA

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Abstract

The goal of the paper is to determine challenges and obstacles to the development of high-tech engineering companies in Russia and define mechanisms of the development of high-tech engineering companies, which would take into account the current state of the Russian economy, the accumulated potential for the scientific and technical progress and national specifics of innovation development. Achieving the goal of the paper is based on the results of the authors' research focused on the development potential of Russian engineering companies with regard to political, economic, social, technical, legal and cultural factors. The results show that main obstacles to the development of high-tech engineering companies in Russia include high monopolization and specialization of production, ineffective state and regional support, low investment attractiveness of engineering or reduction of expenses on research and development. The results support the assumptions that main macroeconomic conditions for the development of high-tech engineering companies in Russia include increase in the number of industrial clusters and regional technology platforms that act as local regulators of production and consumption of high-tech products. The authors suggest organizational and economic mechanisms of the development of high-tech engineering companies in Russia.

Key words: high-tech companies, mechanical engineering, Russian Federation

JEL Code: L50, L52, O32

Introduction

Turbulence and instability of external conditions are the main attributes of the economic development of many countries (Šikýř, 2015). This requires supporting the competitiveness of high-tech industries that develop innovations and high technologies (Korshunova & Bušina, 2015) that allow overcoming the negative external trends in the economic development and reducing the negative externalities (Kucharčíková, Tokarčíková, & Ďurišová, 2015).

A special place among many high-tech industries has mechanical engineering, because it plays an important role in the development of innovations and technologies and represents

a driving force behind the development of other sectors of the economy. It acts as a catalyst for accelerating the scientific and technical progress and the application of new technologies that serve as an incentive to change the orientation of the Russian economy from export to innovation activities.

The need for accelerated modernization of the Russian economy by supporting the development of high-tech companies, innovation activities and modern technologies requires new scientific and industrial policy focused on innovative and technological modernization of the whole economic environment (Izmailova, Reshetova, Rukina, Seifullaeva, & Yunusov, 2016). The development of high-tech companies must be based on an analysis of their business conditions (Liang, 2016), their business models (Weiblen, 2014) as well as their business strategies (Gorokhova & Sekerin, 2016).

1 Goal and method

The goal of the paper is to determine challenges and obstacles to the development of high-tech engineering companies in Russia and define mechanisms of the development of high-tech engineering companies, which would take into account the current state of the Russian economy, the accumulated potential for the scientific and technical progress and national specifics of innovation development.

Achieving the goal of the paper is based on the results of the authors' research focused on the development potential of Russian engineering companies with regard to political, economic, social, technical, legal and cultural factors. The research was carried out in large engineering companies. The results showed the current unfavourable development of the Russian economy as well as the lack of mechanisms of the development of high-tech engineering companies.

The research was based on theoretical methods of scientific knowledge, particularly methods of analysis, synthesis and deduction, as well as on methods of empirical research, which allow authors to understand many of the problems and obstacles to the development of high-tech engineering companies in Russia. The qualitative characteristics of the impact of science, technologies and innovations on the development of high-tech engineering companies were identified with the help of economic instruments. The generalization of empirical results about the impact of the high-tech engineering on other sectors of the economy was done through logical methods.

The current results of the authors' research are summarized in two monographs published in 2017. The first one demonstrated the need to enhance the immunity against instability of the external environment (Veselovsky et al., 2017a). The second one indicated steps to overcome the turbulences of the economy, which include greater support for the development of the innovative environment and high-tech companies (Veselovsky et al., 2017b).

2 Results

The results of the authors' research are summarized and discussed in three parts, focusing on 1) the status of the high-tech engineering and its impact on the economic development, 2) problems of the development of high-tech engineering companies, and 3) mechanisms of the development of high-tech engineering companies.

2.1 The status of the high-tech engineering and its impact on the economic development

The engineering is a manufacturing industry focused on the production of machinery and equipment. By developing new machinery and equipment, it accelerates the development of other sectors. By applying the results of modern science and technology, it stimulates the utilization of available resources and accelerates the function of reproductive processes, which forms the basis for the production of high-tech products. The Global Innovation Index in Russia for 2015 was 38.5, which corresponded to 43rd place (Dutta, Lanvin, & Wunsch-Vincent, 2016). The Russian's innovation rating remains extremely low.

In relation to the innovative transformation of the Russian economy the high-tech engineering seems to be a main driver of the introduction of new technologies. Technological innovations are the basis for the sustained competitiveness and continuous development of high-tech companies (Liang, 2016). However, the process of the development of technological innovations is influenced by many unpredictable factors.

In recent years, despite several measures of the Russian government, the introduction of innovations in engineering companies stagnates. A positive progress is noticeable only in companies producing electronic and optical equipment, where a growing number of developed advanced manufacturing technologies between 2010 and 2015 increased to 192%, reached the level of 149 units and led to an increase in the share of innovative products to 13.8% of total production (see tab. 1).

Tab. 1: Technological innovations and production of innovative products of engineering industries

Indicator	2010	2011	2012	2013	2014	2015
The share of organizations introducing technological innovations (of the total number of surveyed organizations) across the Russian Federation by economic activities (%)						
Production of machinery and equipment	14.8	15.3	14.8	14.9	14.6	12.9
Production of electronic and optical equipment	24.3	24.9	26.5	25.9	27.0	26.5
Production of motor vehicles and equipment	19.0	19.7	20.8	20.4	19.4	16.9
The number of developed advanced manufacturing technologies across the Russian Federation by economic activities (units)						
Production of machinery and equipment	34	42	50	64	44	34
Production of electronic and optical equipment	51	68	76	109	127	149
Production of motor vehicles and equipment	70	54	36	40	50	54
The volume of innovative products and services across the Russian Federation by economic activities (%)						
Production of machinery and equipment	6.5	5.9	6.0	6.2	5.3	5.2
Production of electronic and optical equipment	10.0	9.1	9.7	10.7	12.9	13.8
Production of motor vehicles and equipment	17.1	18.9	26.2	28.1	24.1	23.7

Source: authors based on data from Veselovsky et al. (2017b)

Since the development of the high-tech engineering is a natural consequence of the development of science and technology, the expenditures on the development of scientific knowledge tend to grow, which is reflected in the continuous growth of high-tech industries and expenditures on science, research and education. However, the share of Russian companies on the market of innovative products, which is estimated at about 0.3% of the world market, is very low. Many high-tech engineering companies lack people and knowledge for the efficient production of innovative products. Despite the fact that in Russia there is a relatively large demand for high-tech products, these products are mostly imported. Many industrial companies, including high-tech engineering companies, favour so-called product innovations, it means buying ready-made products. The share of expenditure on the development of technological innovations in the Russian industry is less than 10%, whereas in most European Union countries it is from 40 to 75%.

The development of the high-tech engineering is an important aspect of the development of the Russian economy and its innovative orientation. The technological progress and continuous development are important for both the industrial companies and the economy as a whole.

2.2 Problems of the development of high-tech engineering companies

Dealing with problems of the development of high-tech companies and industries is important because of their importance for the continuous development of the Russian economy. They support and ensure higher living standards through a series of intensive factors: increasing of labour productivity, decreasing relative level of consumption, efficient use of non-renewable natural resources.

The development of high-tech engineering companies is negatively affected by the cyclical nature of the economy and unfavourable market conditions. The problems that limit the development of Russian high-tech engineering companies include: the low rate of modernization of the basic means of production and the purchase of equipment from foreign companies, which have a wide range of technological innovations and marketing techniques to promote high-tech products; the decline of the Russian economy, the slowdown of the socio-economic development of the society and the slow replacement of outdated technologies; the uncertain state investment in high-tech engineering and the lack of interest in long-term investment projects by the Russian financial capital.

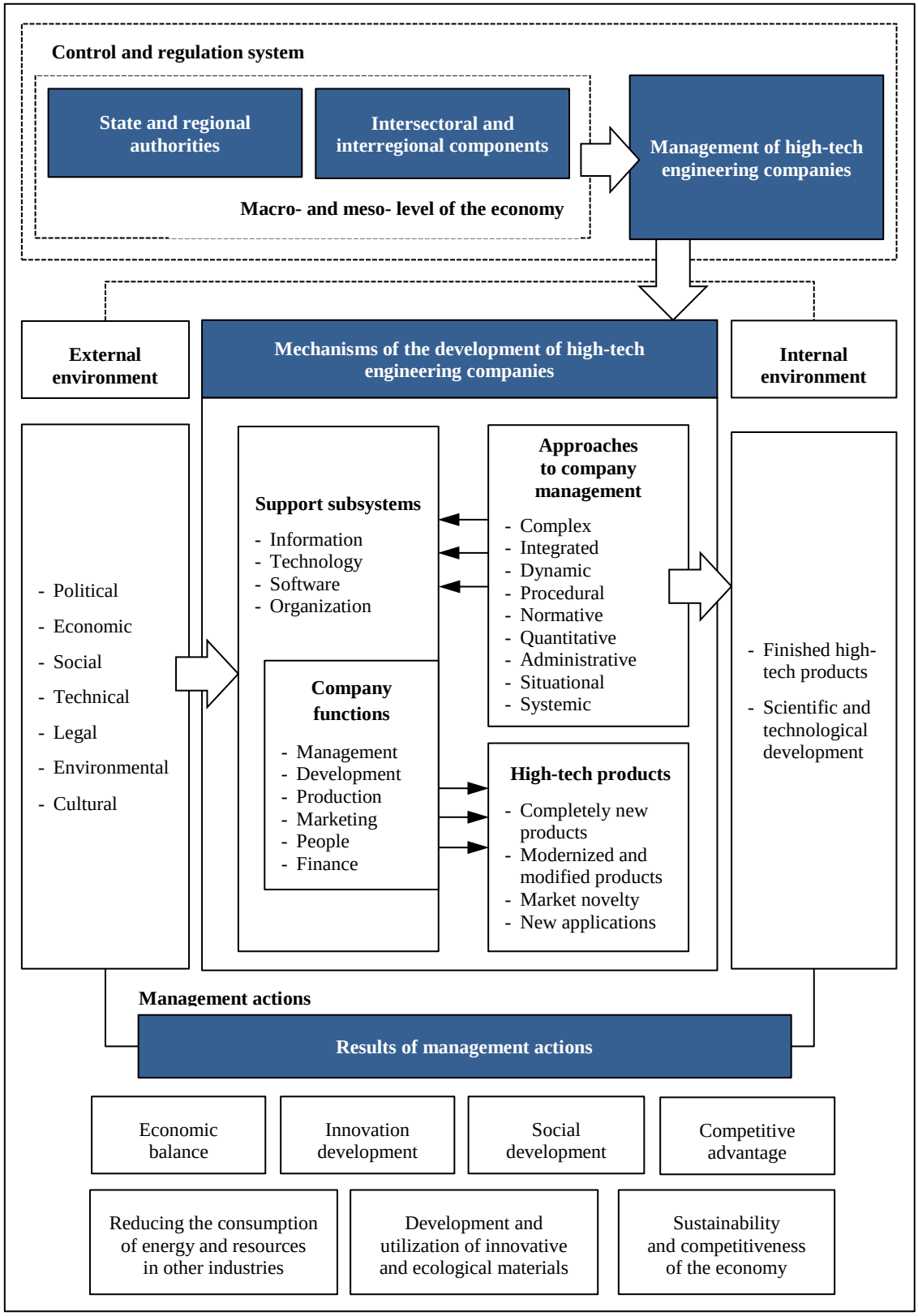
Russian engineering companies have a significant potential to produce high-tech products, but they do not use it fully. The problem is an underdeveloped international marketing. Currently, most engineering companies have no experts who could effectively introduce high-tech products on the market. The excessive unification of products leads to ambiguous consumer interests. In this context, it is necessary to focus on specific consumers and their needs.

Currently, there are already experiences with fiscal stimulation of the development and introduction of new technologies in Russia. However, the state support for the development and introduction of new technologies is not large. Abroad, the development and introduction of new technologies is mainly financed via venture capital. The scientific and technological project realized by high-tech companies should be structured hierarchically according to their priority.

2.3 Mechanisms of the development of high-tech engineering companies

Currently there are many tools to support the development of high-tech industries. Some are based on forecasting of technological development (Gorokhova, Šafránková, & Sekerin, 2015). Others are based on estimating the risk of innovation activities (Liang, 2015). In this context, the authors of the paper define specific mechanisms of the development of high-tech engineering companies (see fig. 1).

Fig. 1: Mechanisms of the development of high-tech engineering companies



Source: authors

The purpose of these mechanisms is the development of high-tech engineering companies, in line with the development of science and research, technologies and innovations. These mechanisms are based on a systematic approach and predetermined and stochastic relations of economic phenomena that occur in a time sequence. The process of the development of these mechanisms is associated with operation of organizational systems within a general model of state regulation. Currently, many engineering companies in the Russian Federation occur in a state of mixed ownership, where a large share of the capital belongs to the state. This means that the state acts simultaneously as a regulator and as a shareholder.

Defined mechanisms include a fairly comprehensive set of procedures, rules and instructions that guide behaviour of people who make decisions at each stage of operating of the organization. Their application requires coordinated, progressive and transparent management practices. The purpose of the application of these mechanisms is to achieve the sustainable development of industrial companies in accordance with the strategic objectives of the industrial sector of the economy, to meet the interests of the state and its citizens, to develop the potential of industrial companies and to rationally utilize available resources.

The desired result of the application of defined mechanisms is the improvement of financial and economic results of industrial companies, which significantly affect the development of the national economy.

Conclusion

The development of high-tech engineering companies is a challenge, but overcoming it will allow to domestic high-tech companies to gain a stable position on the Russian and world markets.

In relation to the innovative transformation of the Russian economy the high-tech engineering seems to be a main driver of the introduction of technological innovations that are the basis for the sustained competitiveness and continuous development of high-tech industries. However, the development of Russian high-tech engineering companies is negatively affected by the cyclical nature of the economy and unfavourable market conditions.

The problems that limit the development of Russian high-tech engineering companies include: the low rate of modernization of the basic means of production and the purchase of equipment from foreign companies, which have a wide range of technological innovations and marketing techniques to promote high-tech products; the decline of the Russian economy, the slowdown of the socio-economic development of the society and the slow replacement of

outdated technologies; the uncertain state investment in high-tech engineering and the lack of interest in long-term investment projects by the Russian financial capital.

The main purpose of defined mechanisms of the development of high-tech engineering companies is to create favourable conditions for the effective operation of high-tech engineering companies within the Russian economy by optimizing the cooperation of stakeholders, improving the competitiveness of the domestic economy and reducing dependence on external factors. Defined mechanisms were tested in the research work of master's and doctoral students of the University of Technology in high-tech engineering companies in Korolev.

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