

Regional Industrial Complex as a Driver of Innovation Development of Industrial Production and Services

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Abstract

Contemporary challenges of the socio-economic development of Russia, including ensuring the sustainability of economic growth, effective regulation and the sustainable use of resources, define the priorities of the innovation market modernisation. When solving tasks associated with Russia's economic recovery and the sustainable development of the national economy, high priority should be given to innovation activity and innovation in a regional industrial complex that can provide an upgrade in the technological and technical base of industrial production, infrastructure and services. The development and production of competitive products, as well as sustainable penetration and presence in the world markets of goods and services, are of great importance. First of all, this requires systemic changes in all spheres of the region's public and economic life. At the same time, the industrial complex combining the region's main resource potential drives the innovative development of industrial production and the services sector. Here, it is important to ensure the dynamics of comparable innovative development of the production and infrastructure complex. Otherwise, the sectoral imbalance will affect the sustainability of the regional economy. In addressing these problems, the formation and development of industrial complexes as the innovative development driver and the basis for increasing the competitiveness of the regional economy are important.

Key-words: Industrial Production, Infrastructure, Innovation Development Management, Services Sector, Regional Industrial Complex.

1. Introduction

Several scientific publications investigated the issues of managing the innovative development of the regional industrial complex. For a comprehensive analysis of this type of problems and identification of innovative development “bottlenecks”, it is necessary to consider various data. The strategic objectives and priorities of planning and development of the Russian Federation were approved by the official documents [1-3]. Indicators of modern innovation are provided in the book [4]. Official data indicate an increase in the need for systemic changes in industrial production, but do not allow determining the tools to manage the innovative development of the industrial complex of the region. The scientific works [5, 6] provide the methodological approaches to the economy spatial development, stimulating an increase in the innovative activity of industrial enterprises. The specifics of the innovative development of the constituent entities of the Russian Federation are covered in the article [7]. The applied tasks of using innovations to ensure safe economic growth, including those in the regional industrial complex, are described in the authors’ research [8-10]. The monograph [11] is devoted to the concept of innovative development management of corporations with state participation. An analysis of the predecessors' work has shown that the study of the industrial complex as a driver for the innovative development of industrial production and the services sector, as well as the basis for increasing the competitiveness of the regional economy, was required.

Let consider the analysis of statistics on innovative activity in the industry to understand the need for managing the innovative development of the industrial complex of the region. The current level of innovation activity of domestic organisations related to industrial production is 10.6 %, while that of the services sector organisations is 7.3 % [4]. At the same time, the share of organisations engaged in technological innovation is the highest one (9.6 % of industrial production versus 6.3 % of the services sector), whereas marketing (1.8 % versus 1.2 %) and organisational (2.8 % versus 2.0 %) innovation resources have been allocated on a residual basis.

On the one hand, this is understandable, since technological innovations play the greatest role both in industrial production and in the services sector. They make the greatest contribution to the increase in the added value of goods and services. On the other hand, despite the dependence of the development of the services sector on the sustainable growth dynamics of the region's industrial production, it is quite true that there are negative trends in the development of an unbalanced economy. Most regions with a sectoral economic imbalance in terms of priority development of the production and/or infrastructure complex and the services sector are the subsidised ones. At the same time, an

imbalance of the production complex has lower risks for the pace of the region's sustainable economic growth.

The innovation costs by type of innovation activity incurred by domestic organisations in 2017 are shown in Table 1 [4].

Table 1. The costs of innovation by type of innovation activity incurred by domestic organisations in 2017

Indicator	Production		Services sector	
	RUB bln.	%	RUB bln.	%
<i>Costs of innovation, of which:</i>	856.79	100.0	543.99	100.0
I. Marketing innovation	3.27	0.4	0.84	0.2
II. Organisational innovation	5.48	0.6	2.21	0.4
III. Technological innovations, including:	848.05	99.0	540.94	99.4
•Research and development	183.17	21.6	407.21	75.3
•Design	12.85	1.5	4.08	0.8
•Acquisition of machinery and equipment	429.78	50.7	41.92	7.8
•Acquisition of new technologies	12.27	1.4	2.03	0.4
•Software acquisition	13.28	1.6	14.88	2.8
•Engineering	114.6	13.5	24.62	4.6
•Personnel education and training	1.43	0.2	0.49	0.1
•Marketing research	0.43	0.1	4.39	0.8
•Other expenses	80.25	9.5	41.30	7.6
<i>The distribution of costs for technological innovation by sources, including:</i>				
•Equity funds	577.40	68.1	157.74	29.2
•Federal budget	76.04	9.0	302.97	56.0
•Budgets of constituent entities of the Russian Federation and local budgets	2.91	0.3	3.48	0.6
•Other sources	191.7	22.6	76.75	14.2

The analysis of the statistical data on the organisation's innovative activities related to industrial production and the services sector made it possible to justify the need to manage the innovative development of the regional industrial complex. Management of innovative development of the regional industrial complex should act as a driver of sustainable growth and sectoral balance in the development of the region's industrial production organisations and services sector.

The functions of managing the innovative development of the regional industrial complexes make it possible to talk about the mutually beneficial and interconnected influence that the regional industrial complexes and the innovation market have on each other. This is due to both the influence of industrial complexes on innovation product markets and the impact of the innovation market on resource markets, which are required for the implementation of innovative projects and the comparable development of the region's industrial production organisation and services sector. As a result,

industrial complexes and the innovation market get the opportunity to influence each other through a system of resource flows and by influencing the innovation commercialisation.

Since organisations within the regional industrial complex are associated with the main processes of its innovative development, they begin to exert an increased influence on the products innovativeness and the external environment of the complex under study. Moreover, the industrial complex today is mostly focused on the formation of a controlled and sustainable external institutional and innovative environment.

In general, the analysis of the scientific literature and statistical information shows the need to develop methods and tools for managing the innovative development of the industrial complex of the region, the presence of which will "make" it the driver of the innovative development of industrial production and the services sector.

To solve this problem, the following has been done:

- a review of the scientific literature was conducted and the need and prerequisites for the introduction of methods and tools for managing the innovative development of the industrial complex of the region were identified;

- theories related to the object of study were considered, which allowed structuring the goals, principles and methods of managing the innovative development of industrial complexes in the region;

- five types of influence of the industrial complex on the conditions for the innovative development of industrial production and the services sector in the region were identified; for each of them, the corresponding prerequisites and criteria characterising the type of managerial impact were identified;

- a general outline of the adaptive system for managing the innovative development of industrial complexes in the region was proposed, requiring for a detailed methodological and practical study, as well as the construction of an appropriate organisational mechanism for the system.

2. Methods

The main theories allowing understanding the possibilities of the influence of the regional industrial complex on the innovative development of industrial production and the services sector are those of the knowledge economy, innovative economy, information economy, communication economy, creative economy, new economy, and intellectual economy. A critical assessment of these

theories made it possible to formulate objectives, principles, and methods for managing the innovative development of the regional industrial complexes (Table 2).

Table 2. Objectives, principles, and methods of innovation development management of the regional industrial complexes

Theory	Objectives	Principles	Methods
Knowledge economy	<ul style="list-style-type: none"> • to form a new type of primary link of industrial production; • to overcome the technical difficulties of implementing a wide range of trading operations related to innovative products; 	<ul style="list-style-type: none"> • horizontal dissemination of knowledge in economic systems; • the participation of workers in improving productivity and quality of labour; • reorganisation and reconfiguration of research structures; 	<ul style="list-style-type: none"> • accelerating the pace of scientific and technological progress; • balancing the processes of complication and appreciation of new technologies; • regulation of systemic changes, the structure of employment and the qualitative characteristics of the workforce;
Innovative economy	<ul style="list-style-type: none"> • change of combination of components in the system of productive forces; • growth in the share of non-material forms of wealth. 	<ul style="list-style-type: none"> • increasing the interest of innovation market actors in the results; • increasing production efficiency; • synergy of interests of the innovative relations subjects. 	<ul style="list-style-type: none"> • the embodiment of ideas in specific innovations; • increasing the mass of consumer value of innovative products; • resolution of contradictions in the interests of participants in innovation processes.
Information economy	<ul style="list-style-type: none"> • quick entry of innovation market entities to world markets due to the availability of the technology; • increasing the share of developments of innovation market entities in global technology markets in terms of sales of licenses for innovative technologies. 	<ul style="list-style-type: none"> • active use of educational information technologies; • developing high-speed innovation data transmission channels; • concentrating licensing operations of the innovation market entities. 	<ul style="list-style-type: none"> • systemic formation and development of information potential; • developing the information technology market; • ensuring mutually beneficial and strategic cooperation in the implementation of informatisation processes.
Communication economy	<ul style="list-style-type: none"> • generating the distributed flows of information resources for organising the work of the innovation market entities; • managing and control over the communication processes through the formation of the culture of sustainable use of analytical information for innovation. 	<ul style="list-style-type: none"> • the impact of communication density on innovation; • creating the regulatory space for innovation; • studying social and cultural aspects of communicative support of innovation market entities. 	<ul style="list-style-type: none"> • the effective and coherent liberalisation of communications; • stimulating the forms of electronic commerce; • developing technological culture value.
Creative economy	<ul style="list-style-type: none"> • changing the paradigm of consumer behaviour; • changing the role and functions of economic, political and social institutions responsible for creating a favourable innovation environment. 	<ul style="list-style-type: none"> • creating new creativity systems in the field of technologies and products; • creating effective production models; • developing social and cultural conditions 	<ul style="list-style-type: none"> • venture financing of innovation; • organising lean production; • contract manufacturing.

		conducive to the creativity of innovation market entities.	
New economy	<ul style="list-style-type: none"> • accelerated development of innovative infrastructure; • creation and testing of a system of incentives for innovation, determined by the distribution of income among different innovation market actors. 	<ul style="list-style-type: none"> • improving the innovation environment through the stimulation of innovative systems; • supporting the "leading" markets most susceptible to innovation; • stimulating innovation in the public sector. 	<ul style="list-style-type: none"> • program-targeted innovation management; • commercialisation of innovation results; • increasing the speed of innovation; • creating a system of motivational mechanisms for updating technologies.
Intellectual economy	<ul style="list-style-type: none"> • laying the foundation for optimising the system of social and economic interests of innovation market entities. 	<ul style="list-style-type: none"> • creating a highly effective system of corporate discourse; • the market-functional analysis of expanded reproduction; • ensuring multi-level capitalisation of knowledge. 	<ul style="list-style-type: none"> • consuming creativity in the development and implementation of innovations; • production intellectualisation; • forming an intellectual leader.

The combination of the above objectives, principles, and methods of managing innovative development targets the regional industrial complexes to the improvement of the innovation culture in economic relations at all stages of the gross domestic product reproduction and levels of the regional economy management that can significantly increase the efficiency of organising innovative activities in the complex under study. It can also ensure the growth of the competitiveness of industrial production and services sector in the region.

3. Results

Let us assess the impact of the industrial complex on the conditions for the innovative development of the region's industrial production and the services sector. The technological, modernising, competitive, organisational and integration nature of the impact of the industrial complex on the innovative development of the industrial and the services sector enterprises in the region should be highlighted. For each nature, there are the relevant prerequisites and criteria, which are summarised in Table 3.

Table 3. Methodological prerequisites and criteria for the impact of the industrial complex on the conditions for the innovative development of the region's industrial production and services sector

Nature	Prerequisites	Criteria
Technological	Involvement of intellectual property rights in the economic turnover;	Reduction in technological innovation costs;
	Creating entrepreneurial structures in the industrial complex;	Growth in the number of entrepreneurial structures in the innovation market;
	Accelerated development of innovative infrastructure;	The level of infrastructure support for the industrial complex;
	Innovative entrepreneurship training and staff development;	Inventive activity;
	Innovative development of economic sectors contributing to the growth of their resource base and competitiveness.	Share of the industrial complex in the market of high-tech goods and services.
Modernising	Changing technical regulation of the industrial complex;	Volume and intensity of technological innovation costs;
	Regulating local markets for innovative goods and services;	Formation and development of technological platforms;
	Formation of markets for innovative goods and services;	Dynamics of the number of markets for innovative goods and services;
	Increased research costs;	Effectiveness of the research implementation;
	Formation and development of innovation and implementation clusters.	Volumes of competitive financing of innovative developments.
Competitive	Development of the innovation environment and conditions for innovation;	The proportion of high-tech and knowledge-intensive equipment;
	Encouraging innovators and ensuring fair competition;	Number of preferences for innovators and volume of claims to competition policy;
	The motivation of innovative activity;	Management and technological solutions;
	Increasing labour productivity in high-tech sectors.	Labour productivity dynamics.
Organisational	Improving the innovation culture and prestige of innovators;	Measures to promote the innovation results in the media;
	Strengthening institutional structures related to knowledge generation;	The relevance of research and development results;
	Training for the innovation market of highly qualified personnel;	Number of institutions implementing educational programs for the innovation market;
	Strategic management of innovation.	The number of innovation development and support programs.
Integration	Improving investment climate;	Barriers to innovation;
	Association of business, science, and the state;	The scope of scientific and industrial cooperation;
	Spread of innovation;	Innovation transfer volumes;
	Supporting external innovation export;	Volumes of external exports of innovation;
	Intensifying international scientific and technical cooperation.	The number of international agreements in the field of scientific and technical cooperation.

First, it is necessary to note the technological nature of the influence due to statistical data and historical circumstances: the industrial complex is a carrier of a significant part of the resource potential of the region's economy. This influence is due to the specifics of the network interaction of the enterprises within the industrial complex, which simplifies innovative development by creating the shared knowledge centres for the results of innovative activities and a simplified transfer of innovations. At the same time, the management of innovative development of the regional industrial complex is effective due to the wider coverage of production and infrastructure processes. As a result, there is the growth of the level of technological development of all organisations of industrial production and the services sector, both those within the regional industrial complex and those interacting therewith.

The modernising nature of the impact of the industrial complex on the conditions for the innovative development of the region's industrial production and services sector is associated with the fact that the industrial complex has sufficient resource potential for the acquisition and development of high-quality production tools, the formation and implementation of innovative development programs. Modernisation and technological updating of production and infrastructure facilities contribute to the comprehensive development of the region and ensure the sectoral balance of the economy thereof. As a result, industrial complexes are experiencing an accelerated improvement of production capacities, which positively influences the region's innovative development of industrial production and services.

The competitive nature of the industrial complex influence on the conditions for the innovative development of the region's industrial production and the services sector is associated with the results of the modernisation of the technical and technological base that allows reducing the cost of manufacturing products (works, services) and gaining competitive advantages. Competitive advantages ensure the sustainable use of market management tools. As a result, the industrial complex provides the most sustainable use of the resource potential, forms more transparent pricing mechanisms, and contributes to the continuous growth of the competitiveness of the manufactured product.

The organisational nature of the impact of the industrial complex on the conditions for the innovative development of the region's industrial production and the services sector depends on the possibility of using systemic links of the complex under study. The sustainable interaction both between participants in the regional industrial complex and with other organisations of industrial production and the services sector allows accelerating the transfer of experience, forming the instrumental and methodological basis for managing the innovative activity, and also ensuring the improvement of

labour and employment factors in the region. As a result, industrial complexes provide an increase in the effectiveness of industrial production organisations and services in the region.

The integrated nature of the impact of the industrial complex on the conditions for the innovative development of the region's industrial production and the services sector is associated with an increase in the level of their innovative activity and general innovativeness. The degree of integration of innovative processes allows the industrial complex to provide a synergistic effect from the development of new technologies and the use of modern tools for managing the innovative development of production and infrastructure. As a result, industrial complexes contribute to increasing the share of production of innovative products, as well as the number of innovative developments of the region's industrial production and services sector entities.

The prerequisites and criteria for the impact of the industrial complex on the conditions for the innovative development of the region's industrial production and the services sector should be considered when managing innovative development. This will increase the innovative activity and added value of products (works, services) of all economic entities involved in the innovation activity of the socio-economic system under study.

4. Discussion

The main structural problem of the innovative development of the regional industrial complex in the subsequent 5 – 10 years is linked to the need for the industrial production gross domestic product to "fill in" the niche that is now engaged in the resource and commodity sector of the economy (in particular, fuel and energy enterprises). This issue of filling in a niche is the ambiguous one and requires significant resource and legislative efforts. Ideally, there exists the necessity of the intensified use of innovative technologies by manufacturing enterprises with the establishment of the strategic priority of creating high-tech production plants and infrastructural facilities, and those of the services sector. However, all of the above related to the impact of the industrial complex on the conditions of innovative development of the region's industrial production and services sector allows concluding that high-tech production based on the active use of the innovation will serve as the foundation. Moreover, it will maintain a high growth rate of gross domestic product (as the active, influential structural elements) only after 5 – 7 years of innovative development of the complex considering the timing practical application of the innovation plans proposed.

Soon, the innovative development of the regional industrial complex will be mainly associated with traditional raw material sectors of the economy and with individual services sector areas. As a result, the process of replacement of the commodity sector with new industries and the development of the infrastructure segment of the national economy will be slow enough. Therefore, one should not expect a significant breakthrough based on increasing innovative activity and creating an adaptive innovative space. In this economic context, the most effective and real way is to consolidate creative small innovative enterprises around integrated structures, including providing support for these processes from government bodies. The modern practice of ensuring innovative development requires the development of an adaptive system for managing the innovative development of the regional industrial complex. It is the development of an adaptive system, and not the traditional support for the publicly-owned corporations that does not lead to the proper efficiency and effectiveness of investments in the creation of innovative products and services.

It should be noted that this is the general contour of the adaptive system that requires a detailed methodological and practical study, and in particular, the construction of an organisational mechanism appropriate for the system. In the framework of the organisational mechanism to manage the innovative development of the regional industrial complex, it is necessary to talk about the need to intensify the organisational and structural reserves to accelerate the modernisation of industrial production associated with the capital pooling, accumulation of innovative and production potentials, and strengthening the commitment of the industrial complex to the implementation of strategic innovative development aspects based on the use of adaptive structural forms of innovative processes.

It should also be noted that the impact of the industrial complex on the conditions for the innovative development of the region's industrial production and the services sector will represent a combination of regulatory influences to create an institutional environment. This will contribute to the formation of elements of the innovation infrastructure and the increase in the added value of the industrial complex and other entities of the region's industrial production and services through the introduction of innovations. Since regulatory impact will combine state and market management mechanisms, it becomes necessary to determine the parameters for their joint use, considering the current conditions of socio-economic development and the sustainable balancing of the socio-economic interests of the state, business, and society.

5. Conclusions

The concentrated and coordinated efforts for the innovative development of the industrial complex and positive impact thereof on the conditions for the innovative development of the region's industrial production and the services sector is necessary to ensure the strategy to increase the competitiveness of Russia's national economy. Here, the industrial complex plays an important role in intensifying innovative activity in industries and services sector. The structural formations implemented in this process take place based on the principles of the current market supply and demand. Such a market structure will be transformed into an element of strategic planning and market regulation of markets for innovative products and services while generating a long-term vision of the prospects for improving the efficiency of individual industrial enterprises.

Therefore, the success of implementing measures to concentrate and coordinate the efforts for the innovative development of the regional industrial complex will depend on the ideology of the national economy modernisation. It is very important today to form a plan of concentration and coordination of efforts on the industrial complex innovative development considering its impact on the conditions of innovative development of the region's industrial production and services sector. The basic documents for the formation of this plan should be the Federal Law "On Strategic Planning in the Russian Federation", the Strategy for Spatial Development of the Russian Federation until 2025, and the Forecast for the Long-Term Socio-Economic Development of the Russian Federation for the Period until 2030 [1-3].

In general, it can be confidently stated that the use of the methods and tools proposed in the study for managing the innovative development of the industrial complex of the region makes it possible to make a significant contribution to solving the problems of increasing the competitiveness of industrial production. The identified prerequisites for systemic changes in the development of industrial production and the services sector in the region, as well as the criteria characterising the type of their managerial influences, contribute to the formation of an adaptive management system. At the same time, the general outline of the system proposed in the study uses the organisational mechanism of adaptation to changing environmental influences, which allows the industrial complex to respond flexibly to changes in the external and internal environment while maintaining its competitiveness. The prospect of using such systems at the enterprises of the industrial complex of the region, as well as the necessity of further scientific research in this direction, are manifested.

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