

# Regional system of scientific and technological development of the industrial complex in the Russian Federation

## Sistema regional de desarrollo científico y tecnológico del Complejo Industrial de la Federación Rusa

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#### ABSTRACT:

The article highlights prerequisites for creation of a regional system of scientific and technological development of the industrial complex. The author's interpretation of the term 'system of scientific and technological development of the regional industrial complex' has been proposed. Structural elements of the system of scientific and technological development of the regional industrial complex have been considered, its goals and objectives have been defined, and the principles of its construction have been developed and systematized.

**Keywords:** scientific and technological development, regional industrial complex, system of scientific and technological development

#### RESUMEN:

El artículo destaca los requisitos previos para la creación de un sistema regional de desarrollo científico y tecnológico del complejo industrial. Se ha propuesto la interpretación del autor del término "sistema de desarrollo científico y tecnológico del complejo industrial regional". Se han considerado los elementos estructurales del sistema de desarrollo científico y tecnológico del complejo industrial regional, se han definido sus metas y objetivos, y se han desarrollado y sistematizado los principios de su construcción.

**Palabras clave:** desarrollo científico y tecnológico, complejo industrial regional, sistema de desarrollo científico y tecnológico

## 1. Introduction

Transformation of the technological factor into one of the main sources of economic growth in developed countries, a significant lag of Russia in the field of scientific and technological development, the economic sanctions imposed against Russia that primarily concern a prohibition on the transfer of modern technology have determined the need to radically revise Russia's economic development model, to focus on the development of science and the creation of advanced technologies.

Fundamental and applied science is essential to technological development, and its role in the transition to higher technological paradigms significantly increases. Recognizing this, the

governments in developed countries make strategic decisions aimed at stimulating the development of science, expand and strengthen international scientific and technological cooperation. Over the last several years top spenders on R&D (the share of the expenditures in GDP) have been: South Korea (the figure amounted to 4.04% in 2016), Israel (3.93%), Finland (3.55%), Sweden (3.41%), Japan (3.39%), Denmark (2.98%), Germany (2.92%), Switzerland (2.90%), the United States (2.77%), Austria (2, 39%) (PWC, 2017). Moreover, the developed countries do not rest on their oars (UNCTAD, 2007; INSEAD, 2015). Thus, in accordance with recommendations of the Committee for Prosperity in Globalized Economy, the US public investment in long-term fundamental research should grow by 10% per year. There are also plans to expand lending and to increase the R&D and education expenditures. Europe is taking similar measures. Approved in 2010, the new European strategy for economic development 'Europe 2020. A strategy for smart, sustainable and inclusive growth' provides for investing in research and development at the amount of 3% of the EU GDP. Large-scale efforts to stimulate the development of scientific research are being made by China where R&D expenditures are envisaged to increase by 10-15% per year (Silberglitt, 2006).

Russia's share in the global high technology market currently does not exceed 1%. However, according to the Director General of the Institute of Aviation Technologies, O.S. Sirotkin (2006), the country, nevertheless, has a basis for moving to the world market with 16-17 macro-technologies: aviation, space and nuclear technologies, shipbuilding, special metallurgy, etc. According to international estimates, the scientific and technical potential available in Russia is underutilized. Thus, according to the dynamics of scientific and technological development and taking into account institutional constraints until 2020 (Silberglitt, 2006), the advanced countries include: USA, Canada, Germany, South Korea, Japan, Australia, Israel; countries with a limited use of scientific potential are: China, India, Poland, Russia; lagging countries are: the Dominican Republic, Georgia, Egypt, Iran, Jordan, Kenya.

The country's leadership understanding of the current crisis in the industry that requires exceptional measures to rehabilitate industrial production on an advanced technological basis resulted in a number of strategic decisions aimed at developing the industry and increasing its competitiveness in 2014 and subsequent years. At the same time, importantly, the country's leadership has set a course for active involvement of the Russian Federation subjects in the development of industrial production and provided for expansion of their powers.

The Strategy for Scientific and Technological Development of the Russian Federation, approved in December 2016, (SNTR, 2016) has acquired the status of a key strategic document along with the National Security Strategy. President of the Russian Federation V.V. Putin has instructed the Russian Government to draft proposals on improving the state management and the state regulation of scientific and technological development, thereby noting the need to create a modern management system for scientific and technological development. The regional system of scientific and technological development of the industrial complex should become an integral part of the state management and the state regulation. The low level of scientific and technological development of the regions directly affects the quality of living, ecology, it creates structural imbalances, does not allow for full use of regional competitive. This determines the relevance of scientific and practical problems of the formation of a regional system of scientific and technological development.

What is meant by scientific and technological development is the process of improving the quality of human capital and technological changes in production capacities based on scientific research and creation of advanced production technologies, the use of which would allow them to manufacture competitive high-tech products (goods and services) and improve the production efficiency.

The goal of the research is to form a regional system of scientific and technological development of the industrial complex that would facilitate the effective interaction of science, business, authorities, as well as lay the necessary groundwork for interconnected technological development of production enterprises and industries located in the region in accordance with the priority areas of the scientific- technological development of the country and the region.

The research findings will lay a scientific groundwork for the development of research areas in regional aspects of the scientific and technological development and will serve as a basis for practical application by the Russian Federation subjects in the formation of a strategic management system for scientific and technological development.

The next section contains a scientific literature review. It is followed by a description of the materials and methods used. The results are presented subsequently. The last section contains conclusions.

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## 2. Literature review

Various aspects of scientific and technological development, including identification of trends, making predictions, and development of policies for its acceleration have been covered to some extent by many studies dealing with the issues of innovative development of both the country and individual regions. For example, a number of scientists (Belyakov, 2014; Burov, 2016; Ermakova, 2007; Tatarkin, 2015; Lopez-Claros & Mata, 2009) have identified the following trends in scientific and technological development: all industrial branches and sectors are characterized by an increased complexity of technological tasks, a growth of costs and risks, an increase in the science intensity of the technologies being developed; developing integration processes in research and development, expanding international cooperation in the scientific and technological sphere; the majority of the developed countries concentrate their efforts on certain scientific and technological areas, which enables them to continuously dominate technological development, while in other areas they are increasing the imports of modern technologies absorbed from other countries; the role of private businesses in funding and organizing research and creation of advanced technologies is growing; the scientific and technological development is becoming systemic in nature and encompasses all stages of the innovation process, the primary, supporting, and servicing activities; new technologies reinforce their influence on business management and organization, stimulate the development of flexible network structures; etc.

The problems of analyzing the scientific, technological, and innovative development have been directly addressed in the works by B.I. Volostnov (2011), V.N. Knyaginina (2008), A.A. Kuzmitsky (2011), L.E. Mindeli (2010), V.V. Polyakov (2011), C. C. Brito (2006), L. Mello (2006), M. Nahtigal (2012), S.-C. Park (2012), Melissa A. Schilling (2016), and other researchers.

Regional aspects of scientific and technological development have been considered in the works by Ye.V. Demidko (2011), Zh.A. Ermakova (2007), V.B. Kondratiev (2007), O.A. Romanova (2008), A.I. Tatarkin (2015).

At the same time, it should be noted that so far there have been very few papers dealing with management and regulation of the scientific and technological development of the regional industrial complex. Among them, one can distinguish the monographs of Zh.A. Ermakova (2007) as she considers the problem of regional industrial technological modernization, and those of an academic team of the Institute of Economics of the Ural Branch of the Russian Academy of Sciences (Romanova et.al., 2008), who deal with the formation of institutional environment for scientific and technological development of the regional industrial complex.

As can be inferred from the published scientific papers, there has been a lack of comprehensive research of the problem of managing the scientific and technological development of the regional industrial complex.

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### **3. Materials and methods**

With regard to the multifaceted nature of the problem under study, its solution requires the application of a whole set of approaches and methods used in economics. The research used a systematic approach, monographic, descriptive, statistical methods, as well as a grouping method.

The main research methods were system analysis (at the stage of determining the components of the system of scientific and technological development of the regional industrial complex and the principles of its construction) and a case study (at the stage of determining the increasing role of regions in the scientific and technological development, the prerequisites for creation of regional systems in the scientific and technological development of industrial complex).

The method of statistical grouping was applied by the authors to analyze the R&D expenditure levels and their main areas.

The research was based on the data available from the Federal State Statistics Service, the Association of Innovative Regions of Russia, the Analytical Center under the Government of the Russian Federation, the Center for Strategic Development Foundation, the National Research University 'Higher School of Economics', the RVC (Russian Venture Company), the Center for Strategic Research of the North-West; information contained in federal and regional information resources and materials of the Organization for Economic Cooperation and Development and United Nations Industrial Development Organization were used.

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### **4. Results**

In the market economy environment, an important role in solving the problems of scientific and technological industrial development of industry belongs to the regions. Within the centralized planned economy that operated during the Soviet era, the state used to define and implement

scientific, technical, and technological policies throughout the country with respect to all economic facilities. The government funded fundamental research conducted by the institutes of the Academy of Sciences. Based on their findings, applied research in the sectoral research institutes was carried out according to the state plans, and new technologies were developed and introduced in industrial enterprises on a regular basis. Regional government bodies were primarily in charge of social problems. They sought to eliminate the existing interregional differences by means of centralized funding arrangements for economy and the regional social sphere, the use of subsidies, subventions, various social compensators, plan prices, etc. However, variations among the Russian regions in terms of the most important socioeconomic indicators were significant (Burov, 2016; RAS, 2016; Kondratyev, 2007; Romanova et.al., 2008).

With the transition toward a market economy, according to V.B. Kondratyev (2007), the regulatory role of the state significantly weakened, the state financial support for the regions was reduced and most economic and social compensators were abolished. The differentiation of regions began to grow rapidly.

It should be noted that in the context of the market relations formation, market leverage and incentives for the development of industrial production and its technological re-equipment have not started operating at full capacity. Measures taken at the federal level to stimulate the technological development have proved inadequate because of the complexity and scale of the problems to solve. Aggravating regional economic problems demanded increased independence from the Russian Federation subjects in solving problems of socioeconomic and innovative development of the regions, as well as development of an appropriate regional industrial policy.

Over the past decade, a number of federal laws have been adopted to enlarge the powers of the Russian Federation subjects, including Federal Law No. 254-FZ of July 21, 2011 'On Amendments to the Federal Law 'On Science and State Science and Technology Policy' (The Russian Federation, 2011) that enshrines forms of the state support for innovation activities and the powers of the Russian Federation subjects in the field of organizing, implementing, and financing innovative activities; Federal Law of December 31, 2014 No. 488-FZ 'On Industrial Policy in the Russian Federation' that defines the powers of the Russian Federation subjects in terms of formation and implementation of the regional industrial policy (The Russian Federation, 2014).

The enlarged powers of the Russian Federation subjects in the innovation sphere, in the formation and implementation of the regional industrial policy is an essential step towards increasing their independence; however, a significant part of the regions cannot take full advantage of that because of a lack of financial resources. Thus, according to the data available from the Ministry of Finance of the Russian Federation as of January 1, 2017, the government debt of all the Russian Federation regions amounted to 2.35 trillion rubles.

The current state is the result of disagreements between the federal policy of increased autonomy for the regions implemented over recent years and the budget model of regional regulation that has been used for a long time, based on centralization of public finances and their distribution in order to equalize the fiscal capacity of the regions on the principle of equalizing the average budget revenues per capita. Such a budget model is aimed at equalizing the interregional differences, whereas the goals of economic development are hardly pursued, if at all. Consequently, the expansion of powers of the Russian Federation subjects in the sphere of innovative and industrial development requires an adequate change in the financial system of intergovernmental fiscal relations, which creates opportunities for sustained economic growth in the regions.

In industrial regions, the regional government is interested and willing to assist in the modernization of industrial enterprises, as it directly faces a large number of problems related to their low technological level. The use of earlier technologies, equipment depreciation and obsolescence invariably entail a low level of labor productivity, high production costs, poor quality of products, and ultimately reduce the competitiveness of enterprises in the region. In addition, such enterprises usually have an adverse impact on the environment. All this together affects the living standards that are a key performance indicator for the regional authorities.

The analysis of the scientific and technological development of the Russian Federation subjects (Table 1) has shown that in the period under review is dominated by those regions rated as industrially developed. Thus, according to the results of 2016, those Russian Federation subjects inside the first ten of the rating account for 64% of the total Russian volume of shipped innovative goods, works and services.

To change the current situation and to stimulate the innovative development in other Russian Federation subjects, what is necessary is not only to provide financial support for rapid creation of a science and technology base, but also to introduce institutional changes, to improve the sector

management system, and to reinforce it with personnel.

From the authors' standpoint, a number of problems of scientific, technological, and innovative development at the regional level can be solved more simply and more productively. Thus, in terms of the regional level, it is possible to foster better cooperation between science, education, and industry, which are the main components of technological and innovation development. It is worth mentioning that without such cooperation, it is impossible to ensure effective operation of advanced development zones, innovative territorial clusters, and innovative special economic zones that the state has recently attached particular importance to as zones of economic growth.

In addition, it is necessary to take into account that scientific and technological development is the cornerstone of the regional innovation policy. It ensures:

- Increased competitiveness of the regional economy;
- A reduction of the technological environmental impact;
- A rise in labor productivity;
- Prudent management of natural, physical, and labor resources;
- An increased energy efficiency of production;
- Enhancement of social living standards;
- An increased tax base for the regional budget.

According to the authors, the market environment, the economic independence of businesses and organizations, and their robust relationship with the region objectively require enhancement of the role of regions in scientific and technological development and formation of a regional system for scientific and technological development. As the authors of the article 'Perspectives of the scientific and technological development of the Russian Federation regions' note, at present, the nature of technological development in the world and in Russia is changing, the factors that determine technological development are shifting, with their organization and significance changing as well. It is impossible to initiate new technological development by means of old infrastructure resources (Knyaginina et al., 2008).

**Table 1**

Movement of scientific and technological development indices of the Russian Federation subjects in 2014-2016\*

Region	2014		2016		Deviation, 2016 against 2014	
	Index	Position	Index	Position	Ratio, %	Position
Moscow	78.03	1	82.11	1	105.23	0
St. Petersburg	72.06	2	70.11	2	97.29	0
Republic of Tatarstan	64.68	3	64.93	3	100.39	0
Nizhni Novgorod Region	63.45	4	64.22	4	101.21	0
Samara Region	61.70	5	61.65	5	99.92	0
Moscow Region	60.36	6	61.51	6	101.91	0
Perm Territory	59.35	7	56.31	7	94.88	0
Sverdlovsk Region	55.02	8	55.53	8	100.93	0
Tula Region	48.63	13	53.58	9	110.18	4
Tomsk Region	52.14	9	52.78	10	101.23	-1
Ulyanovsk Region	50.58	11	52.45	11	103.70	0
Tyumen Region	44.44	21	51.80	12	116.56	9

Novosibirsk Region	51.97	10	51.52	13	99.13	-3
Rostov Region	49.24	12	50.58	14	102.72	-2
Voronezh Region	48.53	14	50.01	15	103.05	-1
Republic of Bashkortostan	47.81	15	49.14	16	102.78	-1
Republic of Karelia	21.48	71	21.27	71	99.02	0
Pskov Region	20.35	73	20.56	72	101.03	1
Republic of North Ossetia-Alania	21.00	72	18.85	73	89.76	-1
Chukotka Autonomous District	-	-	18.17	74	-	-
Republic of Adygeya	14.73	77	17.04	75	115.68	2
Republic of Dagestan	22.79	70	16.62	76	72.93	-6
Republic of Tyva	15.50	74	16.09	77	103.81	-3
Chechen Republic	12.11	81	14.66	78	121.06	3
Nenets Autonomous District	12.75	80	14.08	79	110.43	1
Jewish Autonomous Region	-	-	13.92	80	-	-
Karachayev-Cherkessian Republic	15.23	75	13.62	81	89.43	-6
Republic of Khakassia	13.77	78	13.48	82	97.89	-4
Republic of Kalmykia	10.74	83	12.24	83	113.97	0
Republic of Altai	13.73	79	11.73	84	85.43	-5
Republic of Ingushetia	12.9	82	5.94	85	46.05	-3

\*Based on data available from RIA-Rating

Thus, one can distinguish the following objective prerequisites for creation of a regional system of scientific and technological development of the industrial complex:

- The unevenness of the scientific, technological, and economic development of the regions that directly affects the social living standards;
- The interest of regional authorities in modernizing manufacturing facilities based in the region and in increasing their competitiveness;
- The dependence of technological development on regional factors and conditions;
- The increased economic independence of regions, more powers given to the Russian Federation subjects in the field of innovative development, shaping and implementation of the industrial policy;
- The close interconnection and interdependence of the region's innovative development and the scientific and technological potential available as a basis for innovative development; the existing imbalances in the development of the regional scientific, technological and industrial potential;
- The formation of territorial innovation clusters, advanced development territories, technical and innovative special economic zones, and other organizational forms of the regional economy

- requiring a high technological development level;
- A tenuous relationship between manufacturing facilities and scientific and educational institutions of the region, the need for enhanced commitment of scientific research and personnel training to solving the problems of the regional technological development;
- Insufficiently elaborated applied research and development to meet the needs of technological development of industrial production, the need to adapt the designed advanced technologies to the industrial production specifics in the region, leveling technological expertise and technology transfer centers, as well as engineering centers up to the developing large regional industrial complexes.

When building the system of scientific and technological development of the regional industrial complex, it may be expedient to analyze international scientific and technological development management practices in the market economy environment.

There is variety of experience accumulated in the international practice in the field of scientific and technological development management, with the use of a certain set of instruments for the regions of a particular state, taking into account their own specifics, traditions, available resources, and needs.

The analysis of scientific literature (Volostnov et.al., 2011; Ivanov et.al., 2001; Nesterenko, 2006; Cherkasov, 2013; OECD, 2012; UNDP, 2014) has made it possible to identify a number of instruments used by the developed countries in managing their scientific and technological development: legislative measures; measures to stimulate investment in technologically advanced industries; publicly funded R&D; a contracting system whereby the state does not only fund R&D and the creation of new equipment and technologies, but also ensures market channels for industrial corporations; subventions and subsidies to privately and publicly operated enterprises, allocated from the state budget and extrabudgetary funds; loans subsidized by the state or lent at a low interest; export subsidies; development of scientific and technical information distribution systems, etc.

It should be noted that virtually in all industrialized countries across the world there has been a transformation of the state scientific and technological policy towards decentralization and redistribution of rights and responsibilities in favor of regional authorities.

The national government is normally in charge of the development of a regulatory framework in the area of scientific and technological development, national strategic prioritizing, fundamental scientific research and funding of respective programs and projects, organization of international scientific cooperation, establishment and development of a national information base and relevant national information networks.

At the same time, the profound knowledge of characteristics of the territory, the possibility of direct communication and influence on the activities of the main actors in institutions and regions allows regional administrations to find solutions that take into account the local specifics.

In order to mitigate some downsides that arise from the independence of local authorities (the national initiative loses integrity, the programs of the authorities at different levels overlap, duplicate each other and pursue different goals), the center always reserves the right to take necessary regulatory measures in the areas most important for maintaining national competitiveness and social stability.

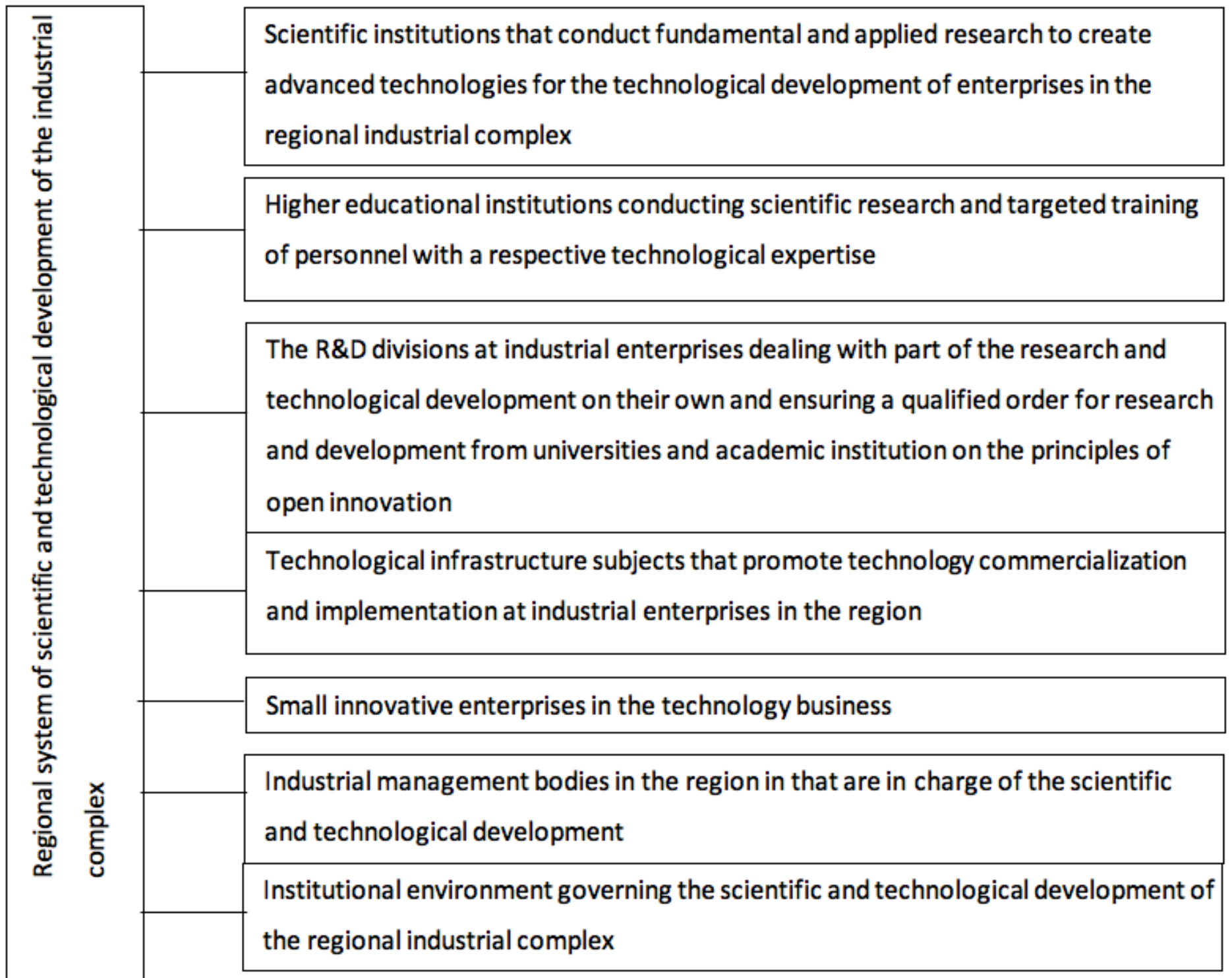
Therefore, the international practices of regional governance of scientific and technological industrial expansion in the context of the existing market relations can be useful for creating a system both in terms of the structure to form and the instruments to use.

The research allows for the conclusion that the regional system of scientific and technological development of the industrial complex should include organizations that would create, transfer and implement technologies at the industrial complex enterprises, ensure personnel training and development for solving these tasks, as well as organize a special institutional environment that would contribute to the scientific and technological development of the industrial complex.

According to the authors, the regional system of scientific and technological development of the industrial complex should be understood as targeted at technological development objectives of the regional industrial complex: the set of institutions and organizations cooperating with it and ensuring creation, transfer and use of technologies by industrial enterprises; personnel training and development for these objectives, as well as the institutional environment that would provide the conditions necessary for scientific and technological development of the industrial complex.

Let us consider the structural elements of the system of scientific and technological development of the regional industrial complex (Figure 1).

**Figure 1**  
Structural elements of the regional system of scientific and technological development of the industrial complex



The primary tier in this system should be organizations that carry out research and development related to the creation of advanced technologies required by the industrial complex.

It should be noted that the scientific potential available in many industrial regions is not fully matched to the current tasks of technological industrial development. The system of sectoral research institutes of the Soviet era aimed at applied research and development, many of them being based in major industrial centers, was almost completely destroyed in the 1990s. The measures taken in subsequent years by the country's leadership to increase the funding of science in universities and to launch federal targeted programs aimed at creating advanced technologies have not eliminated this gap in the innovation cycle.

In this regard, a new approach to the research and development sector organization for the benefit of technological development of the industrial complex is required at the regional level. The approach proposed by the authors is based on the following provisions:

- Involvement of academic research institutions in the process of technological development of the industry based in the region through the development of fundamental target research and inclusion units that conduct applied research and development and commercialize their own developments in their structure;
- Enhanced focus of research in higher educational institutions based in the region on the industrial technological development. First and foremost, this academic activity should become the priority area for new types of higher educational institutions being formed at the present time – flagship higher education institutions intended to ensure the regional economic development with qualified personnel and to carry out scientific research and development for the region's benefit. To implement it in universities, it is advisable to establish special scientific bodies in the form of applied research laboratories that should be created with the involvement of major industrial



enterprises in the region. Such scientific units would be staffed with university teachers and employees on terms of secondary employment, but scientific researchers should be the basic staff;

- Major industrial enterprises establishing their own R&D centers to implement a part of technological development using their own resources, but to even a greater extent to ensure a qualified order for research and development from universities and academic institutions based on open innovation. Studies have recently shown that opening R&D centers within large companies has become a steady trend, with an increasing number of them tending to use the principle of open innovation.
- With proper organization and a well-designed mechanism for funding research and development based in the region, academic institutions and universities in cooperation with R&D centers at industrial enterprises can become the foundation for technological development of the regional industrial complex (Bin and Salles-Filho, 2012; Bubou, 2009; Bianchi et.al., 2010; STHE, 2013).

Closer cooperation between academic institutions, universities, and industrial enterprises can be facilitated through regional technological platforms formed with the participation of the executive regional authorities. An important result of technological platform operation would be achieving a consensus in choosing technological development lines and elaboration of a strategic research plan for advanced production technology creation.

Higher educational institutions based in the region and widely participating in the technological development of the industrial complex should also become the primary center for training and development of the enterprise personnel with the respective technological expertise, whereby various organizational forms can be used: target order of specialists, organization of joint educational programs, new educational directions, etc.

An important structural element of the regional system of scientific and technological development of the industrial complex is a well-formed and effectively functioning technological infrastructure. Regional authorities should pay special attention to building necessary technological infrastructure.

The main goal of building and operation of the technological infrastructure is to accelerate the process of promoting the technology created in the laboratory environment before it is developed commercially and used in production of competitive innovative products based thereon. This goal can be achieved by solving the following tasks:

- Commercialization of the created technologies, that is, bringing them to industrial use and selling in the innovative technology market;
- Maintenance of communication and interaction of technology developers and consumers;
- Assistance in introduction of new technologies in production.

The following was of how technological infrastructure entities that contribute to the solution of these problems can be distinguished (Schwachula et.al., n.d.; Simon, 2016):

- Innovation and technology business incubators, technology parks, innovation and technology centers, prototyping centers, shared knowledge centers, etc.;
- Technology transfer centers, technology brokers, research and technology centers, etc.;
- Engineering centers that would deal with technological engineering and system integrators maintaining package deliveries of equipment for the technology being introduced.

Small innovative technological businesses are included in the regional system of scientific and technological development of the industrial complex, since they play a large part in the creation and promotion of technological innovations. Regional authorities are interested in activities of these enterprises that are provided with state support. Their activities are beneficial for large enterprises that prefer to minimize their costs by ensuring that the technologies created are first tested at small innovative enterprises and only introduced into industrial production subsequent to positive test results. In this case, large enterprises can promote the technology testing.

The established governing bodies and the institutional environment that would regulate scientific and technological development through the system of regional regulations and create favorable conditions for technological development are important components of the regional system of scientific and technological development of the industrial complex.

Thus, having considered the components of the regional system of scientific and technological development of the industrial complex, it is possible to frame its main goals and objectives, as well as the basic principles of its construction.

The main goal of the regional system of scientific and technological development of the industrial complex is to create the necessary conditions for interconnected technological development of

production enterprises and industries based in the region in accordance with the priority areas of scientific and technological development of the country and the region.

Achieving this goal involves the following objectives:

- Formation of the scientific and educational potential of the region according to the technological development objectives of the industrial complex;
- Establishment of close connection and interaction of scientific and educational institutions with production enterprises and industries;
- Organization and funding of research and development for technological development of production enterprises and industries;
- Organization of the system of technological training and development of personnel;
- Building the regional technological infrastructure;
- Adoption of regional statutes and regulations to establish an institutional environment that would stimulate, streamline, and support activities for scientific and technological development of the regional industrial complex;
- Formation of an organizational structure to ensure coordination of activities for scientific and technological development of the regional industrial complex.

An important condition for building the regional system of scientific and technological development of the industrial complex is to observe the following principles:

- Conformity of the regional scientific and technological potential to the scale and prospects for the regional industrial complex development;
  - Concentration of the ongoing research and development on priority areas of technological development of the regional industry;
  - Participation of science, education, business, and civil society in identifying priority areas for the technological development;
  - Optimal combination of fundamental oriented and applied research;
  - The system orientation to the advanced national and international level of technological development;
  - A rational combination of the possibility to conduct the region's own research and development and to cooperate with leading national and international research centers;
  - Interconnection and interaction of science, education, and business with the support and coordination role of regional authorities;
  - Implementation of the research and development life cycle, including: research, development, and commercialization of a technology, introduction of the technology into industrial production, production and release of innovative goods.
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## **5. Conclusion**

The analysis of the current Russian industry state has made it possible to establish its significant lagging behind the leading countries in many scientific and technological areas. The strategic decisions taken over the past years by the country's leadership aimed at strengthening the industry, increasing its efficiency, as well as at scientific and technological development of the industry have been analyzed.

In the market economy environment, an important role in the industrial development belongs to the regions. The research has generalized the global trends of scientific and technological development of industrial production, substantiated the need to mainstream the regions in the scientific and technological industrial development and identified the prerequisites for creation of a regional system of scientific and technological development of the industrial complex. In the process of research, the concept of 'regional system of scientific and technological development of the industrial complex' was introduced, and the structural elements of this system were identified and elaborated. The goal, objectives, and principles of the regional system of scientific and technological development of the industrial complex have been defined, and a new approach to the research and development sector organization to the benefit of technological development of the industrial complex has been proposed.

To summarize, it can be noted that the scientific and technological industrial development is an extremely complex and significant challenge that requires a persistent effort from federal authorities and involvement of the Russian Federation subjects in the process, given the powers granted to them to shape and implement the regional industrial policies.

The research findings will contribute to the intensified activities of the Russian Federation subjects in the public administration and government regulation of the scientific and technological

development, which in turn will facilitate the implementation of the approved Strategy for Scientific and Technological Development of the Russian Federation until 2035.

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