

## Specific Determinants for Structuring the Economy, Taking into Account the Factor of Integration

<sup>1</sup>*Sergey Nikolaevich Glagolev and* <sup>2</sup>*Oksana Valerievna Vaganova*

<sup>1</sup>Belgorod State Technological University named after V.G.Shukhov, RF, 308012,  
Belgorod, Kostykova street, 46

<sup>2</sup>Belgorod State University, RF, 308015, Belgorod, Pobeda street, 85

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**Abstract:** The article describes an innovative trend of development of the area formation, which helps to eliminate gaps in the innovation chain. To study the key dependencies of functioning of multi-level system elements the authors justified the necessity of continuous monitoring of global priorities, which makes it possible to timely change the development strategy of basic and applied science. The work proposes the stages of diagnosis of global priorities. Hypothesis development and validation methodology of structuring the economy have been formulated. The analysis of the innovation infrastructure of the Russian Federation has been accomplished, the authors identified a number of gaps in functioning of the innovation component, the key problem of which is extremely low level of using available human, technological and financial resources. Particular emphasis in the structuring of the economy is paid to identifying the most significant technologies, the great contribution of which is shown in the following four major tasks on a national scale: addressing social problems, strengthening the position in world markets, participation in the global innovation process (integration into global value chains) and competitiveness in domestic markets.

**Key words:** Structuring • Priority areas • Intensification • Innovation • Innovative organization • Innovation process

### INTRODUCTION

In the context of this article integration concept is understood as a complex process of combining, crossing and merging of potentials of the subjects involved in the innovation process in order to achieve different types of synergies, enhance the speed and efficiency of economic modernization. However, the complex nature of this process involves its structuring on the basis of methodological aspects of integration.

Specificity into the structuring trends is explained by the following factors:

- Sharp differences between the subjects of the innovation process by resource endowments, features of their economy, unequal opportunities for them to adapt to economic, developing in innovative pace;

- The scale of innovative projects and programs implemented in priority areas of the economy [1].

To assess the impact of the economic structuring on the resulting functions of the subjects of innovation process requires knowledge of the functional content of integration interaction. However, it should be noted that economic structuring is characterized by a certain methodological uncertainty, expressed in the absence of stable algorithms for identifying priorities for developing innovative strategies, mechanisms for coordinating state and business interests in the implementation of priority areas, including the principles and procedures of indicative control.

We believe that the structuring of the economy must be preceded by analytical work in the following areas:

- Hierarchical analysis of measures for selecting priorities of innovation development;
- Assessment of feasibility of the innovation process and determination of its effectiveness;
- Development of a functioning algorithm for interaction among the innovation process subjects [2].

Justification of the methodology of structuring the economy has not been completely represented so far, though some areas in reforming the Russian economy already have a practical result. Structural reforms of the market environment for adaptive power of the economy, as well as reform to develop innovation potential including other structural measures has not been reflected in the territory of the whole country, which will not only hamper the economic development, but also make a threat to economic and political unity of the country [3]. Therefore, the imbalance of innovation policy and economic decisions taken at various levels, is one of the specific determinants of structuring the economy, which requires a sound methodological framework.

**Basic Part:** To justify the methodology of structuring the economy it is necessary to ensure modeling of integration collaborative engagement between the subjects of the innovation process, identification of patterns of microsystems development in territorial aspect, as well as clarification of the essence of influence of innovation processes on replicating of development patterns of economic systems. It appears that on the basis of modeling it is possible to make processes of the impact of economic and control actions more adjustable.

Modeling of economic structuring is advantageous to carry out as a hierarchical analysis of the regularities in functioning of a multi-level system of a single "organism", characterized by certain external influences, the elements of which are the state, science and business, studied in the aspect of innovation dynamics. This is explained by the following reasons:

- The relationship between the level of economic development of the territory and specialization area in inter-regional actors and the international division of labor is observed;
- Economic potential of territorial structures significantly differs and the degree of impact of particular economic conditions is largely determined

by specific branches (proportion of use of factors of production, cost structure, the level of government regulation of innovative processes, markets, raw materials and products, the impact of market conditions, etc.);

- There exist time series of indicators, characterizing functioning of the economic branches both on the world market and on the national level as well as at the level of regions of the Russian Federation;
- Environment, in accordance with modern theories and concepts of innovation processes, is described in the form of economic conditions and control actions of the governmental authorities on science and business.

To investigate the key dependency of multi-level system elements functioning it is necessary to conduct continuous monitoring of global priorities, which will allow timely change in the strategy of development of fundamental and applied science. [4] The diagnostics of development of global priorities include the following steps:

- Economic diagnostics of the formation of innovation processes and their functioning, including the assessment of interrelationships between the different entities and the identification of trends of development of relations and their possible transformations under the influence of fundamental and applied science. Thus the need arises for radical change, as well as the problem appears to define the "points" of economic growth, the coordinate system in the broad sense as the arena of innovation development of the economy;
- Economic diagnostics and assessment of the economic impact of the innovation process in the development of relations, intra-regional, inter-regional and international relations, the nature of the territorial organization of the markets of various types;
- Economic diagnostics of placement of innovative production and consumption and on this basis identification of imbalances both in the structure of production and its placement and in the structure of consumption of innovations.

The obtained results allow to formulate the following hypotheses for the development and validation of methodology of structuring the economy:

- About the influence of changing economic conditions on the development of innovative processes in the context of competitive industries in the region;
- About the nature impact of the economic potential and market environment on the development of innovative processes in the context of major sectors of local economy;
- About the nature of the relationship between the markets of different types of innovation in the context of micro-indicators.

Thus, we can formulate the main proposals that precede the analysis of the impact of economic factors on the activity of the subjects of the innovation process, where special attention should be paid to the placement of production capacity, the factors of resource and infrastructural economic security of territories. The potential of specific areas is to be analyzed in the following context:

- Location and performance of businesses and industrial sectors for their contribution to the production of the gross regional product;
- Interconnections and interactions of businesses, organizations and elements of innovation infrastructure;
- Availability of such resources as financial, raw material, labor, intellectual;
- Existing infrastructure and efficient functioning of its elements [5].

The methodology of structuring the economy must be built on the basis of the objectives of innovation policy and available instruments of government regulation; the number of indicators which prove the effectiveness of methods of structuring should include indicators characterizing the level of economic potential in all its aspects, as well as the conditions governing the distribution of productive forces [6].

Studies show that Russia still demonstrates low level of innovative activity, which is partly due to the underdevelopment of research departments, however, a certain experience in the development of an innovative component of the economy has been accumulated and the main basic part of the infrastructure has been formed. The dominant share in the innovation infrastructure belongs to technology parks and business incubators

established in 48 regions of Russia, accommodating over 1300 small high-tech firms on the area of about 1700 thousand sq. meters.

Formation of the first elements of the innovation infrastructure (science and technology parks and business-incubators) occurred in the domestic economy in the early 90s in Tomsk, Moscow, Zelenograd on the basis of universities. Major public research centers created technology parks later, approximately in the mid-90s. Since the 2000s technology parks began functioning, their main objective was to develop science-intensive products, the necessary conditions for this type of activity were created due to financial support from the federal and regional authorities. This factor contributed to successful development of small innovative firms within technology parks. In the same period, are innovation and technology centers (ITC). Centers as well as industrial parks were focused on the development of the incubation environment for small high-tech enterprises. A distinctive feature of ITC compared to technology parks was that they were not University-based, they were based on facilities of industrial enterprises and associations, free from the main activity areas. In late 2005 over 70 ITC were functioning in the Russian economy. However, we have to state that technology parks and centers were unable to consolidate the relationship between such subjects of the innovation process as science and business. In this regard, another element of innovation infrastructure- Technology Transfer Center (TTC) was created at the state level, whose main purpose was the promotion of new technologies. Almost all the authors in their publications concerning TTC activities point out that the main objective of technology transfer centers is to establish new businesses particularly on the introduction of innovative technologies developed by and academic and research laboratories, institutes and universities. 135 million rubles were allocated from the federal budget. 86 of TTC and about 50 % of all centers supported by Russian Federal Agency on Science and Innovation, were established on the basis of higher education institutions [7]. Table 1 shows the distribution of technology transfer centers Federal Districts of the Russian Federation.

By now, TTC has not shown any tangible results in the field of innovation development. Thus, the share of high-tech firms established within technology parks among the total number of Russian small innovative enterprises is about 50 %.

Table 1: Distribution of technology transfer centers Federal Districts of the Russian Federation

no	Federal district	Total in the district	Share of regions, where TTC were established (%)	Share from total number of TTC (%)
1.	Central Federal District	30	39	30
	including Moscow	15	-	15
2.	Volga Federal District	13	53	20
3.	North-Western Federal District	15	36	15
4.	Siberian Federal District	8	25	12
5.	Southern Federal District	7	38	11
6.	Ural Federal District	4	50	6
7.	Far Eastern Federal District	4	30	6
	Total	86	Average in Russia – 38%	100

Table 8: Entities involved in technical innovations

	Number of entities, using innovation technologies		% of total number of entities	
	2008	2009	2008	2009
Central Federal District regions				
Belgorod	38	31	11,1	15,4
Bryansk	26	31	7,7	9,4
Vladimir	54	43	13,3	10,4
Voronezh	50	49	12,4	10,8
Ivanovo	14	12	3,6	3,2
Kaluga	33	32	12,0	11,3
Kostroma	20	19	8,3	7,5
Kursk	20	19	9,1	9,0
Lipetsk	23	22	10,2	10,1
Moscow	150	144	9,3	9,6
Orel	32	33	15,5	13,2
Ryazan	15	11	6,3	4,7
Smolensk	20	22	6,8	7,3
Tambov	28	25	9,8	8,7
Tver	24	26	5,0	5,4
Tula	56	49	14,0	12,5
Yaroslavl	25	32	7,2	9,2
city of Moscow	121	103	14,7	12,8
Total in Central Federal Region	749	719	9,4	9,4
Total in RF	2490	2485	10,0	9,7

The number of new jobs created in the industrial parks is still insignificant (the number is less than 3 % of all employed by small enterprises in the sector "science and scientific services" excluding part-time staff). In order to develop such a structure requires long-term financial support. To date, according to experts, only 10% of the TTC are developing dynamically. The key problem of the Russian sector of science and high technology today is extremely low level of using available resources (human, technological, knowledge).

In the absence of an active regional policy the most profitable activity, financial and human capital is concentrated in a few regions-raw material export, financial and transportation centers. In 10-15 of the subjects of the Russian Federation center of decision-making, implementation of information

technology and knowledge base building are being formed. The rest of the territory is converted into raw materials and technological periphery, resource providers and areas to collect outdated technologies, production cost centers, bearing the key environmental and social risks.

The structure of the innovation component of the economy of the Russian Federation differs from its Western counterparts by its multi-level structure. This is explained by the fact that Russia represents a state with a vast territory, the different levels of economic development in different regions. Analyzing the indicators of innovation regions of Russia, we can trace very large differences between the indicators of innovation activity in different regions and even at the level of one particular federal district (Table 2) [8].

High innovative activity of leading economic regions of the Central Federal District, can be explained by relatively high basic socio-economic indicators. However, the question of causal relationship between these phenomena remains open. It is not clear whether the "rich" regions "can afford" a high level of innovative activity, or high innovative activity serves as a prerequisite for economic leadership.

It can be stated that some territorial entities are moving towards management of scientific and technical development of their industrial production. This process is complicated. The difficulties are caused by almost complete lack of management methodology for innovation process, superiority of the state and branch planning, creation of technical innovations, hardly eliminated planning and functional gaps in the innovation process on multi-branch "junctions" while problem solving at the level of the main production unit, lack of preparedness of authorities to the integration collaboration with the existing sector of the economy and scientific-research centers [9].

In the course of structuring the economy, taking into account the factor of integration of relations between the subjects of the innovation process, specific factors inherent to large industrial complexes:

- Presence of significant free financial resources;
- High level of qualified personnel ;
- Provide the opportunity of testing of standard solutions in the experimental production facilities for subsequent replication with the purpose to commercialize the innovations.

Strategic character of innovation processes is also evident, which also requires special tools and linkages between strategic management at different levels. Assessing the impact of government interference, carried out in the framework of innovative development of the region, demonstrated in practice that the dispersion of efforts for regional development turned out to be a waste of funds, which should be eliminated in the future, as well as groundless concentrated interference into individual projects, industries. Therefore, the target use of resources, particularly during the formation of independent industrial and research territorial unit could be an important tool through which issues of structuring the economy will be resolved.

Structuring of the economy, taking into account the factor of collaborative integration among the subjects of innovation process and rational distribution of research centers and science-intensive industries determines the

effectiveness of innovative development of the country. Effectiveness of the development can be assessed by the extent to which research centers and industrial enterprises fulfill Federal Target Program "Research and development on priority areas of scientific-technological complex of Russia for 2007-2012", approved by the Government of the Russian Federation dated 17 October 2006 number 613.

Russia has accumulated some experience in the implementation of major innovative projects. Back in the spring 2003 concluded initial public contracts for the implementation of these projects. In the framework of the federal target program "Research and development on priority directions of science and technology" is the implementation of innovative projects since 2005. During this period innovative projects proved that public-private partnerships is an effective tool for integration of subjects of the innovation process. Their results confirmed the interest of business entities in national scientific and technological developments and the possibility of effective interaction between science, business and federal bodies of executive power.

Within each project, a series of works is being implemented: from the perspective of creating an innovative product to development of manufacturing new high-tech products and began its successful implementation in the market. The projects involve the allocation of risks between the state with the business community on the implementation of innovative technologies and provide the concentration of financial resources on a limited number of priority areas, which are formed on the terms of integration and interaction [ 10].

Ministry of Education has allocated about 9 billion rubles on 12 projects since 2006. By the end of the full cycle of works the amount of products produced and sold will reach no less than 30 billion rubles.

The indicators below should serve to assess implementation the most important projects:

- Number of innovative technologies introduced into the domestic economy ;
- Number of international patents granted to intellectual property resulting from the implementation of major projects;
- Volume of high-tech products produced in the framework of the projects;
- Volume of exports of new and improved high-tech products produced as a result of the implementation of major projects;
- Number of jobs for highly skilled personnel created in the framework of implementation of major projects. [11].

Table 3: Technologies with the largest contribution to innovation development of Russian Regions

Objectives of economic development in Russia	Innovation Technologies
Solution of social problems	<ul style="list-style-type: none"> <li>-Nano container technologies for single point medicines delivery</li> <li>-Technology to create magnetic nano carriers with adjustable point for medical purposes</li> <li>-Technology to create biocompatible materials on the basis of nano cultures imitating living tissues</li> </ul>
Consolidation of the position on the world markets	<ul style="list-style-type: none"> <li>-Technology of catalysis, laying noble metals by nano particles</li> <li>-Technologies to creating and processing of composite and ceramic materials</li> <li>-Technologies to creating and processing of polymers and elastomers</li> </ul>
Participation in global innovation process	<ul style="list-style-type: none"> <li>-Technology of catalytic synthesis of carbon nanomaterials, nanothreads, nanotubes from available hydrocarbonic raw materials</li> <li>- Technologies new and renewable energy sources</li> <li>- Technology of obtaining long length materials with high-temperature conductivity</li> </ul>
Competitive growth on domestic markets	<ul style="list-style-type: none"> <li>-Technologies of creation of new generations of space-rocket, aircraft and sea equipment</li> <li>- Technologies of processing of associated hydrocarbonic gases of oil (gas) production on nanoporous catalysts into automatic compounds</li> <li>-high-temperature conductivity</li> </ul>

In this connection, a full-scale commercialization of innovative production will be made, as well as growth of new and improved high-tech products provided.

Particular attention in economic structuring is focused on the most significant technologies, taking into account the factor of collaborative integration between the subjects of the innovation process. We define the technologies the main feature of which assumes their high contribution to the solution of four most important tasks of national importance-solution of social problems, strengthening the position on the world markets, participation in the global innovation process (integration into global value chains) and increased competitiveness in domestic markets [12]. Studies make it possible to compile a list of technologies, estimated by experts to be the most significant (Table 3).

The major problem of the present stage of development of the Russian economy is to increase the competitiveness of local organizations and their integration into the global value chain not only as a resource supplier, but also as a producer of high-technology products. Thus, according to the World Economic Forum, in the ranking among 134 countries on the Global Competitiveness Index, Russia is ranked the 51st and is still seriously lagging behind not only the developed countries but also from a number of developing countries, including India (50th) and China (30 place).

By the index of availability of latest technologies, included in the calculation of this index, Russia's position is even more modest - 98th. These data suggest that the country requires quality enhancement of competitiveness

of the national economy to fully exploit its resource potential.

Competitive advantages of modern companies in the global market are closely connected with their ability to create and integrate into global value chains. Unsuccessful positioning in this chain may adversely affect the profitability of business, reduce the possibility compared to competitors engaged in more effective management.

If we talk about the trend of "Nanosystems and Materials", expert opinion on possible strengthening position on the world markets and embedding into global value chains were relatively similar. Thus, domestic nano industry may provide technologies and products competitive on world markets, at the same time ensuring the integration of the producers into international division of labor. This direction corresponds to modern trends to create competitive advantages.

The integrated results of research can be applied when forming a system of large-scale innovative projects. They can serve as an information base during developing or specification of strategy of development of certain regions and economic branches, identifying major directions of scientific and technical cooperation with foreign countries.

A possible way of using the forecast materials is definition of scope of research within federal and agency-level target programs containing a scientific and technological component.

One of the major factors which can increase the efficiency of research, is the regularity. Systematic forecast making can quickly update expert assessments,

identify points of mutual interest to different parties. This approach contributes to the consolidation of expert community, creation of sustainable platforms for communication among professionals involved in the discussion of the prospects of scientific and technological development of all new participants [13]. In view of the above, the long-term prognosis of scientific and technological development of Russia has been developed as a systematic procedure.

## CONCLUSION

Let us summarize the above provisions. The results of the work suggest that at present there is substantial scientific and technical potential in the field of nanotechnology, which enables calculation to strengthen its contribution to the innovative development. However, the extent and timing of achieving scientific and technological development of the country will depend on the extent to which a consensus among the key players in this process is achieved-government, business and science, as well as on the extent of their participation in the implementation of the goals set.

Specific determinants of structuring the economy are being revealed in some experience in building infrastructure through the creation of an innovative component in the early 90's, in the form of information technology centers and later business incubators, technology transfer centers. At present this infrastructure has not shown any tangible results, as it requires long-term financial support and higher level of use of available resources (human, technological, knowledge).

The presence of significant technologies is another specific determinant of structuring the Russian economy, the main feature of which is considered to be a significant contribution into the four most important objectives of national importance:

- Solution of social issues (Nano container technologies for single point medicines delivery)
- Technology to create magnetic nano carriers with adjustable point for medical purposes.
- Technology to create biocompatible materials on the basis of nano cultures imitating living tissues).
- Strengthening the position on global markets (Technology of catalysis, laying noble metals by nano particles, technologies for creating and processing of composite and ceramic materials, Technologies to creating and processing of polymers and elastomers).

Participation in the global process of innovation (technology of catalytic synthesis of carbon nanomaterials, nanowires, nanotubes of available hydrocarbon resources, new technologies and renewable energy technology for production of high conductivity long length materials).

- Improving the competitiveness of the domestic markets (technology to create new generations of space rocket and aerospace, aviation and marine equipment, Technologies of processing of associated hydrocarbonic gases of oil (gas) production on nanoporous catalysts into automatic compounds-high-temperature conductivity

**Conclusions:** The process of management of scientific and technical development of industrial production is gradually taking place at the local level. This process is complicated. The difficulties are due to almost complete lack of innovation process management methodology, it is difficult to plan functional gaps in the innovation process on multi branch "junction" for solving the problems of the main production unit, the lack of preparedness of authorities to collaborative integration with the real sector of the economy and scientific-research centers. To activate this process it is necessary to create a territorial unit of Science and Industry, which is an innovative complex and is the organizational and methodical form of realization of such phenomenon as integration between the subjects of the innovation process.

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