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The Analysis of Infrastructural Support for High-Tech Development of the Domestic Economy in the Context Of Neo-Industrialization

Y A Doroshenko

Belgorod State Technological University named after V G Shukhov, Belgorod, Russia

I O Malykhina

Belgorod State Technological University named after V G Shukhov, Belgorod, Russia

O V Leonova

Belgorod State Technological University named after V G Shukhov, Belgorod, Russia

A A Rudychev

Belgorod State Technological University named after V G Shukhov, Belgorod, Russia

Abstract---Nowadays the high-tech sector plays a key role in economic development. The sector of high-tech and knowledge-intensive production is legally considered as a driver for the development of the domestic economy. However, the boundaries of any development are determined by the resource potential, in which the infrastructure component plays an important role. The search for opportunities to maximize the positive effects of investing in high-tech production in conditions of a total shortage of conditionally free financial resources is actualized by the need to implement the neo-industrial concept of economic development as a response to the challenges of the modern world economic system, which confirms the relevance and determines the purpose of this study. The effectiveness of the innovative component of the economic development of the state is predetermined by the quality of the processes of high-tech and science-intensive production in the context of the need to integrate the new industrial basis of the national economy into the system. This problem primarily affects the level of microeconomic systems that

form regional economic systems, which, in turn, determine the pace and quality of development of the national economy. The methodological apparatus and research tools are based on the methods of scientific cognition, which include systemic, structural-parametric, functional, categorical analysis. The article substantiates the mechanism of infrastructural support for the high-tech development of the domestic economy, taking into account the requirements of the concept of neo-industrialization. The analysis of trends in the development of the high-tech sector of the economy in modern conditions is carried out. The necessity of initiating a system of "back impulses" within the framework of infrastructure support for high-tech industries has been substantiated. The concept of multistage infrastructural provision of innovatively active economic entities based on the multipolar distribution of resource flows has been formed.

Keywords---domestic economy, high-technology, infrastructural, neo-industrialization.

Introduction

Solving the problem of effective infrastructural support for the high-tech development of the domestic economy in the face of an objective need for its neo-industrial transformation is one of the priority areas of innovation and technological development identified at the national level. The infrastructure of innovation is one of the key tools for the modernization of high-tech industries and sectors of the Russian industry in the context of the formation of a new industrial base of the national economy (Salawu & Abdullah, 2015; Roehl, 1976). At the same time, the infrastructure of innovation activity is naturally considered by domestic and foreign scientists as an important mechanism, which also has institutional significance and a powerful potential for stimulating economic development through the activation of innovation processes, in particular R&D, intensification of the transfer and diffusion of innovation, improvement systems for the formation, use and protection of intellectual property, which together leads to an increase in the efficiency of high-tech and science-intensive production. Economic science today has a fairly large volume of scientific research results on the problems and prospects of infrastructural support for the high-tech development of the domestic economy in the context of the neo-industrial challenges of our time. Domestic researchers, whose scientific interests are shaped by the problem of infrastructural support for innovative activities, in particular the high-tech sector of the economy, have formed teams of authors represented by E.M. Marchenko, M.V. Rakhimova, D.S. Sokolov, N.S. Tomilina, T.N. Leonova, I.A. Tronina, I.E. Frolov, A.A. Maltseva, S.N. Frolov, E.A. Bobkov, A. Yu. Kalinina, E.I. Lazareva, L.G. Matveeva, A. Yu. Nikitaeva, M.V. Zhurkevich, M.M. Ladutko, A. Yu. Nikitaeva and others. The array of scientific results created by scientists includes a variety of factors and forms of priority development, principles and mechanisms for stimulating the subject and elemental composition of infrastructure support for innovatively active business entities, which together makes it possible to scientifically substantiate and consider it as an economic

process and as a phenomenon, based on the theoretical and methodological approaches presented in modern science.

The first scientific approach is formed by thoughts and views regarding the possibility and feasibility of considering the infrastructure of innovation activity as a set of infrastructural elements that make up its subjective basis (Tronina, 2014; Frolov, 2015). The second scientific approach differs in a wider research range and proposes to understand the infrastructure of innovation activity as an organizational and economic mechanism of its institutional development, within institutions are represented by the subjects of innovation activity (Leonova & Eygel, 2013). Within the framework of the third scientific approach to substantiating the fundamental provisions and essential characteristics of the system of infrastructural support for innovative, and high-tech development of the economy, the idea of the importance of creating favorable external conditions for the implementation of innovative activities is put forward as a priority (Sokolov & Tomilina, 2016). At the same time, within the framework of the fourth approach, which examines the functionality of the innovation infrastructure as capaciously as possible, it is considered as a structure that implements an auxiliary function. Its main purpose is to serve innovative processes (Marchenko & Rakhova, 2011; Maltseva, 2011). Relatively recently, it became possible to single out the fifth scientific approach, within which, based on identifying the integration foundations for the formation and functioning of the infrastructure of innovation activity, it is studied as a set of participants in economic relations with their inherent connections, rules of interaction and forms of integration (Zhurkevich et al., 2021; Lazareva & Lozovitskaya 2020; Matveeva & Chernova, 2017; Nikitaeva & Serdyukov, 2020).

Thus, we define the infrastructural support of high-tech development of the economy as a multi-component system of interacting participants in economic relations that implement auxiliary and service functions to ensure the effectiveness of innovation in systems of all levels of organizational complexity, as well as to stimulate their development. Since in the framework of this study, the high-tech sector with the corresponding industries is considered as a driver of economic development, the problem of their infrastructural support is extremely important. At the same time, high-tech and science-intensive business entities, becoming participants in the innovation infrastructure at the meso- and macro-level, are considered as the same participants in the market for innovative, high-tech products, and therefore they do not need to be fundamentally different from the traditional understanding of infrastructure support for innovation activity. Further, we analyzed the methodological basis of this study to analyze the state of the high-tech and knowledge-intensive sector of the domestic economy, as well as the formation of a mechanism and a conceptual model of its infrastructure provision in the context of neo-industrialization (Pack, 1988; Eswaran & Kotwal, 2002; Nyandra et al., 2018).

Materials and Methods

It should be noticed that the infrastructure of innovation activity consists of a set of subsystems that form it, thus, we will present the most important of them in the context of the characteristics of their subject composition (Maloyvan, 2017):

- Production and technological: innovative scientific and technological centers; technological clusters; technoparks, technopolises; engineering centers; special economic zones; business incubators, etc.
- HR policy: universities, research institutes, and organizations, etc.
- Investment: state and non-state funds for innovative development, incl. venture funds; financial and credit institutions; stock markets and exchanges, etc.
- Expert and consulting: consulting organizations providing consulting services and expert support.
- Sales: intermediary and sales organizations.
- Informational: information organizations in the field of communications and mass communications.

We suggest that the analysis of the system of indicators characterizing the dynamics of innovative activity about the quality of the infrastructure support provided will further ensure the identification of the corresponding problem areas (Table 1, Table 2, Table 3).

Table 1
The level of scientific and innovative activity of organizations, 2019

Region	Number of organizations, units		The level of innovative activity of organization	Including: with scientific research and project design departments
	Doing research and development	Carrying out innovative activity		
Russian Federation	4051	9839	9.1	7.1
Central Federal District	1465	3283	10.8	9.0
Northwestern Federal District	521	1185	10.1	8.5
Southern Federal District	317	770	7.5	4.9
North Caucasian Federal District	149	125	1.7	1.5
Volga Federal District	690	2200	11.6	8.3
Ural federal district	255	828	9.3	7.9
Siberian Federal District	430	1003	7.5	5.5
Far Eastern federal district	224	445	6.0	3.7

Data analysis of 1st table allows us to conclude that the Volga, Central, and North-Western federal districts are leading in terms of the level of innovative activity of organizations. Next, we present data reflecting the share of

organizations implementing technological innovations in 2019 (Kosnikov et al., 2021; Sabodash et al., 2021).

Table 2
Organizations and small businesses that carried out technological innovations in 2019, units; % in the total number of surveyed organizations and small businesses

District	Technological innovation organizations		Specific gravity of small enterprises that carried out technological innovations
	number of units	specific gravity, %	
Russian Federation	7123	21.6	5.9
Central Federal District	2506	28.1	6.6
Northwestern Federal District	878	22.2	5.5
Southern Federal District	527	17.8	5.5
North Caucasian Federal District	98	7.1	2.8
Volga Federal District	1572	22.5	6.4
Ural Federal district	605	20.9	4.6
Siberian Federal District	660	16.4	6.7
Far Eastern Federal District	277	15.4	3.4

Thus, there is the largest specific gravity is made by organizations that carry out technological innovations in the Central, Volga, and Northwestern Federal Districts. This may indicate the high potential for the development of the high-tech sector of the economy in these subjects. Next, we will analyze the values of shipped innovative goods of our production, works, and services performed on our own in 2019.

Table 3
Shipped innovative goods of own production, completed works and services in-house in 2019, million rubles

District	Innovative goods shipped, RUB million	Share in RF, %	Specific gravity of innovative goods, works, services in the total volume of goods shipped, %	
			From all organization	Industrial organization
Russian Federation	4 863 381.9	100.0	5.3	6.1
Central Federal District	1 425 670.3	29.3	5.0	5.4
Northwestern Federal District	591 698.8	12.2	5.6	6.6
Southern Federal District	196 630.6	4.0	2.7	4.4
North Caucasian Federal District	44 225.5	0.9	5.3	9.0
Volga Federal District	1 716 539.3	35.3	11.3	12.4
Ural Federal district	501 088.9	10.3	3.3	3.9

Siberian Federal District	248 562.0	5.1	2.6	2.5
Far Eastern Federal District	138 966.5	2.9	3.0	3.4

In 2019, the specific gravity of innovative goods, works, and services in the total volume of goods shipped, produced by industrial production organizations, prevails in the Volga, North Caucasian, and Northwestern Federal Districts. Because the territorial leaders of innovative development have been identified, we believe it is important to analyze the features of scaling up their successful experience in innovative development within other federal districts (Rothaermel & Deeds, 2006; Fedderke et al., 2006).

Results and Discussions

The analysis of the presented data allows us to form the opinion that in the conditions of neo-industrial challenges it is necessary to ensure the possibility of initiating a system of “reverse im-pulses” within the framework of infrastructural support for innovatively active business entities. By the system of “backward impulses,” we mean a set of favorable infrastructural conditions under which the level of innovation activity within the economic system of the corresponding level of the hierarchy becomes so high that it becomes possible to accelerate its technological development (Barra Novoa, 2021; Mora et al., 2018). As a result, the number of business entities carrying out innovations, including technological innovations, is increasing (ideally, up to 50% of their total number, which indicates the effective implementation of the state's scientific and technical policy).

We should notice that the concept of neo-industrialization is considered by scientists as a universal tool for the formation of an innovative economy through the implementation of a set of measures, a system of conditions and processes for the formation of a new industrial platform through the introduction of high technologies to implement large-scale technological modernization of the domestic economy. At the same time, the peculiarities of the study of the problems and prospects of the formation of the paradigm of neo-industrialization as the basis for the implementation of an innovative model of the economy actualize the role of the high-tech and knowledge-intensive sector, which embodies innovative solutions in practice (Ngo et al., 2016; Schmitt-Grohé & Uribe, 2003).

It is advisable to consider and study neo-industrialization as a natural process-oriented phenomenon that arises in response to scientific and technological progress, the rapid development of technology and technology. Because of that, it is important to study this phenomenon as a complex of key interrelated parameters that form a system of sources of potential economic growth, leading to the implementation of an innovative model of the economy. That is why we believe that the optimal composition of the infrastructure for innovative activities in the context of neo-industrial challenges should take into account the need to implement “reverse impulses” that can move along five verticals, determined by the stages of the life cycle of an innovative product, and in the infrastructure system innovation activities will be as follows (figure 1).

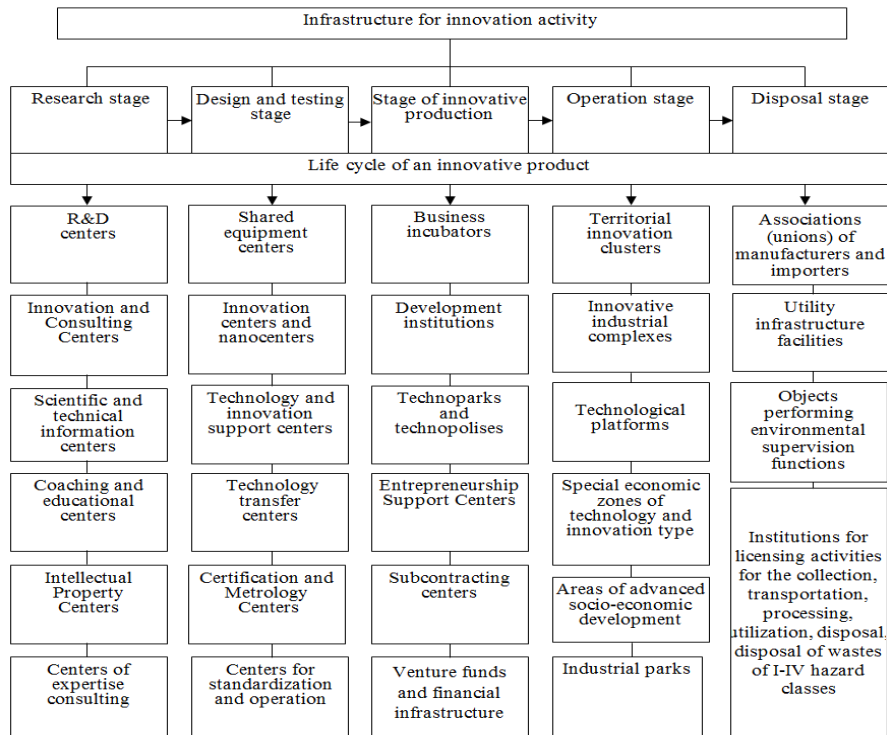


Figure.1. The elemental composition of the infrastructure of innovation in the Russian Federation (Malykhina et al., 2020).

Based on the presented structure of the elemental composition of the infrastructure of innovation activity in the Russian Federation, we propose the concept of multi-stage infrastructure support for innovatively active economic entities based on the multipolar distribution of re-source flows. If we assume that the “reverse impulse” can physically be defined as a result of innovation, expressed, based on the stage of the product (organization) life cycle or the influencing infrastructure subsystem, as an innovative project (start-up), innovative products (services, goods), objects of intellectual property, human capital, etc., then they will be influenced by the multipolarity of infrastructural support of innovations.

Thus, in the Russian Federation, five key poles of the national innovation system with certain functions and powers have been formed: the Russian Academy of Sciences (management and coordination of scientific research), the Federal Agency for Science and Innovation (implementation of scientific and innovation policy of the state), the Russian Space Agency (management of the development of rocket - the space industry), the Federal Agency for Industry (management of innovative development in the sectors of the economy), State funds (distribution and control of state funds for R&D) (figure 2).

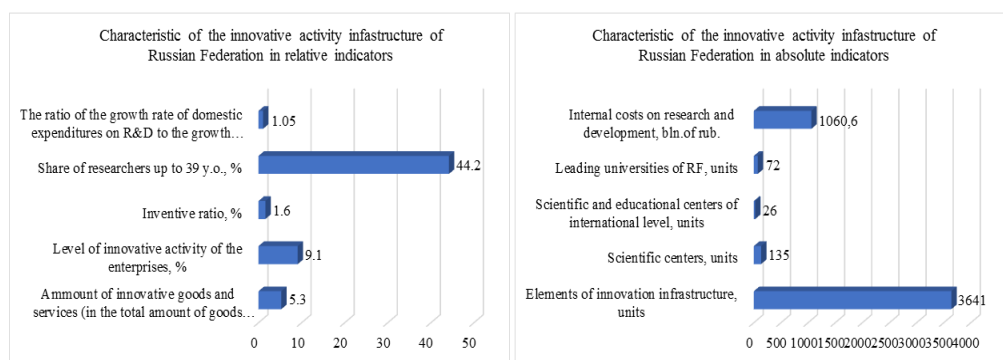


Figure 2. The efficiency of the infrastructure of innovation activity in the Russian Federation, 2020

Because the system of “reverse impulses” can arise within the framework of infrastructure, in particular, innovation activity, it is necessary to take into account the role and functionality of key institutional participants that generate, distribute and control resource flows, i.e. substantiate evidence-based multipolarity of resource allocation. We represent the concept of multistage infrastructural support of innovatively active business entities based on the multipolar distribution of resource flows in figure 3.

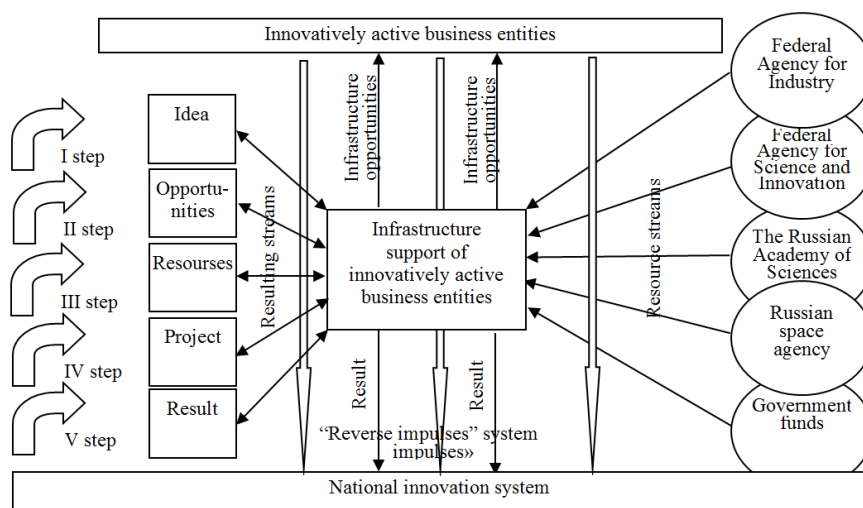


Figure 3. The concept of multistage infrastructure support for innovatively active business entities based on the multipolar distribution of resource flows.

Such a concept forms important conditions for the generation and use of infrastructure opportunities by innovatively active business entities in the national innovation system since it takes into account the possibility of implementing a system of “reverse impulses” as a mechanism for intensifying proactive production decisions to form resultant flows in response to incoming resource flows. At the same time, each of the five stages of infrastructural support is characterized by the achievement of a set of certain intermediate goals (idea - opportunities - resources - project - result), which form the possibilities for the

implementation of the general goal - high-quality infrastructural support for innovatively active business entities (Yoon & Park, 2004; De Ruyter et al., 2001). As a priority direction for further research of the indicated problem, it is important to highlight the issue of the formation of methodological provisions for assessing the effectiveness of multistage infrastructural support of innovatively active business entities based on a multi-polar distribution of resource flows.

Summary

Thus, the system of infrastructural support for the high-tech development of the domestic economy should develop in proportion to the challenges that are formed within the framework of the modern concept of neo-industrialization. We believe that shortly it is important to carry out a methodological study of methodological and instrumental possibilities for assessing the effectiveness of the infrastructure of innovation activity in such topical areas of the high-tech and science-intensive sector of the economy as the technology of new materials and substances; cybersecurity technologies; technologies "Big data" or big data, i.e. large data arrays; artificial intelligence technologies combined with neurotechnologies; augmented reality technologies. The designated areas of innovative development are inscribed in the concept of digital transformation of Russian society within the framework of the neo-industrialization policy, moreover, they are the response of the modern economic system to global challenges and threats.

Conclusion

The system of infrastructural support for innovative activities, in general, is an important mechanism of state participation in key sectors of the national economy that show innovative activity. The main task of the state today is to revive the sector of small high-tech and science-intensive production in times of crisis, which cannot be achieved without the development of infrastructure for innovation.

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