

Hi-Tech sector's forming and development under the conditions of new industrialisation

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Abstract. The article shows that new industrialisation is a key component of the new economic development model, which has been designed in Russia. The following special characteristics of this process are defined: the synchronisation of the processes of the creation of new hi-tech economic sectors and of the modernisation of traditional ones; coordination of changes in technical and economic sphere and in social and institutional sphere; interactive managerial decisions for the realization of these changes. It is shown that new industrialisation is impossible without the creation of indigenous companies in principally new industrial markets. The new trends of global economy development which will define it in the future according to the new technological wave are described. This allows to specify the strategic vector of the new industrialisation of the Russian economy. Convergent technologies are grounded as the intellectual heart of the hi-tech sector of the Russian economy. The importance of technology transfer and the need of transformation of the system of innovations support are stressed. The industrial policy combines the priority guidelines of the development of the state, regions and municipalities taking into account their resource, science and technology and institutional capabilities. Hence, the industrial policy can be an effective mechanism of the development of hi-tech economic sector.

1 Introduction

The creation of an effective model of the Russian economy is one of the most important factors for its modern crisis overcoming. The central component of this model is the new industrialisation aimed at providing the intensive type of extended reproduction, a new quality of human capital, forming a high-tech based economy of Russia as a key factor of its competitiveness and homeland security [1]. These problems solving requires the reorientation of various engineering and technology systems to non-polluting ones. However this concerns not only the hi-tech economical sector, but also the traditional industry whose modernisation is based on so-called "nature-like" technologies and supposes the change of resources involvement with the focus on natural turnover of resources.

2 New industrialisation

The systematization of the consequences of the deindustrialisation of the Russian economy, taking into account new trends of reindustrialisation of the economy of the developed countries, analysing the Russian theoretical and practical research on neo-industrialisation have allowed to formulate the author's view of these problems and to propose the author's concept of new industrialisation. In our opinion, the new industrialisation is "the simultaneous process of the

creation of new hi-tech economic sectors, and also the effective innovative modernisation of traditional ones with agreed quality changes in technical and economic sphere and in social and institutional sphere, provided by means of interactive technological, social, political and managerial changes" [2].

Within this article, a special attention is paid to such an important process of the new industrialisation as hi-tech economical sector development [3-5]. Intensive technological development is the crucial characteristic of the second half of the XX century. Due to this has allowed to the leading countries in this domain to determinate the global geopolitics' transformations. A lack of the clear objectives and priorities for the scientific, technological and innovation policy, uniform organisation of research activity, low share of hi-tech industry based on domestic and not on import technologies have not allowed the Russian industry to be adequate to technological, structural and ecological parameters, to the requirements of the new technological wave.

Recently the idea of the achievement of the global technological parity of Russia and leading technological countries became actual [6, 7]. In such conditions the Russian economy needs to make an attempt to develop a number of domestic "horizontal" technologies playing a crucial role in the creation of new industries. Such a "technological thrust" can contribute to the formation of a new technological environment and to technological

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inequality decreasing, that is one of the aims of the industrialisation.

New industrialisation is also impossible without the emergence of indigenous companies in principally new industrial markets which currently do not exist. In the opinion of many analysts, and the author shares it, Russian companies can reserve for themselves a certain niche only in the markets which have not yet been created [8-10].

The formation of the strategic vector of the new industrialisation of the Russian economy should take into account the trends of the global economy development which will define it in the future according to the new technological wave [11, 12]. It is possible to distinguish among the most important trends those, which are connected with *the growth of the markets based on network solutions*, which leads to the profound changes in the added value chain; with the formation of *the network approach to the organisation of research*, when in the framework of large multidisciplinary centres the cooperation of research and technological organisations is developed, which are consolidated into territorial innovation systems by innovation infrastructure - centres of public access, open laboratories, etc.; with the growing role of the companies which find comprehensive and cost-effective solutions of emerging problems by the combination of the best accessible technologies and various forms of demand [13]. Other trends are not less important, among them the trends which demonstrate complicating of ethical, motivational and psychological problems due to the situation of the society which is not ready to receive number of innovations; trends defining the profound changes of competency profile in-demand in the labour market which lead to critical changes in the employment pattern; trends of the creation of competency portfolio based on the assessment of companies anticipated need which determines the creation of a new model of higher education.

3 Convergent technologies are the intellectual heart of the hi-tech economical sector

Convergent technologies traditionally include nanotechnologies, biotechnologies, information technologies, cognitive technologies. Their mutual influence as well as interpenetration is so named "NBIC-convergences". This term was coined in 2002 by M. Roco and W. Bainbridge who prepared the report "Converging Technologies for Improve Human Performance" in World Technology Evaluation Center. The specificity of the development of these technologies consists in their interdisciplinary character, and they can largely predetermine the development level of the technological base of the domestic economy and its research intensity. However such an important factors of the global development as the creation of new forms of activity, the possibility of social reality design remind ignored. The technologies developed in this domain are called socio-humanitarian technologies. Their

development is promising in number of directions, among which the creation of high technologies from the point of view of the convergence of humanities and natural-science knowledge, as well as of the design of the models of active environment for innovation development, aimed at the multiple distributed sources of innovations.

We can speak not only about NBIC-technologies, but also about NBICS-technologies due to their importance. The consideration of the regularities of the processes of the interaction between technological sphere, individual and society along with the development of the methods and means for influencing them appears to complete the particularity of the development of the new economy. The treatment of the seventh wave as a socio-humanistic one appears us to be substantiated [14]. According to the above mentioned, the convergent technologies are the technologies having a great practical potential, defining a principally new technological basis of the economy which is compliant with environment protection requirements, and being critically important for the socio-economic development of the country and for its national security.

The realization of the main statements of NBICS-technologies within the new industrialisation of the Russian economy will allow to elaborate unconventional applications of scientific research results, to actualize new principles of intersectorial technology transfer, and also their transfer from science to the real sector, to activate the methods of the control of technological platforms in the domain of high-technologies. The emergence of principally new products and services based on the technologies convergence and the implementation of the logic and objectives of their development in the scientific and technological policy of Russia, in the system of sectorial and territorial management which is common for the country and in the whole society, will permit to create new industries resulting from the convergence. The specificity of this process is the transition to the utilization of renewable energy sources, and to the energy saving high-technologies with the ecological priority at all the stages of the development and realization of high-technologies.

Despite all positive features of NBICS technologies application, the ever increasing technological threats must not be underestimated. They are due to the consequences of NBICS' high use and to constantly growing distance between the technologies and ethical and civilization values.

4 New institutions for innovation support

The innovation potential of the domestic economy is composed by the import of technologies in form of patents, know-how, license agreements, joint ventures creation. Another significant direction is the involvement of the business in the technological operations of foreign companies. It is also important to utilize the results of the Russian scientific research. The creation of companies' own scientific and technological reserve is

one of the most significant ways for increasing the innovation potential of the country. However the Russian innovation potential remains insufficient, which results in a low country's rate in the global rating. At the World Economic Forum in Davos 2015 Russia received the 45th place in the global rating, and by innovation potential it is only 65th. A successful convergence of NBICS technologies appears to be able to have a significant impact on the improvement of the innovation parameters of the Russian economy.

The development of innovation strategy based on the model of the demand not only from buyers, but also from the technology sector, is likely to be efficient due to the existing structure of the Russian economy, the specific character of the scientific and technology system and of the institutional system.

Government institutions play a special role in the framework of the interacting public and private innovation organisations. This is the state policy which determine the configuration of the innovation and institutional profile of the system, or of the operating mode of business environment, motivation system of research activity, degree of the market orientation of the basic research, practical orientation of the higher education sector. However nowadays the fact of unrealized expectations from the innovation policy in Russia is generally recognized [15]. The government has showed different initiatives in the domain of innovations. In particular, there are special economic zones as the central platforms for the innovation business development. Although they are still existing, as well as the technology platforms, the state has almost lost interest to them. The initiative of the government to enforce the state corporations to innovative activity has neither met expectations. As a result, the government raises the question of redesigning the existing development institutions without the necessary analysis of their activity, determination of positive results and evident failures [16, p.45].

The "open government" proposes to turn around the management structure of the development institutions by creating a new state corporation. Nevertheless, this suggestion is arguable. The creation of Project Office affiliated to the Central Office of the Government appears to be better substantiated. The principal aim of this new institution is the coordination of the activity of the innovative organisations and elimination of duplication of their responsibilities. The expediency of the creation of an Agency of technology development is widely discussed in Russia. It's supposed to have the status of a nonprofit organisation focused on technology transfer, it is scheduled to be formed in June, 2016 [18]. The author of this concept is the business community represented by "Business Russia".

In author's opinion, the Agency of technology development can become an effective component of the national innovation system if the functions of assuring the whole chain of an efficient technology transfer will be assigned to it. This includes the collection of data on the existing domestic and foreign promising projects taking into account the specific character of industries and markets; fact-based analysis of various technological

solutions for more detailed development of the long term strategy; continuously updating the information about the existing technologies and competences both domestic and foreign; systematic selection of the most effective technologies and their transfer to the private sector after the quality review of projects; legal support of economic entities; assistance for changing the structure of import technologies. It may be noted that nowadays a half of the expenses is concentrated in the engineering which means that Russia generally imports already mature technologies. The share of the purchase of patents, licenses, know-how connected with the new productions, new technologies is only 10%.

It is necessary to coordinate the research of the Agency with the studies conducted within the National technology initiative (NTI). NTI includes system solutions for the determination of key technologies taking into account the global development trends and the need to create new global markets. Three hypotheses have been formulated for the choice of these markets. They include the increasing demands of population, network principle as the basis of new markets in the future, the wishful planning of the studies in the framework of NTI future, from so-called "preferred reality" to the present [10]. The system work within NTI is organized according to the NTI Matrix. It defines 9 basic markets, determines technologies, institutions, infrastructure and resources which are necessary for these markets formation. The road maps created for each of these 9 new markets contain a concrete schedule of the realization of technology initiatives focused at the development of key markets segments. In fact, NTI suggests new institutional basis for resolving the challenges of new industrialisation.

5 Industrial policy as a tool for the hi-tech economical sector development

The new industrialisation has no alternative, and in this context the industrial policy is a universal mechanism of the development of the competitive economy with balanced structure. Thus its forms and methods have significantly changed. The industrial policy acquires a multisubject character when the corporate and public sector (Chamber of Commerce and Industry, Russian Union of Industrialists and Entrepreneurs, Mainstay of Russia and others), civil society institutions along with the state play an important role in its formation. The state plays a key role not only as being present in the economy, but as a SMART-state, or as a state which determines the aims and objectives, priorities of the development of the country. Such a priority is nowadays the creation of hi-tech economic sector, increase of general business and innovation activity. The global and domestic practice shows that this is the industrial policy which plays the crucial role in these processes [19-22].

In Russia the Federal Russian Industrial Policy Act applies since 30th of June 2015. It determines the principles, new instruments of industry support, as well as the powers of public and municipal authorities. A considerable advantage of this Act is the implementation

of such novelties as the creation of the Foundation of industry development, special investment contract and others which can become a supplemental factor for the acceleration of the hi-tech production development. The agreed view of priorities of the scientific and technological development at the Federal as well as at the regional level is a necessary condition for it. Regional industrial policy acts should not contradict to the strategic aims of the Federal Russian Industrial Policy Act. They should be focused on both the national and regional tasks solution. Unfortunately, the Federal Act only defines the defence industry as a strategic priority. The legislative support of the development of other hi-tech industries including convergent technologies, should be documented at the federal level as well as at the local level, since industry policy is firstly a sectorial policy which creates preferences for selected branches [23].

6 Conclusion

Consequently, three new institutions have been created for the acceleration of the formation and development of the hi-tech sector in addition to the existing ones. There are the Project Office affiliated to the Central Office of the Government, Agency of technology development and National technology initiative. Their agreed activity, elimination of possible duplication are capable to considerably contribute to the new industrialisation of the Russian economy. The implementation of the supplementations to the Federal Russian Industrial Policy Act and regional industrial policy acts aimed at the stimulation of the hi-tech production and convergent technologies will allow to provide a gradual achievement of the technological parity with the developed countries based on the single legal basis.

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References

1. S. Gubanov, *Sovereign breakthrough. Neoindustrialization Russia and vertical integration* (Moscow, 2012)
2. O.A. Romanova. *Economy of region*, **1**, 43-56 (2014)
3. M.A. Bendikov, *The high-tech sector of the industry trend of Russian state mechanisms of innovative development* (Nauka, Moscow, 2007)
4. Yu. Koval'chuk, I. Stepnov, *Problems of the theory and practice of management*, **4**, 8-17 (2013)
5. V.E. Dementev, *Economics and Mathematical Methods*, **49**, **4**, 33-46 (2013)
6. N. Volchkova, *POISK*, **8**, (2015)
7. *Conceptual Framework of the National Technology Initiative project* (RAS, 2015)
8. T. Edovina, *We expect a radical restructuring of major industries* (Merchant, 2015)
9. D. Denisov, *Business Journal*, (2015)
10. *National Technology Initiative* (Petersburg International Economic Forum, 2015). <http://government.ru/media/files/T9Crayp8PsBQU6hdVA10SsDlu2XvCvYG.pdf>.
11. A.I. Tatarkin, O.A. Romanova, *Economist*, **8**, 21-38 (2013)
12. A.I. Tatarkin, O.A. Romanova, N. Yu. Buhvalov, *Bulletin UrFU: a series of economics and management*, **3**, 13-21 (2014)
13. A. Chulok. <http://www.rusventure.ru/ru/press-service/massmedia/detail.php?ID=61386>.
14. V.E. Lepskij, *Reflective-active environment of innovation development* (Kogito-Centr, Moscow, 2010)
15. V.M. Polterovich, *Economic science of modern Russia*, **4(55)**, 17-29
16. A. Mekhanik, *Expert*, **6(974)**, 44-45 (2016)
17. T. Edovina, *Kommersant*, **12**, (2016)
18. *Transcript of the meeting of the Presidium of the Presidential Council on economic modernization and innovative development of Russia*. <http://i-russia.ru/sessions/reports/>.
19. D. Rodrik. http://www.project-syndicate.org/commentary/the_return-of-industrial-policy.
20. P. Bianchi, S. Labory, *From "old" industrial policy to "new" Industrial development policies* (Edward Elgar, USA, 2006)
21. T. Altenburg, *Industrial Policy in Developing Countries* (Bonn, 2011)
22. O.A. Romanova, *Modern competition*, **3**, 44-57 (2008)
23. D. Rodrik, *Industrial Policy for the Twenty-First Century* (Centre for Economic Policy Research, London, 2004)