Dual Methodological Approach to the Economic Subject-Matter of the Innovation Cluster

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Abstract

The article introduces a new ambiguous methodological approach to the study of the innovation clusters and defines their major directions of development in the regions of Russia in the current conditions.

Keywords: Innovation, cluster, modernization, cluster studies, economic growth

Introduction

In the present conditions of the stagflation trap, which has been the key characteristic of the Russian economy since 2014, it is the innovation modernization that becomes the conceptual core of the new perspective development model for the economy of Russia. The only alternative to it may serve the current process of deindustrialization and degradation of the economic sectors to a raw-material appendage of China and Europe.
The major characteristic of the innovative modernization is activization and intensification of the innovation processes in the leading economic sectors and in the regions of the country in general, and turning them into the permanent factor of the economic growth. The data on the investigations undertaken by the Organisation for Economic Co-operation and Development (OECD) in 2016 shows that the investment into the innovation sector results in the increase of the gross domestic product in the ratio 1 to 3 and the investment into the sphere of information and communications technologies in the ratio 1 to 2. By 2020 up to 96 % of GDP of the industrialized countries is going to be defined by the innovation and technological progress.

Nowadays, in the USA and the countries of Europe the scale of the investment into the R&D sphere attracted from the various sources augments simultaneously with the R&D efficiency.

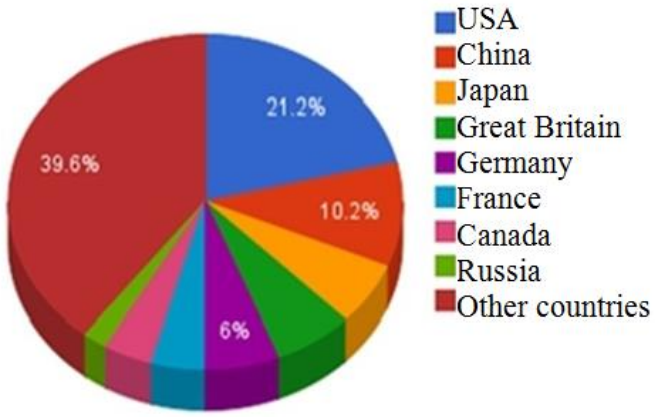
Position	**Country**	**Expenses (%)**
1	Israel	4.40
2	Finland	3.88
3	South Korea	3.74
4	Sweden	3.40
5	Japan	3.36
6	Denmark	3.06
7	Switzerland	2.99
8	USA	2.90
9	Germany	2.82
10	Austria	2.75
11	Iceland	2.64
12	Singapore	2.43
13	Australia	2.37
14	France	2.25
15	Slovenia	2.11
16	Belgium	1.99
17	Netherlands	1.83
18	Canada	1.80
19	Ireland	1.79
20	United Kingdom	1.76
21	China	1.70
22	Norway	1.69
23	Luxembourg	1.63
24	Estonia	1.62
25	Portugal	1.59
26	Czech Republic	1.56
27	Spain	1.39
28	New Zealand	1.30
29	Italy	1.26
30	Brazil	1.16
31	Hungary	1.16
32	Russia	1.16

Source: UNESCO Institute for Statistics, 2015.

Intense development processes are typical of the high technology sectors; alongside this grows the research intensity of the traditional, major economic sectors, of the service industry.

Under the influence of innovation the leading sectors of the economy undergo the radical structural change towards the 4th industrial revolution – the shift to new "smart" economy.

Table 2 The R&D ratio in the world's major economies (2016)



This means that in the leading industrialized countries of Europe and in the USA the former economic sectors created on the outdated technological base are fading away, giving place to all-new innovation sectors based on nanotechnology, bio- and hydrogen energetics, computerization of the traditional industrial sectors. Thus, for example, in Denmark in 2016 the share of the wind energy in the total volume of the generated electric energy in the country ran to 40%. By 2025 more than 55% of the energy in Europe is going to be generated by means of the renewable sources. The fundamental and the applied sciences notably focus on the demands of the innovation renewal of the economy, with a certain inclination towards its creativity.

Dual methodological approach to the innovation cluster study

Conceptual and practical advancement of the Russian economy in direction of the stated global trends of an upcoming industrial revolution is impossible within the traditional schemes of the territorial-economic management of the regional economy and requires the development of the new methodological approaches to management and organization of the innovation activity, which would make possible the implementation of the innovation potential of the Russian economic sectors and territories, as well as the creation of an all-new innovative infrastructure of the sectorial and regional economies.

First of all, it is reasonable to define the key concept "innovation". Initially, a substantial contribution to the development of the innovation theory was made by the Austrian-born American economist Joseph Schumpeter, who is a founding figure in the so called "technological" theory of the economic development, along with the Russian scientists N.D.Komdratiev and S.Kuznets. In his work "The Theory of Economic Development" J.Schumpeter originally substantiated the fact that innovation was the cornerstone of the economic growth. J.Schumpeter singled out 5 essential approaches, which turned into the main factors for classification of the innovation: the use of all-new technical equipment, the introduction of the new technological processes or a new market collateral in production (within the purchase and sale processes); the launch of products with novel properties, the use of novel primary materials; the changes in the industrial engineering; the emergence of the new market outlets. M. Porter and G. Bond suggest subdividing all the innovation into two types: upstream innovation и downstream innovation. The upstream innovation is connected with scientific research and R&D, and the downstream innovation is associated with the process of commercialization. Within the process of the upstream innovation the ideas transform into the technological capabilities: concepts of new products and production platforms. After the technological base is set, the knowledge turn into commercial goods oriented to the demands of the market. W. Miller and L.Morris note that at the upstream stage only 1 of every 3000 ideas leads to the commercial success, while at the downstream stage every 4^{th} or 5^{th} project is successful. It is reasonable to correlate the innovation theory by J.Schumpeter with the concept of long cycles, the so called "wave" theory, proposed by the Soviet economist N.D.Kondratiev in the beginning of the XX century. In his theory N.D.Kondratiev shows the unevenness of the economic development and relates it with cyclicality of the reproduction process of the durable capital goods, when periodical renovation of these goods causes the sustained departures from equilibrium in the economy. N.D.Kondratiev analyzed the data on the technological breakthroughs, showed the wave-like tendency of their dynamics and pointed to the interrelation of the long waves with the technological progress.

The transition to a new economic cycle N.D.Kondratiev related to the wave of the significant technological breakthroughs and innovations. Nowadays the Kondratieff waves' theory has given grounds for the recent theory of the technological modes by S.Y. Glazyev, in which the author suggests the most adequate reasons for the economic declines in the course of development of the economic sectors and territories, and defines the potentially productive ways of overcoming the crisis by means of the innovative renewal of the capital. The greatest contribution to the cluster theory was made by the American economist Michael Porter. This theory is based on the fact that the companies the most competitive on an international scale are usually concentrated in one region that is connected with the wave-like nature of the innovations, which spread over by the most competitive companies and affect the suppliers, consumers and competitors of these companies.

The modern economic research works suggest diverse classifications of cycles, sectorial and intersectorial by their character. Primarily, there are as follows: the inventory Kitchin cycles (3-5 years), the equipment investment cycles by Juglar (7-12 years); the infrastructural cycle introduced by S. Kuznets, also known as "Kuznets swing" (15-22 years), the agricultural and sales cycles (1 year), and the long cycles, also known as "Kondratiev waves" (72 years). The length of the current long technological wave, according to the expert evaluation, covers the period since 1985 to 2035 and it consists in the advances in nanotechnology, microelectronics, informatics, biotechnology, genetic engineering, new energy sources, novel materials, outer space exploration, satellite communications etc.

In our opinion, the cluster is the matter in question in the concept of the industrial network suggested by W.Ruigrok and van R.Tulder [Ruigrok& Tulder, 1995] They single out six groups of actors, whose relations within the network are long-term in nature: the focal enterprise ("core firm"); suppliers (including service suppliers); dealers (sales and trading compaies); trade unions; investors; political institutions and local authorities that belong to the cluster environment. As for the industrial complexes, W.Ruigrok and van R.Tulder define them as a specific type of network, a "bargaining configuration", consisting of the groups of agents that directly or indirectly engaged in the production or distribution of a given product.

As a rule, a new economic growth within the long cycles sets in when the number of significant discoveries and inventions, having been left without implementation in the conditions of the soft conjuncture, gets the critical point; when there come to be the free capital reserves to support of the growth; the low profitability and high expenses bring the entrepreneurs to turn to the novel technologies. The similar approach to the economic growth recovery is a case in point in the theory of technological modes by S.Y. Glazyev. J.Schumpeter studied the factors and periods of the long waves and discovered the superior importance of the innovation. He defined the innovation as technological and economic changes, as new combinations of resource employment, and specified that it is entrepreneur, who serves as interlink between the discovery and innovation; J.Schumpeter also explained the significance of the credit for commercialization of the innovation activity. It is apparent for the most researchers that the innovation process is wave-like in character and is conditioned by the recurrent accumulation of the innovations into clusters and their further synchronic diffusion. The most favourable period for emergence of the technological innovation is the phase of depression, which typically entails the economic crisis, since depression enforces the necessity of innovation as a means of crisis recovery. If in the period of economic growth the new ideas can stand over, because their implementation causes destabilization of the sustainable economy, then in the phase of economic slowdown the innovation turns into an instrumental of crisis recovery. The wave-like, undulatory nature of the innovation process is attributed to the crucial pre-requisite of reaching a critical mass by a novelty in a certain or related spheres (in the economic literature the term "cluster" introduced by J.Schumpeter is in common use; cluster results in a novelty followed by the mass investment). A special emphasis in the research studies is put on the interrelation of the innovation emergence and the phase of economic growth. Thus, G. Mensch put forward and then gave scientific credence to the idea of basic innovation in the phase of depression (the decline of the long wave). The further diffusion of the basic innovation is accompanied by a "storm" of improving innovations, which in the phase of recession of innovation activity result in pseudoinnovations (rationalization). C.Freeman proposed the idea of implementation of the basic innovation cluster in the recovery phase of the long wave. The undertaken empiric study and statistical testing of hypothesis about innovation clustering in the phases of depression and expansion proved the existence of the both clusters of innovation. Having analyzed the innovation entrepreneurs' attitude towards risk in the period of depression, Alfred H. Kleinknecht revealed the obvious tendency of risk aversion. Within the period of depression the strategy of risk minimization dominates over the profit maximization strategy.

The radical product innovation has proved to be comparatively low-risk. The long-wave expansion is favourable for the technological innovation, not the product one. In conditions of depression phase the R&D incline toward the low-risk activities, quite nondescript at the moment, but offering the grand perspectives of economic growth in future. Hence, according to Kleinknecht's point of view, depression comes to be the opportune time for basic innovation implementation.

G. Mensch in his book "Stalemate in Technology: Innovations Overcome the Depression" disclosed the interrelation between the basic innovation, economic expansion rates and cyclicality: the basic innovations cause the emergence of new firms, the supply does not meet the increasing demand, consequently, this results in the acceleration of the production rates. But conversely, amid the saturation of market the supply starts exceeding the demand; this entails the diminishing return and, accordingly, the investment reduction. G. Mensch suggested proper classification of innovations into three groups: basic innovation, improvement innovations and pseudoinnovations. The basic innovations he subdivided into technological innovations (giving rise to new economic sectors or markets) and non-technological ones (changes in culture, management and regulation, in public services). The improvement innovations and pseudoinnovations are inherent within modernization of the existing goods and services.

Alongside with the mentioned traditional approaches there is a contemporary version of the technological development theory with its core concept defined as "general purpose technology". This theory was originally published in 1995. As it is evident from the title, the authors of the theory consider the general purpose technology to be the critical engine of economic growth. Later this theory gained ground in the research works issued in 1998. The originators of the theory characterize general purpose technology as a technology, presupposing numerous improvements, which has different employments, can be implemented in various sectors of economy and be used in combination with other technologies to increase their effectiveness.

A. Kleinknecht and R. Coombs in their works developed the fundamental principles of the theory by G. Mensch and suggested their own classification of innovations:

- "pure" product innovations (new products for consumptive use);
- novel pharmaceuticals, medical procedures and medical apparatus;
- new capital goods for the purposes of the consumer goods and services production;
- new technical devices and materials applicable in production of both capital and consumer goods;
- new research facilities originally designed for the laboratory research purposes that subsequently can also be used in the industrial processes of production;
- "pure" innovations standing for the processes aimed at minimization of the factor costs.

The approach to micro-level innovation implementation, first introduced by the American economist Robert B.Tucker, has become a frequent practice in the contemporary studies in the sphere of innovation. Tucker subdivides innovations according to three degrees:

- Incremental innovation. The innovations of this type slightly affect the net operating profit; nevertheless, they do increase customer satisfaction and improve existing products. The examples of such innovation can be a simplified procedure of client registration or the innovations in the services of a company.
- Substantial innovation. These mid-level innovations presuppose significant changes in the product range of a company and consist in alteration of the fundamental features of a product. For instance, fuel-burn improvement belongs to this group of innovations.
- Breakthrough innovation. This is the highest level of innovations.

With regard to the stated approaches to the matter of innovation, we consider it reasonable to suggest our own dual approach to disclosure of the economic essence of innovation: I) Innovations (novelties) of he first level cover all the economic sectors and are present in all the world's economies, they can be attributed as "routine innovations", i.e. innovations consisting in the rational measures aimed at improvement of the existing products or production technologies. In this respect the innovation stands for modernization without quality changes in technology or products. These innovations are of cross-cutting, sporadic character, and are regularly present in the historic and spatiotemporal aspects of every economic entity at macro-, meso- and micro-levels. In this case innovation means the permanent state of technological progress for all the manufacturers.

II) The next level is the so called "creative innovations". The innovations of this type focus on the quality improvement of the product. According to Mensch's terminology, such kind of innovations is defined as "pure innovations". They consist in introduction of the all new products, but by means of the existing operating technologies.

III) The third level – "revolutionary innovations". These innovations aim at radical change and alteration of the technological modes. Such revolutionary changes occur on average once in 60-70 years, as it has been rightly pointed out by S. Glazyev. The innovations belonging to this type are the discoveries in the fields of quantum physics, bio- and hydrogen energetics, nanotechnology etc. The importance of the changes in technological modes is can hardly be overestimated.

Conclusion

Hence, the essence and the economic subject-matter of innovation can be objectively presented as the degree of creativity of the economic operators, where the upper and lower limits of this creativity are represented by the above mentioned levels of innovations. Creative and revolutionary innovations can be considered both as a state and a process of persistent change, which in its turn ensures the technological progress and represents its technological and economic basis (its core).

Therein lies the dual character of the innovation, which consists in its specific feature to exist in the economic system simultaneously in two states: as a state of the innovation potential of the economic operator and as a development process of its creativeness. Firstly, the innovation as a state appears in every product or service that provides the innovative potential for improvement as a capacity for modernization with the help of inventors and efficiency experts. Secondly, the innovations of the second and the third levels can be fully implemented only in case of the maintained continual innovation process, through increasing of the innovation performance in the economic sectors and the regions and through the switch to the innovative economic growth model at macrolevel. This process can be and should be carried out through the economic form of a certain national innovation system at macro-, meso- and microlevels (in the form of the intersectorial R&D complex, the production process and the sectors of the auxiliary non-productive sphere); and in its more developed form this process should result in the form of the innovation cluster with interregional (automotive or petrochemical complexes), cross-country (e.g. hadron collider) and global localization (mechanical engineering, educational and scientific clusters).

Hence, while in statics the economic subject-matter of innovation is characterized by its innovative potential, then in dynamics the innovations appear as a continual progressive process and require the appropriate economic forms to be implemented, i.e. an adequate innovation infrastructure in the economic sectors and the regions in general. Justification of this dual approach to innovation as to a process and a state opens up new possibilities for innovation cluster development in the regions of Russia in the modern context.

References

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