The Main Features of Innovative Cluster in the Russian Economy

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Abstract: - The article dwells on the theoretical issues of modernization of the Russian economy in the post-crisis stage of its development and its transition to innovative development. The author considered the various approaches to the definition of innovation in the economic literature the U.S. and Europe, defines the main tendencies of the development of innovation in the economy of the United States and Europe, reveals the economic content of the concept of "innovation" based on the theory of clusters by American economist, professor of Harvard University M.Porter and on the concept of cluster by Austrian economist J.Shumpeter. On the basis of their scientific views the author suggests his own dual methodological approach to the definition of innovation: cluster as a state (point approach), and cluster as a continuous process of changes and updates.

Key-Words: - Modernization, Innovation, Cluster, National Innovative System

1 Introduction

The economic reforms had been undertaken in Russia within the past decades have led to fundamental structural changes in the whole economy and in its particular sectors. In the context of continuing global financial and economic crisis, the Russian government set the strategic task of the transition of the economy of the country to the post-crisis recommencement stage of the economic growth based on a qualitatively new model of development.

The main conceptual content of a new model of the Russian economy is its innovative modernization.

The most important characteristic of this modernization is activization and intensification of the innovative processes in the leading industries and regions of the country, their transformation to a permanent factor in economic growth. The results of studies conducted by the Organization for Economic Co-operation and Development (OECD) suggest that the investment in the innovation sector lead to GDP growth in the ratio 1 to 3, the investment in information and communication technologies – in the ratio 1 to 2. By the end of 2009 90% of the GDP growth in industrialized countries is determined by innovation and technological progress [5].

Nowadays in the USA and Europe the scale of financing of the research and development has been increasing alongside with the growth of their effectiveness. The high-technology economic activities have been intensively developing; simultaneously the research and development intensity of the basic traditional industries augment, and under the influence of the process of innovation radical structural shifts come about in the leading sectors of national economy.

In the advanced industrial countries of Europe and in the USA the old industries set up on former technological basis vanish while discontinuously innovational sectors closely associated with nanotechnology, hydrogen and bioenergetics, informatization of the traditional industries arise. Fundamental and applied science more and more appreciably focus on the needs of innovative renewal of the economy, its creative direction keep on strengthening.

2 The Main Theoretical Approaches to the Innovative Process

Nowadays along with the objective of maintaining the competitiveness in a global world economy both at the macro- and mesolevels the problem of renewed economic growth with the help of innovative activization and with its further subsequent transition to innovation model of economic development comes to the foreground. This transition is to provide a qualitative increase in production efficiency, the development of

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knowledge-based structure of regional economy, improvement of the competitiveness of its products and services on new technological basis.

Theoretical and practical solutions for these problems are impossible within the traditional schemes of the territorial and sectoral management, and requires the development of new methodological approaches to management and to the organization of innovative activities which would allow to implement the existing innovative potential of Russian industries and regions as well as to create a new innovative organizational and economic infrastructure, industrial and regional economy [1].

First of all, it is relevant to define the fundamental term "innovation". Initially, it is the Austro-American scientist Joseph Schumpeter who made the greatest contribution to the theory of innovation, and along with N.D. Kondratyev and S. Kuznets is proved to be considered the founder of "technological" theory of economic development. In his work "The Theory of Economic Development" he was the first to substantiate the key role of innovation in the process of economic growth. J.Schumpeter marked out five factors as the principle approaches which turned to be the foundation of traditional classification of innovations: the use of new techniques, new technological processes or new production assurance (in the buy-sell process), the introduction of products with new properties, the use of new raw materials, the changes in the organization of production and logistics, the emergence of new markets.

The central place in J.Schumpeter's theory of "technological" development is given to entrepreneur-innovator as a creator of new, innovative products, new markets and new technologies [1]. These factors unbalance the current economic system, stimulating the economic growth as a kind of accommodation to the innovative shock: innovation involves more and more interdependent sectors and brings about the period of rapid growth in the economy. It lasts until the innovation will embrace the greater part of the production, then under the influence of processes of economic competition the economic balance is restored, but at a new qualitative level.

M.Porter and G. Bond suggest dividing all the innovation into the upstream and the downstream kinds. The first one is connected with research activities and the second one - with the process of commercialization. Within the ascending innovation the ideas are transformed into the technological opportunities presented in the form of product concept prototypes or platforms. After the technological base has been created, the knowledge turns into the commercial products oriented to the market needs. W. Miller and L. Morris write that in the upstream phase only one out of 3,000 ideas brings the commercial success, and on the downstream stage one out of 4-5 projects has a success [14].

In our opinion, it is quite legitimate to establish linkage between the innovative theory developed by J.Schumpeter and the long-wave concept of economic development put forward by N.D.Kondratyev in the 20s of XX century [7]. In the theory of large market cycles N.D.Kondratyev shows the unevenness of economic development, accounting for the cyclical reproduction of durable capital goods when periodically occurring innovation of these goods causes prolonged deviations from the scale of economic balance. N.D.Kondratyev, having analyzed the data of scientific and technical discoveries, demonstrates the wavy trend of their dynamics, points to the correlation of the long waves with the technical progress.

Among the researchers of the XX century the greatest contribution into the theory of clusters development was made by American scholar Michael Porter [15]. This theory is based on the fact that the most competitive on an international scale the firms of one and the same industrial sector are typically concentrated in the same region, and this is due to the wave nature of innovations that are spread by the most competitive companies and affect the suppliers, the customers and the competitors of these companies.

Modern economic studies provide the diversity of cycles both of intrasectoral and intersectoral character. First of all, it is G. Kitchin's cycles of inventories (3-5 years), then K.Zhuglar's cycles of the investment in machinery and equipment (7-12 years); S.Kuzlen's construction cycles (the period of 15-22 years), agricultural and trade cycles (annual) and long N.D.Kondratyev cycles (the period of 72 years). The duration of a new upcoming long technological wave (since 1985 till 2035) is based on the achievements of nanotechnology, microelectronics, computer science, biotechnology, genetic engineering, new types of energy, new materials, space exploration, satellite communications and etc.

J.Schumpeter carried out researches into the causes of long market cycles, their duration and found out that the innovations play significant role in this process. He defined innovations as changes in technology and management, new ways of the

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use of resources; furthermore J.Schumpeter ascertained the entrepreneur's function as the connecting link between the invention and the innovations and substantiated the importance of credit for the commercialization of innovation.

J.Schumpeter attached great importance to economic innovation as the main source of profit, defined the place and the content of economic innovation within the production function. It is obvious to the most of the modern scholars that the process of innovation is undulatory in its nature which can be attributed to the periodical concentration of innovation in the clusters and its further synchronic spread.

The most favorable period for the emergence of technological innovations is the phase of depression usually following the economic crisis, because it is the depression that intensifies the need for innovations as a means of overcoming the crisis. During the periods of economical upturn the ideas can be postponed, because their realization always provokes the destabilization of the economy, whereas within the period of recession the innovations serve as a means of overcoming the crisis.

Undulatory, not even, nature of the innovative process is commonly associated with the need for a "critical mass" accumulation of new knowledge in a particular field or related fields (J.Schumpeter in his work introduced a special term for it – "cluster"), and this process results in innovation accompanied by a massive investment. In the works of researchers considerable attention is paid to the correlations of the appearance of innovation and the phase of the economic development wave. For example, G. Mensch suggested and proved the idea of the appearance of basic innovations in the phase of depression (long wave decline). Further spread of the basic innovation is accompanied by a "storm" of improving innovations that result in pseudoinnovations (rationalizations) [9]. in the phase of decline of innovation activity. K. Freeman expressed his views on the implementation of a cluster of basic innovations in the recovery phase of the long wave.

The undertaken empirical researches and a statistical testing of the hypotheses about the clustering of innovation in the phases of depression and recovery confirmed the presence of the both clusters of innovation. A.Kleinknecht in his works proved that the innovative entrepreneurs characterized by a low degree of inclination for risks during the depression phase. During the depression, the strategy of minimization of the loss dominates the strategy of maximizing the profit. Radical product innovations turn to be less risky. The long-wavelength rise is favorable for the technological rather than for the product innovations. During the depression research and development reoriented to the activities with lower risk, more uncertain, but promising great potential for economic growth in the future. Hence, in A.Kleinknecht's opinion, the depression proves a favorable period to implement the basic innovations. Significant steps towards the introduction of the basic innovations are to be made during the preceding boom. Considering the relationship between the basic and improving (according to A. Kleinknecht's terminology - "complementary") innovations, he pays attention to the effect of "innovation multiplier" that is, the growth of the investment into more affluent sectors (for example, nowadays in our country it is food and construction industries) [10, 12].

Gerhard Mensch, in his book "The technological stalemate: innovations overcome the depression" revealed the relationship between basic innovations, economic growth and cyclicity: the appearance of basic innovations results in that new companies arise, new products falls short of growing demand that leads to high rates of output growth. However, in the situation of the saturation of the market the supply begins to exceed the demand, so that the rate of profit falls, the investment funds are reduced. G. Mensch legitimately classified innovation in the three groups: basic, improving and pseudoinnovations. Within the basic innovations he distinguishes the technological ones (that form new industries and new markets) and non-technological ones (that cause the changes in culture, government, public services). Improving and pseudoinnovations exist in the context of the modernization of the existing goods and services.

There is also a modern version of the "theory of technological development" the central element of which is a "general purpose technologies" (GPT). This theory was first published in 1995 [2]. According to the authors of this term, general purpose technologies are the main leading force of the economic growth. This theory was further developed in a collection of articles of 1998 [4]. The authors characterize the GPT as a technology that allows of numerous improvements and has a variety of application possibilities, so that they are applicable in many sectors of the economy and can be combined with other technologies, significantly contributing to their effectiveness. Owing to these features, each technology of this kind generates a tree of new technologies that radically changes the technological structure of the economy, preventing the diminishing returns of the factors of production,

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and hereby supporting the economic growth. Note that the concept of GPT is close to the concept of "basic innovation" introduced by G. Mensch, but not quite coincident with it (G. Mensch differentiates the basic innovations and scientific discoveries. As opposed to a discovery an innovation should be ready for the implementation in production).

2.1 The classification and the levels of the innovation

The basic tenets of G. Mensch's theory [8] were developed by A.Kleinknecht and P. Kumbus, who gave their own classification of innovations: "pure" innovations – the products for final consumption, new medical procedures, devices and drugs, new capital goods intended for the production of the consumer goods and services, new technical devices and new materials that are available in the production of both the investment and the consumer goods, scientific instruments, which are intended for laboratory research and in the future may be used for the industrial purposes. "Pure" innovation is the process directed only at the saving of the factors of production [6].

It is noteworthy to single out one more approach among the modern experts' suggestions in the field of innovation, it was developed by Robert Tucker (USA) who to a greater extent specialized in introducing innovations at the microlevel. He subdivides the innovations into three levels: the first one is the level of "incremental innovations" that are the innovations that have a slight or insignificant impact on the net profit of the company, but, nevertheless, they enhance the customers' satisfaction and the efficiency of the product. Examples of such innovations: a simplified procedure of clients' registration, innovations in the company's services sector. Another level is that of the so called "significant innovations", they imply a significant change in the company's product line, changes the basic properties of the goods. The example of such an innovation is a reduction in fuel consumption by cars. The highest level of innovation is "breakthrough innovations". The author defines them as the "epochal discoveries", the giant steps forward on a global scale, they do not belong to any particular company and create totally new industries. The invention of the cars, of electricity, the discovery of penicillin, as well as the Internet – they all are the epochal breakthroughs [17].

3 New Approach in Economic Essence of Innovation

On the basis of the mentioned approaches to innovation, we legitimately suggest our own dual methodological approach to the disclosure of the nature and the content of the three-level economic innovation:

The first level of innovation covers all sectors of the economy and is present in all the economies of the world. In our opinion, it should be called the "routine innovation", that is the innovations in the form of rational proposals aimed primarily at improving the existing production technologies and manufactured goods. Innovation in this sense appears in the form of modernization, with no qualitative change in applicable technology and manufactured goods. These are the cross-cutting innovations, point in their nature, they always present in the historical and spatio-temporal aspects of each business entity at macro-, meso- and microlevels. In this respect, the nature of innovation manifests itself as a permanent state of scientific and technological progress for all producers.

The second level of innovation is "creative innovation." This type of innovation aimed at improving quality of the product itself. According to the terminology of G.Mensch, such an innovation is defined as a "pure innovation". These are represented by the production of high quality new products, but with the use of the available, already operating technologies.

The third level - the "revolutionary innovation". This level of innovations aimed at the change and the replacement of the existing technological structures. These revolutionary changes, according to S.Glazyev, occur once in nearly 60-70 years. The following discoveries can be attributed to the "revolutionary innovations": discoveries in quantum physics, bio- and hydrogen energy, nanotechnology, etc. The importance of changing of the existing technological structures can hardly be overestimated. The introduction of the "revolutionary" technologies contributes not only to expand the scale of economic growth, but also the tasks used to overcome the shortage of resources, as well as growth in socio-economic efficiency in the industry today.

Thus, the nature and the content of the economic innovation can be considered a measure for businesses creativity, the lower and upper bounds of which are defined by the three mentioned levels of applied innovations.

Creative and revolutionary innovations, in our view, are to be represented not only a point state, but also as a process of continuous change, directly providing the scientific and technical progress and

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turning to be its technical, technological and economic basis (kernel of scientific and technological progress).

This is the dual nature of innovation, which is reflected in the fact that innovation can simultaneously exist in the economic system as a state in the form of the existing innovational potential and as a process of changing of the measure of the economic entities' creativity. First, innovation as a state finds its expression in every product or service with the innovation potential of improvement as the ability for modernization with the help of the inventors and the innovators. Secondly, the innovation of the second and the third levels can be fully realized only on condition of the organized process of continuous innovation, by force of increase in the innovative activity of industries and regions, and the transition to innovational model of the economic growth at the macro level. This process can and should be carried out through its organizational economic form as a relatively isolated local innovation system at the macro-, meso- and micro levels, in the form of the complex intersectoral R & D, manufacturing, and non-production sphere services, and in its most developed form – as an innovative cluster having an interregional (automobile, petrochemical complexes) inter-country (such as the Hadron Collider), and global localization (engineering, education and scientific research clusters).

Thus, as a point state in statics, the innovation for its economic content is characterized by its innovative potential, and similar to a process in dynamics, innovations are presented in the form of continuous progressive improvements that require a specific organizational and economic condition for its realization: an adequate infrastructure in the industries and the regions.

The substantiation of this dual approach to innovation as a process and a state requires the disclosure of the economic content of the concept of innovation system. Or, as has become customary to define it in the domestic scientific literature - the national innovation system (the NIS) [16].

The concept of "national innovation system" was firstly introduced by K. Freeman and then developed by B.-A. Lundvall and R. Nelson. "National innovation system, as K. Freeman points out, is a complex system of the economic entities and the public institutions (law, regulations) involved in the creation, the storage, the distribution and the transformation of new knowledge into new technologies, products and services consumed by society"[3].

According to the classic interpretations of Lundvall and Nelson, innovation is a complex process of improvements, bringing together various participants: the companies, the producers of new knowledge, technological and analytical centers.

In international practice, the following definition is accepted: national innovation system is a set of institutions belonging to the private and public sectors, which independently and in cooperation with each other are responsible for the development and dissemination of new technologies within a particular state [11].

Thus, the national innovation system if characterized by its components is:

Firstly, it is a set of institutions of economic, legal, financial and social kind, providing innovative processes. This set of institutions, that is a set of conditions and rules (formal and informal), that the organizations operate in compliance with. The purpose of functioning is to develop and to disseminate the new technologies, innovations and new economic entities in the form of intellectual property within a particular state.

Secondly, as an open system NIS is manifested in the interaction of organizations (structures), various forms of ownership, occupied by the creation of scientific knowledge, the objects of the intellectual property and their preparation for commercialization within national borders.

Thirdly, the NIS results in new technologies, new knowledge, know-how, the products of new generation, and ultimately the accumulation of new products, knowledge and technology, the new technological order. The latter radically changes the industrial structure, the quality of the GNP and GDP.

The structure of the national innovation system requires, in our view, the economic-organizing mechanism that can operate all the components of the NIS. Such a mechanism should have the adequate forms of its realization.

The leading economic-organizing form of the innovation system implementation in the economy at any level is, in our opinion, the inter-industry innovation cluster, capable of providing a continuous process of innovation at all mentioned levels: the point modernization, the creation of revolutionary innovations. It is the inter-sectoral and the inter-regional integration of the enterprises and organizations allocated in every particular national innovation system, of the related industries performing various functions (beginning with the research and R & D in general, training, to manufacturing and logistics), and united by a common process, this integration will be a catalyst for innovational activities in each specific industry

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and region. The result of such a "merging" will be the industrial innovation cluster, creating a high tech product by the efforts of all participants of this process.

In this case, it is important to note that in the modern situation of expanding globalization of economic relations the industrial innovation cluster should not be only a localized, closed and self-sufficient within a particular territory, and should be open to all international parties, both in terms of developing new products and services and commercialization and production line in the system of outsourcing in those regions of the world, where their production is more efficient.

Thus, within the global innovation clusters we can single out the localized (inter-sectoral, intra-regional) and the non-localized (interregional) ones.

There are two methodological approaches to the concept of clusters developed in the foreign and the Russian economic literature. The first one, more narrow, defines a cluster as a productive network of closely linked firms (including suppliers) in the chain of added value. The second approach is broader and includes a network of research institutes, universities, network firms, specific customers, etc. In this form the industrial cluster is a complete, relatively local innovation system, bounded by the territorial proximity of participants and / or industrial and technological profile.

Several advantages of the second approach in comparison to the traditional, sectoral one can be marked out. Instead of focusing on the groups of participants at one and the same position in the network, the economy of the sectors and regions is displayed in the form of the strategic groups on their various levels. If in the context of sectoral profile the emphasis is made on the final product and the related production, the clusters already cover suppliers, consumers, service providers and other specialized institutions in the different sectors. It is typical of the sectoral approach to account only the competitive relationship, while the cluster one combines the analysis of competitive and cooperative processes, opening up the opportunities for the effective application of various tools of dialogue between government and business.

The cluster approach finds its basis in the works of Alfred Marshall and Joseph Schumpeter, so that it can be summarized that the historical foundations of the cluster approach are, on the one hand, Marshall's “industrial district” and “economics of agglomerations”, and on the other – of Schumpeter’s innovations promoting the economic growth within the industrial agglomerations. Thus, two basic functions are simultaneously provided in the cluster: 1) the effect of localization, that is the reduction of the costs due to the close proximity of related firms, and 2) the effect of the inter-sectoral cooperation increase, that is the spread of innovation from one firm to another, bringing about a constant growth of productivity in the cluster in general.

4 Conclusion

The modern interest in the cluster concept is largely associated with the works of Michael Porter, the author of the classic definition of the term: "a cluster is a group of geographically neighboring branch of interconnected companies and associated organizations operating in a particular area, characterized by common activities and complementary to each other [14].

M.Porter singles out several functions that clusters perform in the economic development of any country: clusters are the critical motors in the economic structure of national and regional economy. The prosperity of the region depends on the significant positions in a number of the competitive clusters; the clusters may determine the fundamental objectives in the national or regional business conditions: the clusters largely correspond to the nature of competition and microeconomic factors that affect the competitive advantages; the clusters provide a new way of thinking in the field of economy and the efforts in its structure development. Thus, the phenomenon of cluster provokes reconsideration of the role of the private sector, government, trade associations, educational and research institutions in economic development, and helps to identify the common opportunities and not only the common problems of firms and companies of all forms of ownership.

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