

Innovation Clusters as the Basis for the Development of a Modern Economy

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Abstract An important distinguishing feature of the cluster is its innovation orientation. The most successful clusters are formed where a “breakthrough” in the field of technology and production technology is carried out or is expected, followed by access to new “market niches”. In this regard, many countries - both economically developed and just beginning to form a market economy - are increasingly using the “cluster approach” in the formation and regulation of their national innovation programs.

Keywords Cluster, Science, Cotton-textile, Innovations, Economy, Industry, Agro-industrial complex

According to Michael Porter’s theory, a cluster is a group of geographically adjacent interconnected companies (suppliers, manufacturers, etc.) and related organizations (educational institutions, government bodies, infrastructure companies) operating in a specific area and complementing each other. M. Porter [1] believes that the country’s competitiveness should be viewed through the prism of international competitiveness not of its individual firms, but of clusters - associations of firms in various industries, and the ability of these clusters to effectively use internal resources is of fundamental importance.

The cluster concept of economic growth and increasing the competitiveness of economic systems is becoming more widespread in the world. This is due to the processes of globalization, the development of communication tools, and the active formation of network structures. It is based on identifying clusters of commodity producers, stimulating their organization and networking. The cluster of commodity producers is considered as a network organization of complementary, territorially interconnected relations of cooperation of enterprises and organizations (including specialized suppliers, including services, as well as manufacturers and buyers), united around a scientific and educational centre [2].

Innovation is the introduction of a new or significantly improved product, service or process, a new marketing method or a new organizational method in business practice, workplace organization. The general sign of innovation is that it must be implemented.

Innovation is the locomotive behind the development of countries, industries and enterprises. Economic development at the level of global and national economies propels innovation through a dynamic process in which new products, technologies and market strategies replace old ones [3].

The development of economies is realized through the development of industries, which is promoted by innovations. New industries owe their emergence to innovation. Either old industries disappear over time, giving way to new ones, or they survive repeatedly. Those that survive owe their survival to timely renewal. The development of companies is also driving innovation. Companies innovate to achieve the goals of their development strategies, i.e. increasing competitiveness and expanding business [4].

In our time, in the context of economic development, two concepts are widely discussed: clusters and open innovation. These two concepts [5] have an essential commonality: in both cases, we are talking about processes (production and innovation), covering groups of enterprises and organizations that cooperate in solving problems of common interest (which does not exclude competition between them outside these common interests).

The factors of economic growth achieved through clustering include:

- activation of innovation activities of subjects through the accumulation of knowledge in the cluster and the transfer of knowledge, experience, skills, diffusion of *know-how* as a result of migration in the cluster of highly qualified personnel; conducting training seminars for cluster members;
- transparency of information about the intensity of demand, consumer preferences;

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- improving methods for solving complex problems;
- flexibility and speed of development and implementation of innovations;
- internal specialization and standardization due to the presence in the cluster of flexible entrepreneurial structures of small business, representing innovative points of growth;
- minimization of costs for the introduction of innovations; acquisition of innovations in the framework of international technological cooperation;
- development of entrepreneurship due to the creation of a cluster of demand for specialized material and technical resources and services by large manufacturers;
- development of outsourcing, when small and medium-sized enterprises produce products, works and services for key subjects of the cluster;
- attracting foreign investment through network cooperation of cluster entities with foreign suppliers and investors;
- expansion of exports by entities through joint marketing programs, as well as organizational support for exporters in the region [6].

An innovation process is the process of moving from an idea to an end result in the form of an innovation. Real innovation processes are usually much more complex than these simplified model representations. Real innovation processes are usually not linear: at different stages, it is possible to return to previous stages for further development by trial and error. In real innovation processes, the push and pull models are intertwined. Not every real process ends with a positive result [7].

The world economy at the present stage is characterized by a transition to a post-industrial type of production based on the acceleration of scientific and technological progress. In this regard, the study and practical implementation of the concept of innovative development is becoming increasingly important.

The purpose of the study is to identify the features of the impact of innovation clusters on the innovative development of the territory and to develop proposals to improve the competitiveness of the innovation system.

The appearance of the term “innovative economy” in scientific circulation is attributed to the mid-1990s. This was the name of a process that reflects a qualitative transformation of the type of production, as well as a change in ideas about the criteria for the effectiveness of economic activity. In modern publications, discussions are still actively conducted on the definition of the conceptual apparatus, issues of essential understanding, as well as the role and place of science in the “innovative economy” [7,8].

Creation and strengthening of regional innovation clusters in the United States was identified as a top national priority in a 2001 Council on Competitiveness report. The main slogan of American innovation policy is “investing in technology is investing in America’s future.” At the same

time, special attention is paid to identifying and supporting those innovations that ensure long-term business development. There are four main forms of state innovation policy here:

- direct budgetary support for the development and implementation of new technologies and products;
- indirect support through tax policy and through administrative regulation;
- investments in the education system;
- support of critical elements of the economic infrastructure necessary for the rapid advancement of innovation [8,9].

Much attention in the United States is paid to the creation of a national network of centres for the introduction of industrial technologies based on universities. This measure is especially beneficial for small businesses that gain access to modern technology. Various cooperative forms of organizing innovative creativity have become widespread - from mixed capital and risk sharing to the joint use of expensive equipment. Finally, the formation of innovation clusters is supported and stimulated - the phenomenon of Silicon Valley [10].

It should be noted that the cluster approach provides an excellent basis for creating new forms of knowledge pooling. Cluster-oriented industrial policies stimulate and indirectly support the emergence of “new combinations”, especially in education and research, as well as through innovation intermediary centres [2,3,4].

For example, cooperation programs such as Eureka play a very important role at the European level. They bring together potential partners who have not been able to find the additional knowledge they need at the local level. Of course, large demonstration programs play a certain role in the formation of new combinations [10].

Currently, the European Parliament is discussing the issue of creating a Common European Research Area (EESP). The author of the idea is the EU Commissioner for Scientific Research Philippe Busquin. According to him, “The initiative that I advocate has three goals: (1) to promote the creation of the most favourable conditions for research in Europe; (2) support for measures that promote research performance; (3) strengthening the role of Europe as an innovative springboard”.

The fact is that the EU is seriously concerned that the investments of the USA and Japan in scientific and technological development are increasingly surpassing those of the EU countries, and this gap is constantly growing not in favour of Europe. According to the European Commission, the EU has a chance to rectify the situation if it unites the resources of its countries, in each of which the national science policy will be reformed in accordance with a single European standard. An important role in this is assigned to the development of innovation clusters both within countries and within the EU [6,7].

As an example of the application of the cluster approach, consider the research on the development of an innovation

strategy in the Netherlands [11].

The entire economy of the country was divided into 10 “megaclusters”: assembly industries, chemical industries, energy, agro-industrial complex, construction, media, healthcare, commercial service industries, non-profit service industries, transport. The analysis of “knowledge flows” between clusters made it possible to identify the characteristic features of innovation processes. It turned out that three clusters (assembly industries, commercial service industries and chemical industries) serve as “net exporters” of knowledge to other clusters. In this case, the first two represent general “exporters”, exporting knowledge to all other clusters [12].

The health care and non-profit service industries (which have large knowledge industry institutions) are also net exporters of knowledge, albeit to a lesser extent.

Two clusters represent net importers of knowledge: construction and media. Three clusters (agro-industrial complex, energy and transport) have a rather “self-sufficient” character and produce knowledge mainly for themselves [13].

Such an analysis not only made it possible to obtain a general picture of the development of innovation processes, but also determined the main priorities in the state's innovation policy.

In world practice, the following main forms of stimulating small innovative enterprises have developed, including within the framework of cluster industrial systems:

- Direct financing (subsidies, loans), which reach 50% of the cost of creating new products and technologies (France, USA and other countries);
- Provision of loans, including without payment of interest (Sweden);
- Targeted grants for research and development (practically in all developed countries);
- Creation of funds for the introduction of innovations taking into account possible commercial risk (England, Germany, France, Switzerland, the Netherlands);
- Gratuitous loans, reaching 50% of the cost of innovation (Germany);
- Reduction of state duties for individual inventors (Austria, Germany, USA, etc.);
- Deferral of payment of fees or exemption from them, if the invention relates to energy savings (Austria);
- Free management of office work on applications of individual inventors, free services of patent attorneys, exemption from payment of duties (Netherlands, Germany).

A feature of this definition is the understanding of innovation as qualitative changes not only in the product and technology itself, but also in the organization and management of its production. Thus, innovation can be called not only a product, but also a process. Innovation is an essentially new combination of conditions and factors of production carried out by an entrepreneur, as well as a new way of organizing the activities of an enterprise. (Fig. 1).

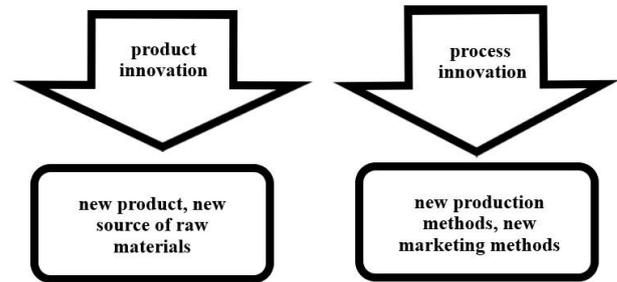


Figure 1. Innovation space

This diagram reflects the differences between product innovation and process innovation, and if in the first case, the materialized product is the source of profit, in the second it is knowledge and a person as its bearer.

The main source of innovation is people who have knowledge, ideas and are capable of promoting them.

To distinguish between the concepts of “novation” and “innovation” let us consider the innovation process. An innovation (innovation) is a formalized result of fundamental, applied research in a certain field of activity (new knowledge, method, invention). Innovation implementation, i.e. the practical application of new knowledge in order to meet certain needs turns it into an innovation (innovation). (Fig. 2).



Figure 2. Innovative creation process

In the work of Yu. Yudanov, economics is considered innovative in two cases: 1) creation and successful implementation of the simplest and most effective innovations based on old knowledge; b) new knowledge is not created, but innovations built on it are borrowed [6].

If all phases of the process take place within the boundaries of the company, this innovation process is closed.

If at certain stages of the innovation process there is an interactive interaction with agents external to the company, this innovation process is open.

External relations connect the innovation firm with other subjects of the innovation system: scientific laboratories, universities; government policymakers; competitors, suppliers and consumers.

Thus, innovation can be developed internally or externally. There are three main types of external relations:

Open sources of information are publicly available information without the requirement to purchase technology or intellectual property rights or interact with the source of information.

Innovative cooperation involves active cooperation with other firms or government research institutions in the field of innovation (that may also include the acquisition of knowledge and technology).

The acquisition of knowledge and technology involves the purchase of external knowledge (in the form of licenses, patents, and others), as well as fixed assets (machinery, equipment, software) and services that embody new knowledge or technologies, without interacting with their source.

The practice of attracting innovations from external sources on a commercial basis is becoming more widespread. We can talk about the quantitative growth and qualitative development of open innovation markets. This development is evidenced, in particular, by the emergence of such a business model as an Innovation Intermediary.

Henry Chesbrough coined the term “open innovation” in the early twentieth century [14]. However, the history of innovation goes back centuries, it is much older than the history of corporations and even design workshops. Therefore, in the distant past (for example, in the era of the invention of the wheel - the great revolutionary innovation), open innovation was common.

At one time, such advanced powers as China, Japan, South Korea and many other countries actively borrowed innovations. In world practice, trade in licenses and patents for the production of innovative goods, franchises is widespread. Starting their path to an innovative economy, the advanced powers laid the foundation for their development, at the same time they actively financed both new developments within their own state and through foreign direct investment outside it.

The history of the development of cluster policy dates back to the 1970s - 80s, as such large-scale programs to support clusters at the national level did not exist, instead there were identical local programs that were implemented in certain regions. Since the second half of the 1990s, a number of countries have been gradually introducing national programs for cluster development. By the end of 2000, the national cluster policy covered 26 member states of the European Union. Currently, targeted support of territorial clusters within the framework of the state cluster policy is carried out in Austria, Brazil, Great Britain, Germany, India, Spain, USA, Japan, and Canada [5,15].

It can be concluded that the main condition for an innovative economy is the availability of finance and intellectual capital.

Based on the foregoing, an innovative economy can be characterized as follows - it is a type of economy of a post-industrial society, the main condition of which is the availability of finance and innovators, who are the main source of creating new wealth. And the transition to innovative development in this case is considered as a transition to an innovative economy, i.e. moving to the point where innovation becomes a source of new wealth creation [9,10,11].

The presence of finance in the definition is an integral component, because, firstly, as mentioned above, money can buy innovations, and secondly, for the appearance of such innovations, research is needed for which funding is required.

World experience shows that in the last two decades, the process of cluster formation has been quite active. In general, according to experts, to date, clustering covers about 50% of the economies of leading countries (Table 1).

Table 1

Countries	Number of clusters
USA	380
Italy	206
UK	168
India	106
France	96
Denmark	34
Germany	32

In the United States, more than half of enterprises operate within clusters, and the share of GDP produced in them has exceeded 60%.

To date, various models of territorial clusters are used in international practice. One of them is represented by the Italian “industrial districts”, in which a high degree of concentration of small firms allows them to fight against large companies. Such clusters are called protoclusters.

Another model is industrial clusters formed as a network periphery of companies grouped around one centre, which can be a large company, university or research laboratory (most of the clusters in South Korea, a number of clusters in Germany and France, the Japanese Sapporo Valley). Finally, the third model is innovation clusters (clusters of Scandinavia, Switzerland, USA, and a number of clusters in the countries of Southeast Asia). They represent a system of interconnections between geographically closely located firms, their suppliers and customers with large research centres and universities, which are generators of new knowledge and ensure their rapid implementation [11].

With regarding to the innovative development, then this type of economy should be based on modern progressive knowledge. The essence of such development is the organization of interaction between the main producers of knowledge (Fig. 3).

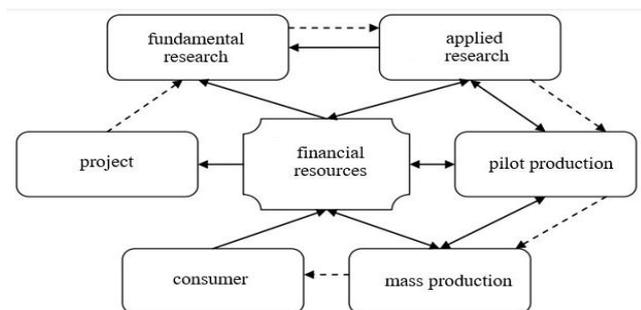


Figure 3. Organizational relationship between science and innovative development

Only in this case can we talk about the innovativeness of our own economy. If we simplify the proposed figure, then it can be argued that the result of the work of fundamental science works for the future - for the day after tomorrow, i.e.

today the knowledge will be obtained on the basis of which technologies will be created tomorrow, and the day after tomorrow - new products and profit. The result of the work of applied science is tomorrow, i.e. technologies will be created today that businesses can only use tomorrow. The result of the business is making a profit now by selling a new product [12].

Thus, the essence of the innovative development of the economy lies in its competitive transformation in the interests of ensuring economic growth based on advanced knowledge and promising technologies.

One of the key concepts in the context of studying the theory of innovative development is the concept of "innovation system", the study of which is devoted to a significant number of works by both domestic and foreign scientists.

As the experience of advanced countries shows, the most important structural element of the innovation system is science (a source of innovative ideas). Science should not be a closed, isolated system (universities and research centres), but should become a key link in each major segment of the state's innovation system, since in order to educate a new generation, which will be not only a consumer of innovations, but also a full participant in their creation, it is necessary to provide access of young specialists to new knowledge and advanced technologies, and this is possible only in the process of close cooperation between the state - education - science and business [13].

An effective tool for introducing such cooperation can be the use of a cluster approach.

The cluster can be recognized as one of the most effective forms of innovation processes implementation. Combining companies into a cluster creates not a "spontaneous" concentration of various inventions, but a strictly balanced system of dissemination and transfer of innovations, technologies and new knowledge.

A distinctive characteristic of an innovation cluster is a close relationship not only between companies, customers and suppliers, but also with large universities and research centres that generate innovations. Thus, the innovation cluster provides an opportunity to coordinate investments in the development of new products and sell them on the market using new technologies.

The main advantage of clusters is the ability to produce simultaneously several types and types. The main distinguishing features of the cluster are:

- availability of highly qualified labor resources;
- geographic proximity of all participants, facilitating the dissemination of knowledge;
- existence in clusters of flexible structures in the form of medium and small enterprises that contribute to innovative growth.

Research results show that countries with a high level of development of information technology and innovation are leaders in the development of clusters, which proves the dependence of the clustering of the economy on the index of

innovative development of the territory [7].

The most promising type of cluster is an innovation cluster based on the transition to a spiral model of innovation from a linear one, i.e. based on the interaction of the state, business and scientific institutions. Institutional factors of cluster development are the most important prerequisite for its sustainable development.

The problem of creating the institutions of an innovation system that allows generating, reproducing and using scientific and technical innovations to increase the pace of economic development and the quality of life in our country is becoming extremely important.

The implementation of the following measures is seen as particularly important in the near future:

1. increasing funding for fundamental research and priority scientific and technological areas, implemented mainly within the framework of state programs;
2. redistribution of budgetary resources towards increasing the share of funds distributed on a competitive basis;
3. radical improvement of information and educational support, including by attracting resources from specialized commercial structures;
4. significant improvement of the incentive systems for scientists, primarily in the public sector;
5. development of mechanisms to stimulate the attraction of talented young people to science;
6. deepening the integration of science and education on the basis of the best world experience in order to improve the quality of training specialists for promising high-tech areas;
7. a gradual transition to the use of a contract system for hiring specialists in the scientific and technical sphere;
8. restructuring of a part of sectoral research and design institutes into engineering firms with a more developed financial, economic, marketing and commercial structure.

In a crisis state of the economy, the economic blockade and budget deficit, the problem of the development of territorial innovation clusters in almost all sectors of the economy is becoming actual. For the effective development of clustering policy, it is necessary: creation or introduction into the existing development strategy of a clustering mechanism in all spheres of the economy, development of effective programs to support small and medium-sized businesses, improvement of mechanisms of public-private partnership in the innovation sphere [14,15].

Researchers refer to the advantages of clusters: concentration of rivals, their buyers and suppliers, increasing specialization of production; growing public-private partnership, stimulating the creation of new forms of knowledge pooling; achieving greater mutual understanding with world business leaders [12].

An important feature of the cluster approach in advanced countries, according to researchers, is the cultural innovation

environment of the cluster. The national market creates conditions under which products are tested and fine-tuned with their subsequent transfer to production in countries with cheap labor [16].

In Italy, the region of Lombardy and Emilia-Romagna is distinguished by the presence of a high development of mechanical engineering. It occupies a fundamental role in the production of the country, and acts as a leader in the implementation of innovations. The main achievements of the cluster are a more significant level of the coefficient of production of new types of products in comparison with other industries, an increased level of innovation in production (primarily in the field of logistics, production management, marketing innovations), maximum export indicators at the country level [17].

As the experience of foreign countries shows, high competitiveness and stable economic growth are provided by factors that stimulate the spread of new technologies. Considering that modern competitive advantages are almost completely determined by the advantages in production technologies, management, organization of goods promotion, the successful development of the competitiveness of the economic system is possible with the integrated use of the theories of the cluster mechanism and modern concepts of innovative development. In this regard, many countries are increasingly using the cluster approach in supporting the most promising areas and forms of entrepreneurial activity, in the formation and regulation of national innovation systems.

Analysis of national innovation systems in Uzbekistan and European countries has shown that in world practice, various approaches are used to accelerate technology transfer. Technology transfer organizations and instruments include joint research facilities, knowledge centers, technology transfer companies and technostarters, joint research projects, memoranda of understanding and research contracts, intellectual property licensing, associations, etc.

For Uzbekistan, an important direction in the development and formation of the concept of a national innovation system is the development and implementation of public-private partnerships in the innovation sphere. There are a number of programs, one of which is the BCT (Bukhara cotton-textile) project, where there will be public-private partnership is carried out.

In general, the policy of states in this area is aimed at developing cooperation between firms, industrial sectors of the economy, and associations of entrepreneurs (including representatives of small and medium-sized businesses), universities and research organizations, as well as financial institutions.

All new forms of economic development in an innovative economy (clusters, technopolises and technoparks, innovation-oriented programs, technology commercialization centers) contribute to the creation of larger and more competitive regional industrial complexes that can reduce transaction costs through joint technological cooperation of enterprises and a single development strategy,

which can be flexibly changed in the changing conditions of the external environment.

The balance of power between competing companies is constantly changing, it also varies between countries. The innovation process is the creation and use of new knowledge or technology in the economy, therefore the structure of the economy affects the nature of innovation. At the same time, innovation can change the structure of the economy because of the development of new products and markets.

Thus, in the advanced countries at the end of XX - beginning of XXI century used a variety of approaches to the creation of clusters, their specialization and the formation of innovation policy. Then the experience of the effectiveness of the functioning of clusters, the expediency of their structure, the intensity of ties between industries, clusters, sectors, the nature of integration into the industry and the locality, the degree of openness and transparency were studied. This analysis allows us to draw conclusions regarding the further development of programs, the participation in them of various regional organizations, local authorities, the determination of priorities and specializations of technological innovations. It seems that in Uzbekistan the present is suitable both for studying the experience of advanced countries in creating clusters, and for forming state policy and its implementation. Now in Uzbekistan, active work is underway to create technology centers, cluster formations and technology parks.

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