Theories of Formation and Development of Industrial Cluster

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Abstract. **In this paper has been investigated theories for formation and development of industrial clusters.**
Keywords: Clusters, theory, industry, regional clusters, formation process.

1. INTRODUCTION

Clusters are geographical concentrations of economic entities specializing in a certain field. Along with skilled manpower, technology and infrastructure, their effective integration and cooperation are the most important factors for the formation of clusters. The emergence of agglomeration of production forces in the regions is the initial stage of cluster formation. If there is a desire of concentrated enterprises and organizations to innovate, minimize costs and approach sales markets, clusters will begin to appear on their basis. In the economy, first of all, clusters are formed on the basis of innovative influence mechanisms. The main distinguishing feature of clusters from industrial cooperation and economic entities is the formation of concentration and deepening of mutual relations between them. Clusters are mainly formed in the economy of regions aiming to create competitive advantages in the field of production and technology, to enter new "market spaces". [14]Another most important distinguishing feature of the cluster between production, cooperation and economic entities is innovation orientation. However, cluster formation does not occur in many regions, despite the concentration. Such a situation was observed especially in developing countries, including Uzbekistan. In this case, governments should start forming clusters. This article considers the main aspects that should be taken into account in the formation of territorial clusters. An algorithm for regional industry clustering is proposed, promoting cluster initiatives.

2. LITERATURE REVIEW

Approaches to the development of regional clusters are relevant for developing countries. This is necessary for the formation of clusters in the regional economy and reforms for effective management.

Marlene Komorowski conducted research on the formation of clusters and the definition of cluster structures in the media industry of Brussels [1]. Opportunities to create an innovative industrial cluster in the form of a virtual enterprise Babkin.A. studied in the study [2]. Svetlana S., Elena G. [3] and others conducted a study on the agglomeration of forestry furniture industry enterprises of the Voronezh region of Russia and the prospects of forming a regional industrial cluster. Creation of innovative clusters in the field of biotechnology industry and their impact on regional development in L.A. Suvorova and L.L. Zaushitsynal [4] was evaluated. This article discusses the main stages of creating innovation clusters.

The process of formation of a new industrial cluster is determined to have an important role of sellers in the local market. T. Sonobe, D. Hu & K. studies show that the formation of clusters plays a more important role in the domestic market [5]. A step-by-step clustering algorithm was proposed by Alina Romanova, Anton Abdurakhmanova and others [6]. In most studies, the formation of clusters as a natural process is connected with the development of business entities [7]. Formation and development of industrial clusters should be carried out by initiators. Executive power and local government bodies should focus on the creation and organizational support of clusters. There are 6 models of formation of industrial clusters: Italian model, Japanese model, Finnish model, North American model, Indo-Chinese model, Russian model [8]. The formation of clusters in the economy of the region was determined through the agent model of spontaneous growth [9]. Although a study by Timothy L. Faley was conducted to help take the first steps in creating an industrial cluster, it did not recommend a specific algorithm.

3. ANALYSIS AND RESULTS

There are two main methods of cluster formation in international practice. The first method is spontaneous, that is, clusters are formed without any initiative under the influence of market mechanisms. An example of the emergence of such clusters is the majority of regional clusters in Germany [12]. The spontaneous option is preferable from the

point of view of both regional and national economies, because its implementation occurs naturally and is ideal for creating competitive advantages, but it requires a very long time;

The second direction is mainly formed as a result of coordinated actions of state bodies, business and scientific community on clustering of regional industry, activation and development of existing clusters, promoting cluster initiatives [7]. In this option, appropriate measures are implemented to create cluster schemes based on the economic status of the area, existing and potential opportunities.

There are two ways of forming regional industrial clusters. The first direction is the formation of new network clusters on the basis of leading scientific institutions acting as carriers of innovative ideas. The second direction is related to the existing economic agglomerations, which include educational and scientific-research institutions and create conditions for the active introduction of innovations into production [8].

In general, the creation of a cluster implies the formation of an economic agglomeration and the development of innovation-oriented interactions between its participants. If the economic agglomeration already exists, measures are taken to activate the cluster in the country [12].

It is appropriate to understand the difference between the above two directions of regional industrial cluster formation in terms of the sequence of stages of cluster formation. The process of formation of a regional industrial cluster consists of a number of stages given in figure 1.

Clusters first appear as industrial agglomerations, which are formed based on the concentration of leading industrial enterprises, as well as related and auxiliary industries.

In the spontaneous method of cluster formation, industrial zones are initially formed. The necessary conditions for industrial production are created in industrial zones, in particular: infrastructure, institutional conditions, human resources and quality of life. Motorways have been connected to industrial zones, a metro line will be built. An example of the formation of such clusters is the automobile cluster in Guangzhou, China. Japanese companies Toyota, Honda, and Nissan are clusters formed during the transfer of their production to China. Developing economic agglomerations have attracted a large number of banks, logistics companies, local suppliers of equipment and spare parts. The formation of an automotive cluster in Guangzhou province is related to the provision of innovative activities to localized organizations, for this purpose, it is established through the establishment of specialized universities and research institutes, the formation of innovative infrastructure, and the increase of the number of local firms providing high-tech services. The most important element of the cluster policy is to attract workers with high professional skills who skillfully organize the production process. The most important direction for this is the formation of its scientific base. Guangzhou Municipality has taken the following measures in this regard, first of all, the number of Japanese-Chinese translators has been increased. The availability of translators has been an important factor in attracting Japanese firms involved in the automobile business to China. Chinese engineers study similar manufacturing processes in Japan. It should be noted that in the case of the formation of an automobile cluster in Guangzhou, the task of increasing innovative activity in proportion to the development of agglomerations has become more and more urgent. [7]

Another main scheme of cluster formation is the "Innovation - economic agglomeration - cluster" scheme. An example of this is the US Silicon or Silicon Valley. Silicon Valley is a region in California, where many giants of the information technology (IT) industry, as well as medium and small companies engaged in new software products, clusters that create the most advanced electronic computing systems are located. The emergence and development of this technological center is associated with the concentration of leading universities in large cities, sources of funding for new companies, as well as a Mediterranean-type climate. [5]

The sequence of cluster formation in Silicon Valley can be expressed as follows (Figure 1).

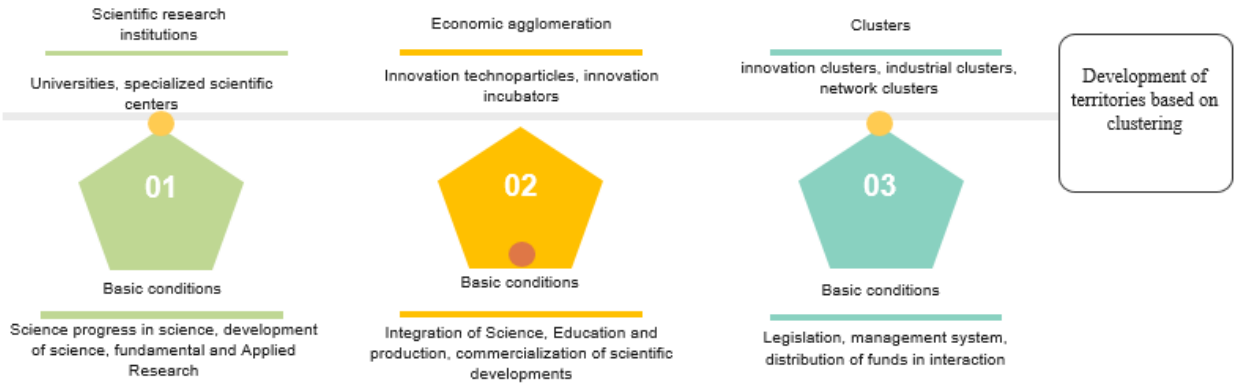

Figure 1-spontaneous direction of cluster formation

The formation of Silicon Valley began in 1891. Stanford University, located in California, decided to lease university-owned land to business entities for a long period of time, resulting in the creation of the Stanford Industrial Park. The existence of a large plot of more than 32 square kilometers made it possible to solve the initial financial problems of the university in the conditions of land shortage. For dynamic development, many high-tech companies have entered into contracts for continuous operation. An additional condition of the land lease was the employment of Stanford University graduates. The introduction of such rent restrictions for high-tech companies solved one of the university's main problems - Stanford graduates were able to find work close to the university.

In 1954, Stanford University adopted a co-op program that allowed undergraduate and graduate students to combine their studies with work at local companies. For rental companies, the same situation brought certain benefits, because it solved the problem of providing highly qualified personnel. [5] The first company to move into the Stanford Industrial Park was Varian Associates (inventor and manufacturer of klystrons), which signed a lease in 1951. Later, offices of Eastman Kodak, General Electric, Shockley Semiconductor Laboratory, Lockheed, Hewlett-Packard and other companies were opened. Currently, 52% of the 95 companies located in the Stanford Industrial Park (Stanford Research Park) are research and technology-oriented companies, and 46% are service companies. Among them are 12 financial companies, 10 law firms, 4 consulting firms, restaurants, cinemas. Another 2 percent of the companies' activities are related to the Internet. [1]

In addition to Stanford University, directly related to the activities of the Park, the University of California (Berkeley), the University of San Francisco, as well as several large universities have qualified personnel and research services, which use the park as a laboratory.

The formation of a regional industrial cluster on the basis of the "Volkswagen" automobile manufacturer of Germany is an example of the form of achieving the goals of industrial concentration in the direction of the development of the calculated regions. In Wolfsburg, Germany, a car manufacturer, local government and McKinsey have created an automotive cluster. The program aimed at achieving economic growth in the region through the development of the automotive cluster was called "AutoVision". In the implementation of this program, the interests of the management of the "Volkswagen" car concern aim to create a business community and gain additional benefits from cooperation with local suppliers. The main goal was to reduce the region's high unemployment rate and revive the declining service and retail industries.

The first means of forming clusters is the presence of industrial agglomeration. The Volkswagen car concern has a strong manufacturing base and is a highly influential chain as the main car supplier for the country.

The second tool is recruitment agencies. They must provide local labor for the new jobs created by the AutoVision program. The agencies have a big responsibility: they have to help the region overcome long-term unemployment and reduce tensions in the German labor market, attracting new talented professionals to the city of Wolfsburg. [6]

The third tool is Wolfsburg's service sector, which aims to improve the quality of life in Wolfsburg and attract professionals from other regions. The centerpiece of Volkswagen's program is the new Autostadt (Car City) - a tourist center with the car concern's showrooms, an IMAX cinema, a car museum and a five-star hotel.

The fourth tool is a kind of innovative "nursery" for new entrants, which is important primarily from the point of view of providing innovative activities to new companies in the region. By forming a local business community, these companies can share knowledge and information about potential investment projects. Nationwide project competitions are also held here every year, which attracts young companies from all over the country to Wolfsburg and helps to

conclude deals. In addition, the program envisages the construction of a scientific center.

Analysis of the above schemes of formation of regional industrial clusters led to the following conclusions:

The processes of cluster formation are not the same, but have their own characteristics, which are related to the different effects of the factors that make up the system, the difference in the initial conditions of the clustering process for the manifestation of the cluster initiative, and the chosen scheme of cluster implementation. Based on this, it can be said that the formation of a regional industrial cluster is a creative process that excludes the possibility of using single schemes. These situations require an in-depth analysis of the socio-economic situation in the area and the development of a cluster policy.

Despite the obvious differences in the processes of cluster formation, there is a methodologically important logical sequence of the formation of regional economic agglomerations, which form the basis of regional industrial clusters based on the considered schemes. This logical sequence can be expressed as follows: "formation of clusters - existing conditions in the region - main industrial enterprises - related organizations". For the emergence of promising regional clusters, conditions must be provided for the main industries, such as water supply and sewerage, communication, educational institutions, personnel, housing conditions, and medical services. and the development of the entertainment industry, etc.

Clusters formed in a certain industry network lead to the development of clusters in other related and supporting industries. The next stage of growth of any formed economic agglomeration is effective integration with education. The need for innovations, as well as highly qualified specialists capable of implementing innovations, is the main means for the next stage of development of any clusters. The role of educational institutions in the conscious formation of a regional industrial cluster should be clearly defined within the framework of the implementation of the cluster policy and the socio-economic development strategy of the relevant region.

A regional industrial cluster (as an economic agglomeration), regardless of its origin, should have the whole set of common cluster characteristics [9]:

- The first condition is the existence of a strong competitive position in the international and local markets and the high export potential of the cluster members. The following can be cited as indicators of competitiveness: a continuous chain of production, a high level of export of products and services;
- The second condition is the presence of local conditions for the development of the cluster, which may include: favorable geographical location, availability of raw materials, human resources, availability of suppliers of components and related services. Availability of specialized educational institutions and research organizations, necessary infrastructure and other factors. As indicators of competitive advantages of the region, it is necessary to take into account, among other things, the accumulated volume of attracted direct investments;
- The third condition is the geographical concentration and proximity of cluster enterprises and organizations, the presence of opportunities for active cooperation. As an indicator of geographic concentration, a certain region is highly specialized in a certain industry.
- The fourth condition is the existence of a positive effect of cluster interactions. Availability of effective cooperation between cluster members, including the use of contractual mechanisms, cooperation between production, educational and scientific research organizations, coordinated activities for collective promotion of goods and services in domestic and foreign markets.

Regional industrial clusters should correspond to the definitions given by scholars of the term "cluster". [2,4,8,15]

A regional industrial cluster should be considered as a functional economic agglomeration in the presence of cluster characteristics. From the perspective of a process approach [10], the formation of a regional industrial cluster should go through a number of stages, namely the following [3]:

- creation of an initiative group for the formation and management of a regional cluster;
- conducting research by the initiative group on the possibilities of creating a cluster in the selected area;
- receiving support from the government and local authorities;
- conducting activities aimed at attracting cluster members;
- to identify group structures (scientific centers, educational institutions, laboratories, information centers) included in the cluster;
- development of pilot projects and strategic projects;
- to conduct research on the effectiveness of the cluster activity in order to ensure the competitiveness of the cluster.

The sequence of the above steps is typical for the directions of forming an initiative cluster. At the same time, the

state is one of the main subjects of cluster initiatives, and ideally, it should coordinate the interests of all participants in the development of the cluster. [12]

Although there are specific approaches to regional cluster formation algorithms proposed in scientific studies [15,11,13], there is no clear algorithm for the processes of clustering the economy of the entire region and forming a single cluster. The disadvantages of the algorithms proposed in the research are that they are focused only on creating clusters based on existing economic agglomerations. The issues of regional cluster formation on the basis of scientific and educational institutions, which are the main core of clusters, were not envisaged.

The fundamental stage of clustering is the formation of a process management body, which is an initiative working group formed with the participation of regional authorities, regional industrial enterprises, scientific and educational organizations, and the cluster development center.

The second stage is the analysis conducted in order to evaluate the socio-economic development of the region and implement the procedure of industrial clustering of the region. As a result of the implementation of this stage, a decision is made about the feasibility of creating clusters in the region. The main focus should be on the analysis of the economic development of the region and the degree of influence of external factors on certain types of economic activity. [3]

The third stage is related to identifying the types of specialized and export-oriented activities of the region and the areas of innovative activity, in which the advantages of the region over others are determined. Existing economic agglomerations and leading scientific and educational institutions that can become a promising regional cluster are studied.

At the fourth stage, the existing economic agglomerations, innovative active educational and research institutions in the region are determined, cluster formations are determined, the possibilities of creating clusters based on economic agglomerations or leading scientific and educational institutions are evaluated, and a decision is made on the formation of clusters. Regional industrial clusters are not formed independently of educational and scientific institutions. Their presence and activity ensure the presence of a certain characteristic of the cluster.

The next step is to decide on the formation of a regional cluster. It defines the target for support through cluster policy. However, even the identified cluster structures do not become clusters. There may be budget constraints or insecurity among the economic entities participating in the cluster. In the selection of clusters, not only economic, but also social and political factors are taken into account, their consideration is necessary to ensure broad support of the cluster policy by the private sector in the region.

In the fifth stage, regional industrial clusters will be formed on the basis of selected economic agglomerations and scientific and educational institutions. This stage is the formation of individual clusters as sub-processes.

In the sixth stage, the effectiveness of the regional economy clustering process is analyzed. The impact of the established regional industrial clusters on the socio-economic development of the entire region is evaluated, and proposals for decision-making on management issues are developed.

At the seventh stage, the body managing the clustering process of the region's economy develops a decision on clustering management and implements control actions.

4. CONLCLUSIONS

The successful implementation of the project opens up the possibility of developing and implementing long-term projects aimed at achieving high specialization and division of labor in the cluster. Development of a cluster strategy includes analysis of macro and micro environments, formation of a unified development plan and establishment of a structure of relations between enterprises that are part of the cluster. At this stage, the problems of all members of the group are carefully analyzed and the reasons for the emergence of mutual integration are determined. The functional tasks of individual structures of the cluster are determined. The normative legal basis of cluster activity is formed. Also, such things as pooling of resources, creation of new industrial and service enterprises, introduction of modern industrial technologies and creation of common local brands for the cluster are carried out.

At the final stage, the efficiency of the activity of the established cluster is evaluated, its impact on the socio-economic development of the region is analyzed. As a result, a regional industrial cluster becomes a strong cluster only when state support becomes insignificant.

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