

Role of Clustering in Provision of Economic Growth

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Cambridge
Scholars
Publishing



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This book first published 2016

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

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ISBN (10): 1-4438-9038-3

ISBN (13): 978-1-4438-9038-0

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ACKNOWLEDGEMENTS

Apart from our efforts, the success of any project depends largely on the encouragement and guidelines of many others. We take this opportunity to express gratitude to the people who have been instrumental in the successful completion of this book.

Our thanks go to Drahomira Pavelkova, our Czech colleague from Tomas Bata University in Zlin, for a new look at cluster formation in contemporary reality.

Guidance and support received from all the members, who contributed and who are contributing to this book, were vital for its success. We are grateful for their constant support and help.

The research was conducted with financial support of the Russian Humanitarian Science Foundation. Project No. 15-22-01011 “Theoretical and methodological foundations of marketing provision of innovational development of intellectual resources of the Republic of Belarus and the Russian Federation under the conditions of economic integration (by the example of creation of universities of business type)”.

INTRODUCTION

Under the conditions of the modern-day concourse of the economic situation, the business-structure of society again faces the phenomenon of unstable markets. Their recessive state, which was often discussed in various types of scientific works, explains the behavior of financial and economic factors in the business vector of the global economy. The existing situation is clear: regions of the world require a “breath of fresh air” – an implementation of new steps for positive changes of quality of their economic growth.

For historical reasons, the optimization of crises and other manifestations of economic instability are usually related to the phenomenon of clustering. In its turn, the latter, beginning from the second half of the 20th century, constantly proves its popularity throughout the whole world.

What are clusters and clustering? What is their influence on the economic sphere of life in society? Which positive effects could be expected from their functioning and which should be feared? At which moment is it better to consider your company’s capability to participate in a certain cluster initiative? Or, for example, how is it possible to be sure that your organization and the process of clustering are incompatible categories?

This work is set to provide clear and substantiated answers to the above-mentioned questions. The authors define the notion and meaning of clustering, determine the specifics of the formation of modern economic clusters, view the advantages and negative aspects of clustering, study the phenomenon of “underdevelopment whirlpools” as a manifestation of clustering, analyze the contradiction of clustering, determine the merging of clustering into small and medium enterprises, put the emphasis on the connection between clustering and intellectual transfer, consider cluster initiatives, and present a methodological approach to cluster formation under the modern conditions.

This book is directed to students of Bachelor and Master degree courses, to “Economics” and “Management” majors in full-time and part-time education, to lecturers and other readers interested in information regarding clustering and its influence on economic growth. The book can be used within the “Macroeconomics” and “Management” higher educational establishment course units.

CHAPTER ONE

NATURE OF CLUSTERS

In the modern world, the success of economic development is associated with the notion of **industrial advance**. As a rule, it is closely related to the process of the modernization of enterprises, which is mostly conducted by the government, determining the priorities and directions of the development both of the system of economic subjects and of productive complexes and sectors on the whole.

Correspondingly, the economic science meets the challenge of studying, describing, and developing the mechanism of industrial policy, the main targets of which are the issues of **providing the rates of sustainable growth and the increase of competitiveness** at all levels. An increase of globalization processes leads to the growth of competition not only between companies and countries, but also between regions.

Economic globalization is the process of the growth of the economic interdependence of national economies, caused by the increase of movement, speed and volumes of goods, services, technologies, and capitals over national borders.

New world economic relations are being formed which determine the status of each country, region, or enterprise in the global economy structure. A notion of economic integration arises, the main instrument of which is the competitiveness of each country's industry.

Economic integration is the process of the economic cooperation of countries, which leads to the convergence of economic mechanisms in the form of interstate agreements and is regulated by interstate bodies.

Clustering, as an alternative to traditional sectorial industrial policy, is a tool for increasing competitiveness of one or another territorial entity. The implementation of its main processes is done by means of the effectiveness of the subjects of economic activities in a region.

At present, a special **topicality** of clusters is determined by their capability to provide a timely synergetic effect as a result of the organization of the effective cooperation of governments, business subjects, and R&D structures of developed and developing countries of the world on the basis of the common objective laws of economic development.

Thus, it is impossible to consider the development of a country and its competitiveness (and, consequently, of a population's well-being) without a clear program of the development of a region where a cluster approach is implemented. At that, "cluster" should be not a popular term, but a toll of an effective industrial policy.

1.1 Idea and Notion of Clusters

At present, the notion of a "cluster" is very popular in the theory and practice of the economies of various countries. Despite the huge number of publications devoted to the issue of the creation and functioning of clusters, **there is no unified definition of this term**. A variety of notions of "cluster" in economic theory proves the absence of a unified, full, and general idea. In order to give readers the most systemic idea of the research object that is of great interest to us, it is advisable to study the time stages of the cluster theory formation.

The phenomenon of the cluster, as an object of the economic agglomeration of interconnected enterprises on a certain territory, has been known **since the beginning of the 18th century**, the times of the handicraft industry. The classic theories of international trade by **A. Smith, D. Ricardo, E. Heckscher, B. Ohlin (Smith, 1904; Ricard, 1971; Heckscher, 1919; Ohlin, 1933)** created foundations for the analysis of regional specialization and research of economies of scale.

In **A. Smith's** theory, the total advantage in the manufacturing of products was achieved with the help of labor division and the cooperation of manufacturing with free competition and the government not interfering with the economy. With his theory of comparative advantages, **D. Ricardo** proved the profit of interstate specialization from a combined location of territories, when the correlation of expenses for products from one country to the expenses of other countries is more favorable for it than for other products. Conclusions from the theories of **A. Smith** and **D. Ricardo** created a scientific foundation for the further development of economic thought in the studied sphere and later – with the help of the production factors of **J.B. Say (Say, 1971)** – were adapted for companies. **In the 1930s**, Swedish researchers **E. Heckscher and B. Ohlin**, within the theory of ratio of production factors, studied the correlation of the interchangea-

ble factors of production – labor, capital, and land (export and import can be substituted by the movement of production factors) and the competitive advantages of regions, created by a means of rationalization of the transregional division of labor.

The first regional clusters were similar to **A. Marshall's** “industrial districts” – he was the first to pay attention to the phenomenon of clustering in the economy as an interconnection between the combined location of companies and their economic effectiveness. **A. Marshall's** book “Principles of Economics” (**Marshall, 1920**) raised the topic of **localized industries**, or **industrial districts**, and studied the specific peculiarities of geographical regions, where people with common labor skills unite into closed industrial entities – “**Marshall's knots**”. As a matter of fact, **A. Marshall** considered clusters with extensive interfirm labor division. Types of external economies (a wide pool of specialized labor force, a quick distribution of new ideas and improvements in the sphere, the development of specialized suppliers of goods and services), invented by **A. Marshall**, became the foundations of the Marshall-Arrow-Romer externalities model, which was the consequence of the territorial concentration of enterprises of the same specialization. **A. Marshall's** ideas continue to inspire economists for new searches even now, despite his theory being incapable of explaining the origin of cluster creation.

G. Becattini (Becattini, 1962) developed and continued the research of **A. Marshall**, creating a theory of industrial districts which became a specialization of economics and a methodological base for the creation of industrial districts, in particular in Italy and France.

Analyzing various sources of literature, it is possible to distinguish the following scientists in the block of “Standort” theories: **J. Thunen, B. W. Launhardt, A. Weber, W. Christaller, and A. Losch (Thünen, 1921; Launhardt, 1882; Weber, 1929; Christaller, 1933; Lösch, 1944)**. These theories unite formalized models of economic space and explain the interdependence of geographical agglomeration and economy from the scale and displacement of the population. Later they became historical and theoretical preconditions for the development of the cluster concepts of **M. Porter** and **M. Enright (Enright, 1995)**.

J. Thunen developed the system of concentric circles, in which various spheres of agriculture are located around the center, which is a single sales market for products. He introduced the notion of economic space and the idea of the importance of geographical location. **W. Launhardt** developed a space model of weight location triangle, the ideal placement of production, which should provide the minimization of transport expenses

for the supply of raw materials, supplementary materials, and final products.

“Any further movement regarding the issues of the space location of industry is possible and conceivable only through Weber’s theory”. **A. Weber** formulated the comprehensive theory of the location of industrial production. He thought that the sizes of industrial areas and their productive capacity are determined by agglomeration factors of production locations “without their merging into one production unit” in the form of the simple expansion and enlargement of homogeneous productions, close to one or another geographical place. **W. Christaller** and **A. Losch** created an orthogonal (hexagonal) model of region, in which demand and offer form areas of service and the sale of products to the population. **W. Christaller’s** theory of central spots includes the symmetrical “cell” location of communities and the “behavioristic” principle of maximal time, energy, and assets required by the inhabitants of peripheral communities for purchasing goods in the central spot. Studying the theoretical problems of communities’ location, **A. Losch** analyzed economic space on the level of regions. His merit consists of the fact that he “demonstrated logic and an operationalism of abstract thinking, thus opening for his followers a direct way for the creation of the common theory of space economy”.

At present, the theory of Michael Eugene Porter, Professor of Harvard Business School, is the most recognized and successful. As a matter of fact, he can be considered a founder of cluster theory in its modern understanding.

Thus, in his work “On Competition”, the professor distinguishes the following – in his opinion – main definitions of the category of “cluster”:

- geographically concentrated groups of related companies, specialized suppliers, service providers, and companies in **allied spheres**, as well as organizations related to their activity (e.g., universities, standardization agencies, trade unions) in the spheres which compete, but are involved in the cooperative work;
- a group of geographically close interconnected companies and related organizations which work in a certain sphere and are characterized by the community of activities and which **supplement one another**;
- **a system** of interconnected companies and organizations, the value of which as a single whole exceeds the simple sum of its parts;
- a space organizational form, which by its internal essence may be more **effective** as to the arrangement of production factors if the local competitive suppliers are available;

- a form of **network** within the limits of a geographical region which, due to close location of companies and enterprises, possesses certain forms of community which increases the frequency and level of **cooperation**;
- a new **method of structuring and understanding of the economy**, the organization of theory and the practice of economic development, and the formation and establishment of state policy, which provides additional possibilities.

At that, the initial treatment of the term, studied by M. Porter, became the most popular in modern scientific and conventional circles.

A cluster is a group of geographically close interconnected companies and related organizations which work in a certain sphere, are characterized by common activities, and supplement one another.

Companies supplement one another within a cluster entity, thus increasing the competitive advantages of a certain economic sphere. There is a constant process of integration between them by means of the implementation of innovational and top-quality technologies, the exchange of highly qualified staff, the joint use of services, advertising and marketing promotion, and infrastructure.

Later, **M. Porter's** cluster theory (**Porter, 2008**) was developed in the works of the Western economists, who "introduced a wide range of their own ideas", among which are the following:

- **E. Dahmen (Dahmen, 1950)** used in his research a thesis "of development blocks" as to the study of interconnections of large Swedish multinational corporations. He thought that the development of competitive success is formed on the "vertical of actions" within one sphere and related to other spheres, which provides the possibility for competitive advantages.
- **E.E. Leamer (Leamer, 1984)** studied clusters with a high level of correlation export during analyzing trade at the national level.
- **P. Krugman (Krugman, 1999)** introduced the ideas of the synthesis of macro-economics and the theory of locations of production capacities in space.
- **E. Feser (Feser, 1998)** distinguished two types of cluster policy – targeted cluster strategies and "cluster-informed strategies", and studied the measures of cooperation for cluster development programs.

- **V. Feldman (Feldman, 1999)** developed the theory of competitiveness on the basis of wide empirical research on diversification forms in various countries, where diversification is the basis for the emergence of the most effective clusters of innovative activities, and the very process of diversification often follows the matrix “expenses – issue” or contacts between spheres.

It is possible to distinguish the group of scientists, the research of whom also influenced the evolution of cluster emergence at various levels of economic development and in various spheres of economics. Economists **F. Perroux, J. Boudeville, J. Lasuen and P. Pottier (Perroux, 1961; Boudeville, 1961; Lasuen, 1969; Pottier, 1963)** developed the theory of growth poles, which was widely acknowledged in leading spheres that produce new goods and services. French scientists **J.A. Tolenado, D. Soulie (Tolenado, 1978; Soulie, 1989)** used the notion of “dies” for descriptions of groups of technological sectors. **J. Schumpeter, K. Arrow, R. Nelson and T. Hagerstrand (Schumpeter, 1934; Arrow, 1962; Nelson, 1959; Hagerstrand, 1952)** studied the factors of the increase of innovative activities of market structures. Institutionalists **O. Williamson and R. Coase (Williamson, 1985; Coase, 1988)** studied the influence of transaction expenses for the formation of intersectoral complexes. These works are devoted to the analysis of peculiarities of competition in networks, the necessity for the expansion of sales markets for products, the minimization of expenses, and the innovational development of territories’ dispositions.

Systematizing scientific opinions on cluster emergence, it is possible to conclude that these theories are based on cluster approach, which is an innovational form of the modernization of a territory’s economy, which stimulates the exchange of knowledge, cooperation, and network relations between large and small business, and allows national spheres to develop and support their competitive advantages.

These opinions could be expanded by an epistemic and technological approach to cluster creation, which would be the basis for the transformation of the spheres of preceding industrial order. The task of cluster formation with an epistemic and technological approach supposes combining fundamental practice-oriented science, design and engineering development, and new, high-tech productions, which will allow for building the supporting institutional structure (the core and backbone) of the future cluster.

An analysis of the evolution of cluster theory allowed for determining that while in the 19th century the historically formed industrial complexes

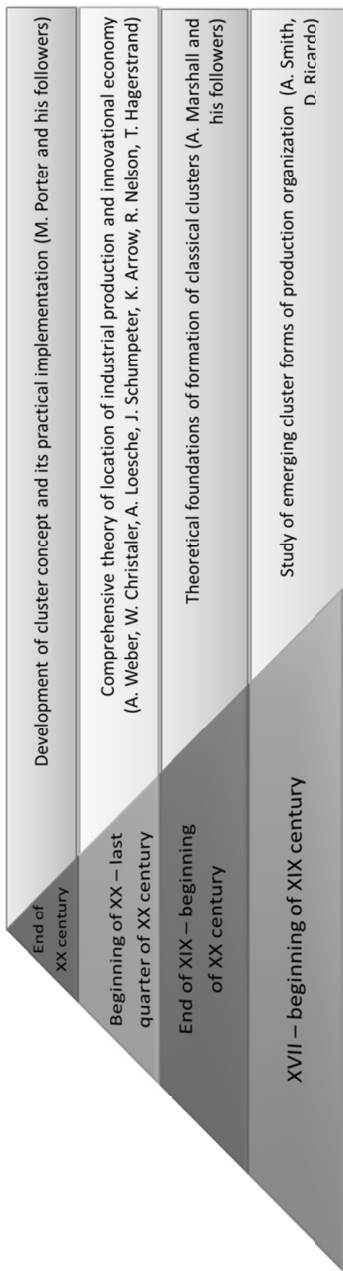
were viewed within an industrial approach as centers of the development of regional and national economies, the economic theory, beginning from the last quarter of the 20th century, has been studying clusters from positions of the theory of competition, paying attention to the growth of competitiveness and innovative activity.

Within the conducted research, the evolution of opinions on the stages of clustering is observed; it is offered to determine time stages in the formation of cluster theory (Fig. 1).

- I. **18th – beginning of 19th century.** The emergence of cluster forms of production organization (handicraft industry), labor division, and production cooperation (**A. Smith, D. Ricardo**);
- II. **End of 19th – beginning of 20th century.** The development of the theoretical foundations of the formation of classical clusters, which emerged on the basis of resource spheres (**A. Marshall and his followers**);
- III. **Beginning of 20th – last quarter of 20th century.** The formation of the comprehensive theory of industrial production location (**A. Weber, W. Christaler, A. Loesche**) and the expansion of the innovation economy (**J. Schumpeter, K. Arrow, R. Nelson, K. Hagerstrand**);
- IV. **Last quarter of 20th century – modern period.** The formation of cluster theory (**M. Porter and his followers**), the development of the cluster concept and its practical implementation.

By the 20th century, the research and ideas of scientists allowed for the forming of a serious scientific base which could explain the importance of clusters as a type of development of the economy for the growth of competitiveness. However, the task of increasing the competitiveness of territorial systems from the positions of cluster theory didn't lose its topicality. New groups of theories emerge (for example, the theory of technodynamics), which try to apply cluster theory in various sciences and scales of economy.

Figure 1 (next page) – Time stages of cluster theory formation
Source: compiled by the authors



Thus, generalizing the above, it is possible to state: the modern understanding of clusters is founded on **three key elements** (Fig. 2). In this case, the first element is **geography**. Clusters are formed mainly under the conditions of the maximal territorial proximity of their enterprises and, consequently, in places of a massive concentration of labor force – in other words, in large regions and cities. The next aspect is **value creation**. Clusters are based on companies from various spheres of industry, connected by the process of the manufacture of specific goods and services, which are valued by their consumers. The third significant component is the **business environment**. As a matter of fact, the effective functioning of clusters is ensured by the means of a certain set of business conditions on the basis of the systemic cooperation of business subjects, governmental establishments, universities, and other organizations of the national and regional innovational structure. (Lundvall, 1988; Lundvall, 1993; Freeman, 1995; Edquist, 1997; Cooke and Morgan 1998; Cooke et al., 2000; Cooke, 2001). Besides, clusters, as such, are essential elements of stable **business-oriented environments**.

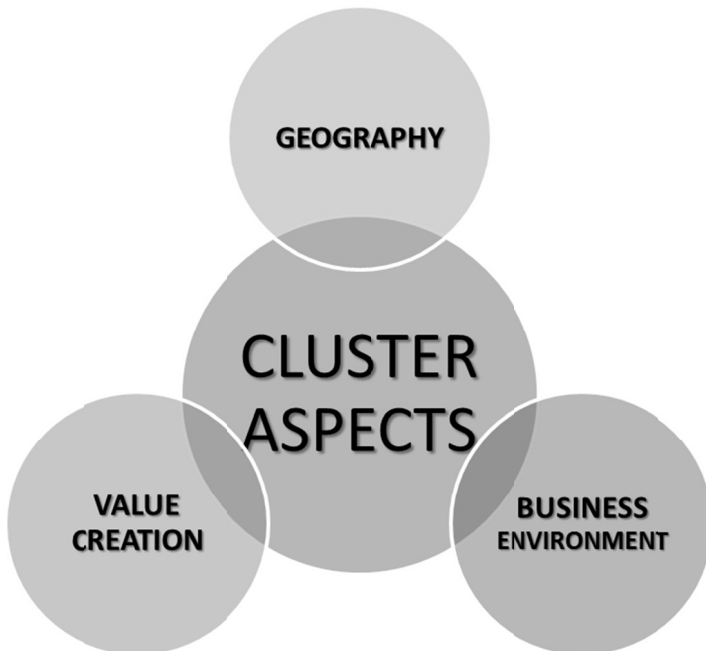


Figure 2 – Key aspects of cluster formation

Source: compiled by the authors

The **moving force of cluster efficiency** is various external factors – for example, subject and object relations with suppliers and the use of common production factors between members of a cluster entity – labor resources and knowledge. Despite the fact that these external factors exist independently in nature, they can gain dynamics from their usage in the processes of cluster cooperation and even competition (Best 2001).

The above elements of cluster functioning could be observed in any spheres of economy - not only in knowledge-intensive spheres, as it is often considered. For example, in tourist business, a hotel's capability to create value for its guests is largely determined by the effectiveness of local companies which work in other spheres, from agro-industries to restaurants, transportation, travel agents, shops, and financial and health services.

1.2 Characteristics of clusters

According to the rules, the idea and notion of economic combinations of cluster type is followed by a description of their characteristics. It should be noted that in due course, the full characteristics of clusters were given by M. Porter in his work "On Competition". Let us study the opinion of the popular scientist.

Thus, according to M. Porter, the **key characteristics of clusters** are the following.

1. **Clusters differ as to their size, scope, and level of development.** Some clusters consist mainly of small and medium companies. Others include both large and small companies. Some clusters are oriented at the research possibilities of universities, while others do not have any connections with universities. These differences in the nature of clusters are reflected in the structure of spheres which comprise a cluster. The most developed clusters have deeper and more specialized lists of suppliers and more related and supporting spheres.
2. **Clusters form an important and complex organizational form, a center of influence on competitive struggle.** Developed clusters include not one sphere, but several allied ones. These spheres often work on similar production factors, which largely expand the possibilities of suppliers.
3. **The advantages, caused by innovations, are strengthened by direct pressure (pressure of competitiveness, pressure aimed at**

the levelling) and also by the constant comparison which exists in the clusters that are concentrated geographically.

4. **Clusters certainly are a combination of competitiveness and cooperation.** Tough competition is observed in the struggle for a consumer, for its conquering and keeping. The presence of many rivals in the market and the availability of strong stimuli emphasize the intensity of competitive struggles within clusters. However, cooperation takes place in many spheres.
5. A geographically compact cluster, consisting of independent and informally connected companies and organizations, is a strong organizational form in a continuum between markets and hierarchies. **Cluster can often be a unique local market.**
6. Intense competition, which is often observed in clusters, together with a reduction of barriers for entry and exit, sometimes decreases the time of the appearance and disappearance of new business's structures in specific spots. The final result is that **many companies that remained in a cluster can strengthen their position compared to rivals in other places.**
7. **Clusters that show good results go beyond the limits of hierarchical networks** and turn into nets of numerous overlapping and moving interconnections between individual entrepreneurs, companies, and other cooperating organizations.
8. **Functioning of clusters also supposes large amounts of efficiency and flexibility**, which are quite possible in the networks built on the principle of close location and unofficial local connections, in comparison with the networks that include formal or hierarchical interconnections between the companies.

According to M. Porter, clusters emerge only where all the required factors, resources, and competences are concentrated, where they reach a certain scale or a certain critical threshold, and acquire a key role in a certain economic sphere with a decisive and stable competitive advantage over other regions due to better productivity, development of innovations, and new types of business.

For the whole economy of the country, clusters are “growth points” of the internal market. The **peculiarities of the clusters**, in comparison with other forms of organization, are the following:

- A large quantity of members;
- The geographical size of a cluster may vary from city to country or group of countries;

- The presence of the synergetic effect;
- The flexibility and dynamics of functioning;
- Competitive companies cooperate with the aim of realizing the territory's potential and its competitive advantages.

Thus, cluster is a vivid example of a multifunctional and multi-aspect economic system.

Clusters allow their members to reach the following main goals:

- **To satisfy the demands of market**, which needs regular supplies of products and services that are produced at the clusters' enterprises and conform to the modern requirements as to the quality;
- To receive **effects from the scale** of materials' purchase;
- To provide **personnel training**, research of the market, and logistic and technological research;
- To acquire **new sales markets** for production due to active marketing activity and the innovations policy;
- To acquire **stable contacts** with financial and credit establishments due to the formed cluster image.

However, these targets cannot be achieved if a cluster doesn't possess a coordinated interconnection of its members, if there is no mechanism for the control of members' activity and no **harmony** between the economic and managerial aspects of work.

The **harmonization of cluster activity** is the creation of a coordinated system of members' cooperation through the formation of a centralized managerial apparatus, the provision of a unity of targets for cluster members, and the determination of unified ways for reaching these targets.

The result of the harmonization of economic and managerial aspects of cluster activity should be the formation of its key subsystems that provides stable functioning and dynamic development, the strengthening of the market positions of a cluster, and its competitiveness. Consequently, the harmony between the economic and managerial aspects of a cluster may be reached only due to the internal concurrence of its separate structures.

1.3. Types of clusters

There are different approaches to the classification of clusters with the usage of a wide range of features, according to which clusters of enterprises are combined into homogeneous groups (Fig. 3). Clusters of enterprises are classified according to such parameters as geographical location, the presence of capital, the proximity of suppliers, the state of competitiveness, access to specialized services, the development of labor potential, the availability of specialized educational establishments and research organizations, sectorial belonging, etc.

As to the character of manifestation, there are:

- Spontaneously forming or spontaneously created clusters of enterprises;
- Consciously, deliberately, or artificially created clusters of enterprises.

As to the nature:

- Real clusters of enterprises;
- False clusters of enterprises (dominating firm; industrial district).

As to technological parameters:

- Handicraft;
- Industrial, which manufacture traditional products;
- Intellectual or innovational.

As to a way of formation:

- Clusters with a regional form of economic activities (regionally limited associations within related sectors around a scientific or industrial center);
- Clusters with vertical productive connections in narrow spheres of activities, created around main companies or a network of main enterprises, covering the processes of production, supply, and sales;
- Sectorial clusters (associations of enterprises in various spheres of an industry – i.e., “pharmaceutical cluster”);
- Industrial clusters.

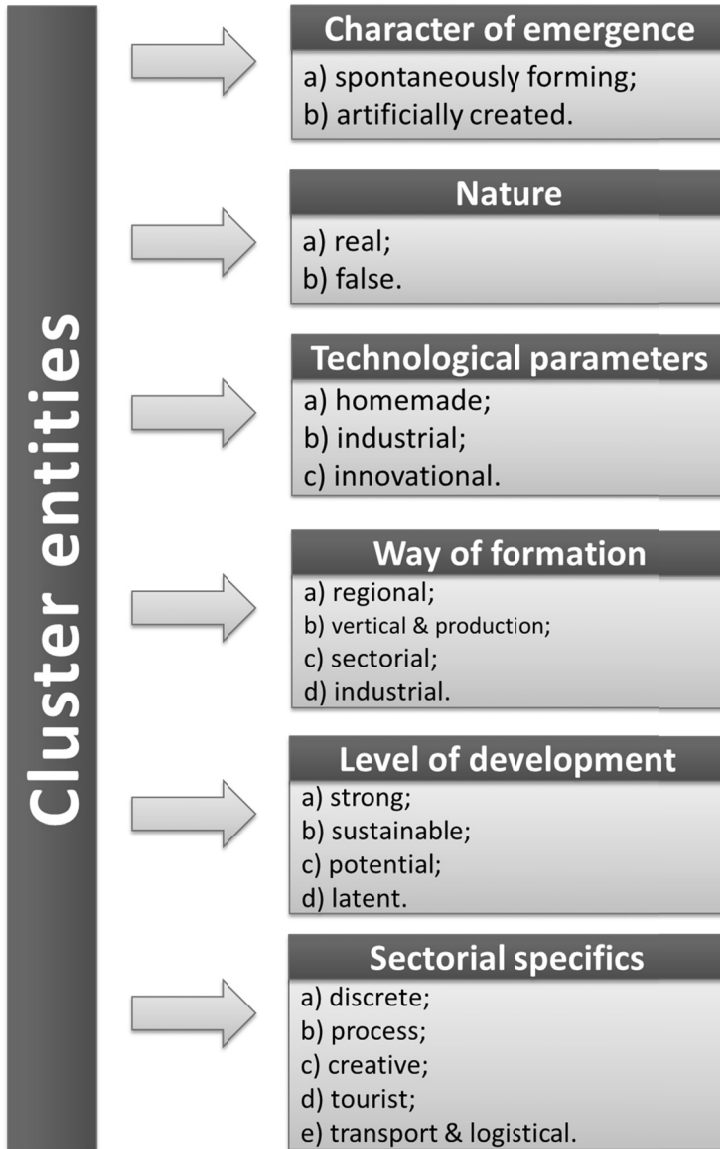


Figure 3 – Types of cluster entities
Source: compiled by the authors

A regional cluster is a totality of companies, universities, and other organizations, connected in a certain productive sphere in a certain region, where synergy is achieved with the help of competition and cooperation between members.

In this case, the synergetic effect from the cooperation of organizations, which are cluster members, is achieved by means of an emerging regional connection: all enterprises of the region cooperate on the basis of competitive and collaborating relations for the purpose of achieving the common goal – development of the region on the whole, as a cluster. At that, all economic subjects are in even conditions for conducting their activities: one territory and one law. Among the characteristics of regional clusters, it is possible to distinguish openness, which expands beyond the limits of intraregional networks and aims for the usage of external resources.

As to the level of development, P. Filippov distinguishes the following types of regional clusters: **strong clusters** are characterized by strong internal competition, intensive intra-cluster cooperation within joint projects and work of intersectorial organizations; **stable clusters** show the positive dynamics of all elements of cluster and intra-cluster cooperation – however, they haven't achieved the level of development necessary for the acquisition of firm profit from unification; **potential clusters** are characterized by the uneven development of cluster structure and the weakness of particular elements – however, there are factors which facilitate their further development; **latent clusters** combine a variety of successfully functioning organizations and companies, but they are still far from a full-scale cluster structure. In practice, modern regional cluster systems are a totality of functionally and economically interconnected enterprises on the territory of a region, built into one network of production. At that, these enterprises, as a rule, are strategic or they perform a “structural and axial” role in the region's economy.

A sectorial cluster is an informal association of sectorial and adjoining companies on the basis of cooperation and competitive connections, which have a capability for the mutual strengthening of competitive advantages by means of a synergetic effect. In this case, the synergetic effect from the cooperation of organizations, which are members of this cluster, is achieved only by means of the sphere, as it plays the role of a unifying factor.

In this case, a cluster of large companies with a clear single center, strong cooperation, and weak competition inside the structure is formed. This model is peculiar for **heavy industry** in old industry districts. It should be noted that such a type of cluster differs from a territorial production complex, firstly, by independence and economic interest in creation, and, secondly, by the presence of the innovational foundations of functioning. In this case, the cluster is something bigger than the territorial production complex - it is a **network structure**, which includes the representatives of authorities, the business society, and organizations of the business community in the region, which are concentrated around the core of competitive economic activities.

Airbus, a well-known European company, works according to this principle. For example, in order to manufacture aircrafts, there is a need for a cluster including enterprises producing separate components for aircrafts: discs and tires for chassis, wings, engines, material for trimming, metering instruments, etc. Another classic example of a sectorial cluster is a ship-building cluster in Norway (Norway Sea Group).

An industrial cluster is an entity that focuses on the competition within a sector and consists of various doers, resources, and types of activities, which unite for the purpose of the development, production, and sale of various goods and services.

As a rule, an industrial cluster is not tied to any region in terms of space. Opposite to a regional cluster, it possesses a tendency of having wider borders, covering the whole region or even country. The critical mass in the chain of value calculation makes companies more competitive, as they gain profit from the common labor market and other factor conditions. This differs much from the classic ideas of territorial and sectorial complexes which, as a rule, are **monolithic and do not integrate servicing productions**.

An example of such a cluster is the forest cluster of Finland, which includes logging, timber processing, and cellulose and paper spheres. The main types of logging, cellulose and paper sphere products issued are paper, cardboard, sawn wood products, cellulose, plywood, wood boards, and joinery products. Logging and timber processing enterprises are scattered over the whole territory of Finland.

The most significant difference between clusters and vertically integrated structures is their **innovational character** and **flexibility of specialization**. Surely, all clusters possess innovations to some extent. However, it is more peculiar for sectorial clusters, unlike regional ones – as the