

Structure and attributes of regional clusters in modern Russia

Estructura y atributos de los clusters regionales en la Rusia moderna

Andrey A. SADOV'YEV [1](#); Inna L. LITVINENKO [2](#); Natalia V. SPASSKAYA [3](#); Svetlana V. KOZLOVA [4](#); Natalia B. GOLOVANOVA [5](#)

Received: 18/03/2018 • Approved: 29/04/2018

Contents

- [1. Introduction](#)
 - [2. Literature review](#)
 - [3. Materials and methods](#)
 - [4. Discussion](#)
 - [5. Conclusions](#)
- [Bibliographic references](#)

ABSTRACT:

Despite the wide spread of the cluster phenomenon in the economies of many countries, the nature of clustered entities hasn't yet been entirely comprehended and uncovered. When homogeneous objects are grouped under the influence of certain attractive forces, such a combination can be the result of clustering as a mathematical method that sorts them according to certain specified parameters. Objective processes manifest themselves in the economy: "the processes of clustering (combining) homogeneous parts into a single whole – enterprises into clusters".

Keywords: cluster, regional economy, management system, construction algorithm

RESUMEN:

A pesar de la amplia difusión del fenómeno de conglomerados en las economías de muchos países, la naturaleza de las entidades agrupadas aún no se ha comprendido ni descubierto por completo. Cuando los objetos homogéneos se agrupan bajo la influencia de ciertas fuerzas atractivas, dicha combinación puede ser el resultado del agrupamiento como un método matemático que los clasifica de acuerdo con ciertos parámetros especificados. Los procesos objetivos se manifiestan en la economía: "los procesos de agrupación (combinación) de partes homogéneas en un solo todo: las empresas en grupos

Palabras clave: Clúster, economía regional, sistema de gestión, algoritmo de construcción

1. Introduction

Clusters include a large number of small and medium-sized firms. Not only firms are significant possible actors. Clusters can enter into intensively working alliances with a variety of institutions such as universities, research institutes, public authorities, and consumer organizations. The four main categories of actors are extremely necessary and, as a rule, are present in any cluster (Buyanova & Vuilov, 2011):

- companies;

- authorities;
- research associations;
- financial institutions.

The so-called cooperation institutes are also important for cluster initiatives. They can contribute to the establishment of completely new structures and involve numerous organizations, but they can also represent a number of already established actors such as chambers of commerce, industrial and professional associations, trade unions, technology transfer organizations, and others (Ketels, 2003).

Different actors are involved in cluster initiatives using various ways and incentives. Their capabilities and roles may vary depending on the national context and the life cycle of the cluster.

When the cluster concept was first introduced, the attention of strategists, practitioners and researchers of clusters was focused on firms. However, as attention gradually shifted to issues that might arise in the sharing of knowledge and skills, a systematic approach developed that emphasizes the interaction and interdependence of the various stakeholders involved.

For example, more attention started to be paid to the role of universities. Universities are important not only because of their mission in education and research, but also because of their ability to serve as nodes for entrepreneurial, scientific and industrial interaction.

Any cluster passes through several stages. They may not be identical, and the pace of their development may change. However, there is an internal logic of the way in which clusters develop, which makes it possible to distinguish some characteristic models. Even though the exact form and direction will depend on certain circumstances, the cluster passes through the following stages of the life cycle:

- agglomeration. There are a number of companies and other actors in the region;
 - emerging cluster. Some agglomeration participants begin to cooperate in the area of the main activity and realize common opportunities through their relationship;
 - developing cluster. As new participants in the same or related activities in the region are emerging or involved, new ties arise between these new actors. Formal and informal institutions for maintaining cooperation can emerge. Names, websites, and general content associated with the region and its activities often begin to emerge (Borodina, 2008);
 - mature cluster. A mature cluster has already reached a certain critical mass of actors. It established links beyond its borders, with other clusters, areas of activity, and regions. There is an internal dynamics of the creation of new firms, private and public organizations, through their appearance, joint ventures, and through separation;
 - transformation. Over time, markets, technologies and processes change. So do clusters. For a cluster to survive, be viable, avoid stagnation and decay, it is necessary to innovate and adapt to change. The cluster can choose to transform into one or more new clusters that focus around different activities or simply change the ways in which products and services are delivered (*"European Cluster Excellence Initiative..."*, 2015).
-

2. Literature review

In the economic literature, there is a significant number of definitions of cluster, which is the basis of the cluster theory of economic development. Thus, M. Porter defines cluster as geographically neighboring interconnected companies (suppliers, producers) and related organizations (educational institutions, government bodies, infrastructure companies) operating in a certain sphere and complementing each other.

The cluster approach was also used by E. Dahmen to identify and study the interrelationships of large Swedish multinational corporations. According to E. Dahmen, clusters are formed in "development blocks", the basis for the development of competitive success is the connection between the ability of one sector to develop, and the ability to ensure progress in another. Development should be carried out in stages, or on the "vertical of actions" within the same industry as other industries, which will provide an opportunity to

gain competitive advantages.

The French scientists J. Tolenado and D. Soulie used the concept of "dies" to describe groups of technological sectors. The formation of dies was explained by the dependence of one sector on another on the technological level. Thus, "dies" are very close in meaning to the term "cluster", since the basis for their development is the need to create technological links between sectors of the economy in order to realize their potential advantages. E. Leamer considered clusters with a high level of correlated exports in his analysis of trade at the national level.

According to A.A. Migranyan, cluster is "concentration of the most efficient and interconnected types of economic activity, that is, the set of interconnected groups of successfully competing firms that form the "golden section" (in the Western interpretation the "diamond") of the entire economic system of the state and provide competitive positions on the sectoral, national and world markets."

T.V. Tsihan identifies three broad definitions of clusters, each of which emphasizes the main feature of its functioning:

- regionally limited forms of economic activity within related sectors, usually tied to one or another scientific institution (research institute, university);
- vertical production chains; rather narrowly defined sectors in which the adjacent stages of the production process form the core of the cluster (for example, the chain "supplier ® producer ® marketer ® client"); the same category contains the networks formed around the head firms;
- industries identified at a high level of aggregation (for example, a "chemical cluster") or a set of sectors at an even higher aggregation level (for example, an "agro-industrial cluster").

M. Afanasyev and L. Myasnikova believe that the main thing in the structure of a cluster is the spread of innovations to the whole value chain and to the single logistic window for interaction with the external environment.

There is no single, strict definition of the cluster, which is due to the incompleteness of Porter's concept. Over the years, various authors have given different definitions to the concept of cluster.

Clustering implies diversity, not single firms. In the absence of such diversity, each observed agglomeration probably consists of an expanded enterprise, where other companies or units can serve only as subcontractors or customers in relation to the main organization (Bogoviz, Vukovich & Stroiteleva, 2013).

Likewise, group companies incorporated as affiliates, controlled through formal joint ownership, are not independent and are usually subject to their own costs and benefits.

3. Materials and methods

The theoretical and methodological basis of our research is made up of the works of domestic and foreign authors and professional managers in the field of studying the structure and attributes of regional clusters in the Russian Federation, identifying approaches and methods that ensure the effectiveness of their operation. In determining the features of the functional content and development factors of regional clusters in the Russian Federation, functional and structural analysis, and general economic analysis were used.

Instrumental and methodological research apparatus includes principles that ensure the application of system, strategic and evolutionary approaches to the development of the theory of regional clusters (Bogoviz Alexei, Vukovic Galina & Stroiteleva Tamara, 2013). To solve the set tasks, the following methods of scientific cognition were used in the work: system-functional analysis, synthesis, deduction and induction.

Informational-empirical and normative-legal basis for providing evidence of conceptual provisions, reliability of conclusions and recommendations of the study were legislative and regulatory acts in the form of federal laws, decrees of the President of the Russian

Federation, resolutions of the Government of the Russian Federation; sources of information of various kinds: materials of scientific conferences, official statistics of the Russian Federation, expert assessments, materials of sociological surveys and author's observations, electronic network resources.

4. Discussion

4.1. The structure and attributes of regional clusters in the neighboring countries of the Russian Federation and the CIS

Ukraine, the Russian neighbor, began its cluster policy much earlier than in Russia, in 1997. The favorable coincidence of the interests of the local authorities of Khmel'nitsky region to get out of the difficult economic situation and the interests of the scientific local community, mainly from the technological university, made it possible to create the first cluster in the construction industry in Ukraine.

Currently, clusters also exist in other areas, such as Kharkiv region, Volyn region, Sumy region, Poltava region, Ivano-Frankivsk region and Rivne region (Erznkian & Akinfeeva, 2009).

The Republic of Belarus has not been very successful in the sphere of innovative clusters, because now the authorities are just preparing the ground for creating innovative clusters through the establishment of relevant infrastructure, the formation of an adequate institutional environment and favorable conditions for the development of technological capabilities. The state is determined not only to develop within the country, but also to establish international associations with large transnational enterprises from the People's Republic of China, Cuba, India, and Russia. Within these associations, Belarus plans to create joint production, as well as to attract foreign professionals for permanent work from the countries of the European Union and the CIS.

Key areas for the development of innovative clusters are biotechnology, nanotechnology, pharmaceutical and microbiological industries. Moreover, the Republic of Belarus aims to create not just innovative clusters around certain enterprises, but also training centers, research laboratories, business incubators.

In addition to innovative clusters, the government of the Republic of Belarus is working to create clusters based on state industry. It is planned to divide it into the following six sectors.

Table 1

Prospective new clusters created on the basis of state industry in the Republic of Belarus.

Location	Industry	Enterprises	University
Minsk	IT	State Unitary Enterprise "United Institute of Informatics Problems of the National Academy of Sciences of Belarus", representatives of the High Technologies Park	Belarusian State University of Informatics and Radioelectronics, Belarusian State University
Gomel	Agriculture	RUE "Gomselmash"	Gomel State Technical University named after P.P. Sukhoi
Grodno	Chemical industry	JSC "Grodno Khimvolokno", JSC "Grodno Azot"	Grodno State University
Mogilev	Chemical-textile industry	JSC "Mogotex", JSC "Mogilev Khimvolokno"	Mogilev State University of Food

Minsk	Machine building (cars and tractors)	RUE "Minsk Tractor Plant", RUE "MZKT", RUE "Minsk Automobile Plant", RUE "Minsk Motor Plant"	Belarusian National Technical University
Novopolotsk	Petrochemical industry	JSC "Naftan"	Polotsk State University

Source: (Ivanov et al., 2009).

In the Republic of Kazakhstan, the authorities have chosen the following strategy for the development of innovative clusters: several key industries were identified for the creation of clusters at the state level. Such branches are the gas industry, the oil industry, the textile industry and the food industry. Steps are being taken to form clusters in the fields of engineering, construction materials, logistics and tourism. In order for these processes to proceed in the most effective way, it was decided that close cooperation with Russia, Azerbaijan, Indonesia, China and America needed to be established.

In order to achieve the objectives, the following documents were adopted:

- State program for the development of innovations and promotion of technological modernization of the Republic of Kazakhstan for 2010-2014;
- Strategy of industrial and innovative development of the Republic of Kazakhstan;
- State program on accelerated industrial and innovative development of the Republic of Kazakhstan for 2010-2014.

As a result, the mentioned programs and strategy should offer to all the researchers and developers technoparks that meet their requirements. It turns out that in Kazakhstan clusters are divided into two levels – national and peripheral, located in large cities. National clusters have sectoral specialization, and as a bonus from the state, they are offered simplified taxation.

While clusters in big cities should help regions discover their strong innovative side, usually this happens at the expense of universities, laboratories or leading companies in the city. Relations between the state and innovation clusters can be characterized as public-private partnerships (Kleiner et al., 2007).

The development and introduction of logistic and fish clusters began relatively recently, both clusters are connected with water resources (the seaport Aktau and the Aral Sea).

As for the Republic of Moldova, innovation activity here is at a rather low level. This can be attributed to the fact that innovative goods or services are practically not in demand in the country. An undeveloped scientific component along with a lack of venture funds and investments add to this.

In this regard, in Moldova innovative clusters are only in a nascent state. To date, several scientific parks and one innovative incubator are slowly starting to function in such areas as agro-industry, microelectronics and nanotechnologies. Residents are selected on a competitive basis, which is carried out by the Supreme Council for Science and Technology Development under the Academy of Sciences of the Republic of Moldova (Buyanova & Vuilov, 2011). Not all companies that apply for residency, are connected with innovations, rather, they just want to get all sorts of preferential terms and privileges.

Nevertheless, apart from such areas for innovation development as agro-industry, building materials, nanotechnology, tourism and biopharmaceuticals, IT is still the priority branch for this development. This can easily be explained by the fact that in Moldova there is a high concentration of outsourcing enterprises in this sphere, cooperating with the leading IT countries.

In another CIS country – the Republic of Azerbaijan a law on the establishment of special economic zones was adopted in 2009. The government of Azerbaijan aims to increase the level of innovative interest and activity among the population, as well as to strengthen the

image of scientific researchers and developments and create an innovative infrastructure. Along with this, the authorities also decided to concentrate on regional innovation zones, where, in addition to the above, special attention will be paid to personnel training and IT penetration into all kinds of business, market and production spheres.

As a positive result of the adopted government measures, the Sumgait technopark can be cited. It is now in the final stage of establishment – of the 16 planned plants, so far six are functioning.

Construction and equipping are done in a modern way; the products manufactured (electrical equipment) will be exported. Moreover, another advantage for the Sumgait technopark is the fact that in the near future it will have a neighbor chemistry cluster. In addition to electrical engineering, Azerbaijan is determined to create technoparks in the field of solar and wind energy.

The analysis shows that clusters not only promote the development of all aspects of regions, but also create more profitable production processes, chains whose added value is higher. They also stimulate the emergence of new relationships between such spheres as production, business and entrepreneurship, and science, research and development that result in the emergence of relevant urban and innovative infrastructures.

Moreover, with regard to the role of cluster policy, it acts as a guarantee of competitiveness at the international level, in regional and national contexts due to the focus of the cluster results on the export market (Kleiner et al., 2007).

4.2. The structure and attributes of regional clusters in the Tomsk Region

The Tomsk region is one of the leaders in the formation and development of regional clusters. The comparatively small cluster “Pharmaceuticals, medical technology, information technology and electronics” proved to be the most effective in terms of management in the Tomsk region. Participation in the European Cluster Improvement Initiative study reveals the key components of this success, which can be reduced to three groups: quality communication, formalized and shared rules of interaction, professional organization (Kutsenko, 2015).

Let us look at these groups in more detail. The peculiarities of the cluster “Pharmaceuticals, medical technology, information technology and electronics” include a number of contacts and the variety of communication channels between its participants:

- constant informing all cluster members about possible financial, organizational and information support from the management company Cluster Development Center of Tomsk Oblast and other infrastructure companies (more than 80 mailings as of 2014);
- carrying out a large number of communication activities (initiated by cluster participants, employees of the Cluster Development Center of the Tomsk Region, Tomsk Oblast Administration, partners and development institutions interacting with the management company);
- the formation and updating of the calendar of events in the cluster (more than 110 events of regional, Russian and international significance), the invitation to participate in these events of the cluster residents, informing about the options for supporting such participation;
- maximizing personal contacts of specialists of the management company with the leaders of the companies-residents of the cluster;
- identification of the needs of cluster participants in services, events, invited partners, the volume of financing of cluster projects through regular questioning.

The rules of interaction are aimed at increasing the interest of organizations to participation in cluster activities:

- maximum coverage of the audience by the services of the management company (support for events and projects, regardless of their scale);

- focus on supporting joint projects involving the maximum number of cluster organizations (a minimum of two);
- ensuring transparency of the procedures and decisions of the management company (including those related to the formation of applications for federal funding);
- ensuring equal access of the cluster members to information and support;
- individual approach to each company that has requested support from the management company (conclusion of a cooperation agreement, creation of a working group for the implementation of a cluster project/event with the participation of a representative of the Cluster Development Center of Tomsk oblast, assistance in project management);
- assessment of the management company's actions by the cluster participants (conducted within the framework of the strategic session of the Cluster Development Center of the Tomsk Region).

4.3. Features of the structure and functioning of the Center for Cluster Development of the Tomsk Region

Features of the structure and functioning of the Center for Cluster Development in the Tomsk Region allowing to maintain intensive communication in the cluster are as follows:

- the presence of a project office responsible for the implementation of cluster projects (administrative functions in the project) and monitoring the implementation of milestones (milestones) of projects, achieving indicators at each stage, identifying the reasons for the deviation of the project from the plan;
- appointing a person responsible for organizing the events;
- organizing the activity of the Cluster Development Center press service on outsourcing (forming a flow of news on the cluster participants and the management company, publishing and disseminating key documents related to cluster development).

In addition to impressive number of organizations participating in the cluster, the number of events held and joint innovation projects, the Center for Cluster Development of the Tomsk Oblast can be credited for the high growth dynamics of new participants, as well as the independent generation of joint projects by organizations in the cluster (the project "Information and Communication Integrated systems for the Russian Arctic zone", collective procurement of transport services, general exhibition equipment).

Despite the good results achieved, the pilot cluster of the Tomsk region will have to solve a number of problems characteristic for most Russian clusters. First, it is a question of a low level of confidence on the part of the cluster participants to its governing bodies and to the initiatives of the state as a whole.

4.4. Mechanisms of influence on decision-making by ordinary members of the cluster

The mechanisms of influence on decision-making by ordinary members of the cluster are still limited and not formalized. One more problem typical for clusters, including the Tomsk cluster, is the delineation of powers between the naturally formed structures of business self-organization and the governing structures created by regional authorities.

In addition, one cannot overlook the problem of credibility to the center of cluster development and the cluster as an instrument of innovation policy on the part of the regional authorities themselves. The development of clusters and obtaining visible results of their work are a long-term process, while the authorities act in the conditions of a worsening economic situation, severe social demands, competition from alternative federal programs that imply regional co-financing, and restrictions imposed by the logic of the political cycle.

In this regard, the Cluster Development Center of the Tomsk Region identifies a number of important areas for its further development, including those aimed at developing trust and increasing the level of involvement of organizations and key stakeholders in cluster activities. Among them is the gradual introduction of membership fees for the formation of the Cluster Development Fund, which will allow diversifying sources of funding and

enhancing the stability of the Center's work. Another important innovation is the cluster loyalty program, which involves the formation of a pool of unique proposals for cluster members.

In addition, it is expected to increase the number of communication events, strengthen the project office, and gradually introduce the practice of regular visits by the Cluster Development Center managers of participating organizations in order to find new ideas for cooperative projects.

Cluster activities will be intensified through the development of regulations, standardization and automation of the workflow for the Center for Cluster Development. Successful adoption of the experience of the cluster "Pharmaceuticals, medical technology, information technology and electronics" of the Tomsk region can significantly contribute to improving the quality of management and development of other Russian innovative territorial clusters.

5. Conclusions

Cluster organization of production involves the location of economic entities in one region or federal district, which allows them to "discuss the common tasks, quickly solve the problems, and determine the direction of activity that is most competitive for the given territory and will be profitable in the future" (Dadaev, 2008). From this characteristic of the cluster organization of the regional economy, it follows that the impetus for creating a cluster can be the initiative of the economic entities of the region under the conditions of their close proximity to each other, their belonging to related industries and/or functionally related activities. These two characteristics are mandatory for creation of a cluster.

In its development, a cluster passes several stages: from the cluster initiative to the full cluster characterized by all the previously listed characteristics. In this chain, the concept of "cluster formation" has intermediate role – it is an entity in which the characteristics of the cluster are either not expressed fully, or some of them are missing (insufficiently close ties between economic entities, poorly developed or completely absent infrastructure facilities, not enough number of economic entities to talk about a high level of competition within the cluster).

To create a full-fledged cluster, it is necessary to achieve a certain critical mass of its participants (the number of economic entities, the number of employees), which causes the transition from quantitative indicators to qualitative transformation in the life cycle of the cluster (to achieve synergistic effects mentioned earlier). The experience accumulated in European countries shows that in order to form the critical mass necessary to create a cluster, it is required that at least 30-50 economic entities are included (Artamonova & Khrustalev, 2013).

With regard to the coverage of participants in cluster formation, the following conclusions can be drawn:

- from the point of view of infrastructure, there are advantages of those cluster entities that are initiated by the state, with a tangible role;
- from the point of view of the direction of ties of the cluster formation, the companies that make up the "core", already have ties with the objects of infrastructure support.

Clusters are formed around socially or economically significant enterprises or industries. The priority aspect is the type of economic activity that determines the specifics of both the cluster enterprise and the cluster itself. Distinctive features of such cluster formations are:

- the focus of all cluster participants on the effective operation of the cluster enterprise;
- often the production is export-oriented; thus, this type of cluster contributes to the inflow of capital into the region;
- a significant share of the output of the cluster in GRP;
- high degree of concentration of production and its relative efficiency.

The significance of the cluster enterprise is such that its presence or absence determines the very presence or absence of a cluster. Other elements of the cluster do not have this significance, since their appearance or disappearance, seldom affects its characteristics.

The process of creating cluster formations in the region should take into account the priority level of development of certain types of economic activities and products. Therefore, they are mainly small and medium-sized enterprises focused on regional markets, or budget-forming enterprises with a large export potential. They specialize in the production of a product with high added value, usually oriented towards the external market. Their development is part of the all-Russian strategic priorities. These are enterprises with a high concentration of capital, technology, labor, producing a mass product.

Bibliographic references

- Artamonova, Yu.S. & Khrustalev, B.B. (2013). *Guidance on the formation of clusters - the main directions for the formation and management of cluster initiatives*. Penza: IP Tugushev S.Yu.
- Bogoviz Alexei, V., Vukovic Galina, G., & Stroiteleva Tamara, G. (2013). Study of regional labor market based on factor analysis. *World Applied Sciences Journal*, 25(5), 751-755. doi:10.5829/idosi.wasj.2013.25.05.13342
- Bogoviz, A. V., Vukovich, G. G., & Stroiteleva, T. G. (2013). Motivation of staff in the corporate sector industry. *World Applied Sciences Journal*, 25(10), 1423-1428. doi:10.5829/idosi.wasj.2013.25.10.13390
- Borodina, E.A. (2008). *The role of economic clusters in increasing the competitiveness of the regions of the Russian Federation*. Dissertation of Candidate of Economics: VolSU.
- Buyanova, M.E. & Vuilov, D.A. (2011). Formation and development of the cluster potential of the regions of the South of Russia. *National interests: priorities and security*, 24(117), 34-42.
- Dadaev, L.M. (2008). Theoretical Aspects of the Analysis of the Cluster Organization of Regional Economy. *Economics and Management*, 24, 54.
- Erznkian, B.A. & Akinfeeva, E.V. (2003). Regional clusters as network structures: features of formation and prospects of development. *Microeconomics*, 3, 161-174.
- European Cluster Excellence Initiative. The quality label for cluster organisations – criteria, processes, framework of implementation*. Retrieved 8 February 2015 from: <http://www.cluster-excellence.eu>.
- Ivanov, Yu.B., Annenkova, E.V. & Ponomareva, E.V. (2009). Development of cluster structures in the regional economic space. *Economy of the region*, 2, 69.
- Ketels, C. (2003). The Development of the cluster concept – present experiences and further developments. In: *NRW conference on clusters, Duisburg, Germany*, 5.
- Kleiner, G.B., Kachalov, R.M. & Nagrudnaya, N.B. (2007). *Formation of the strategy for the functioning of innovation-industrial clusters*. Moscow: CEMI RAS.
- Kutsenko, E. (2015). Pilot Innovative Territorial Clusters in Russia: A Sustainable Development Model. *Foresight-Russia*, 9(1).

-
1. Russian Academy of National Economy and Public Administration under the President of Russian Federation (RANEPA), Moscow, Russia
 2. Lomonosov Moscow State University, Moscow, Russia
 3. Orel State University in the name of I.S. Turgenev, Orel, Russia, E-mail: info@oreluniver.ru
 4. Financial University under the Government of the Russian Federation, Moscow, Russia
 5. Moscow Technological University, Moscow, Russia
-

Revista ESPACIOS. ISSN 0798 1015
Vol. 39 (Nº 31) Year 2018

[Índice]

[In case you find any errors on this site, please send e-mail to webmaster]