

Economic aspects of forming innovative cluster based on regional transport system

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Abstract. The paper studies the technologies for creating an innovative cluster being a modern form of managing the development of the economic potential of the regional transport system, considers the main factors determining the features of the cluster management arrangement, analyzes the domestic experience in the formation of an industrial and transport cluster. It studies the organizational structure of transport cluster management, which implies the presence of a system of goals and their distribution among various management links of this system; composition of subdivisions and organization of intrasystem communications; distribution of functions and tasks, those rights and obligations within the organization that determine the ratio of decentralization and centralization. Innovation management technology is a relatively new concept in the scientific, technical, industrial, technological, and administrative fields of activity. Innovation management is based on the following key points: the search for an idea fundamental for this innovation; organization of the innovation process, promoting and implementing innovation in the market. The essential parameters and characteristics of the territorial innovation cluster.

Key words: innovation cluster technology; relevance of cluster method application; signs of innovative clusters formation; methodological support; control mechanism

1 Introduction

Innovation is the object of influence on the part of the economic mechanism, and it is implemented by using certain techniques and a special management strategy.

Taken together, these techniques and strategy form a kind of innovation management mechanism.

Innovation management includes strategy and management tactics. The strategy determines the general direction and method of using funds to achieve the goal. After achieving the goal, the strategy ceases to exist as a direction and means of achieving the goal. Tactics are specific methods and techniques to achieve the goal in specific conditions. The task of innovation management tactics is to choose the optimal solution and methods for achieving this solution that are most acceptable in each economic situation. Economic progress is achieved not by the efforts of individual large, medium, and small enterprises, but by the activities of groups of companies united based on different characteristics, conditions, and prerequisites.

The legitimacy of the relative independence of the participants in the association, the absence of directive methods for making administrative and other decisions from the management sphere and, as a result, the legitimacy of competition among the cluster participants is an essential feature of a cluster, in contrast to a corporation and other types of associations. The product put forward on the market by the participants of the cluster is its unifying basis, and the companies that

produce such a product are the core of the cluster. To provide financial, innovative, consulting, scientific, technological, engineering, and other components, the cluster includes relevant organizations, enterprises, companies, and institutions both as manufacturers and goods and services suppliers. Thus, the purposeful activity of the cluster members aims to release final products (services) best produced by this cluster, which is ensured by the internal interaction of the participants, on the one hand, and a single logistics window to ensure access to the external environment, on the other hand. Cluster management of the economy is one of the theories on the formation and development of competition. In this regard, using the Porter diamond model as a theoretical basis for applying the cluster approach at the level of the industrial policy of the region sparks interest.

This model reflects a system of certain indicators that characterize the competitive advantages of the socio-economic system of the region. These indicators include data on human and natural resources; scientific potential; infrastructure and overall quality of life in the region; the dynamics of the quantitative development of demand, etc.

The integration of intellect and capital formalized through the cluster approach creates the prerequisites for creating a single economic space in the territories of several regions, and in some cases countries. The

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common economic space created in this case is an interesting scientific object for research (Fig. 1).

2 Materials and Methods

The state policy on supporting clusters includes the following areas: direct budgetary support for the development and implementation of innovative technologies and products; indirect support through changes in tax legislation and the application of administrative regulation; support of the economic infrastructure links that are critical for implementing innovations; investment in the education system.

At the same time, when implementing innovative activities, cluster members are in a complex relationship of cooperation and competition, requiring a certain corporate culture.

The combination of the level of interaction between the participants of the innovation cluster and the ability to use internal and attract external resources largely determine its competitiveness.

The transport cluster development is determined by the possibilities of access to scientific knowledge, innovative technologies, and financial resources.

In turn, they require a developed infrastructure adapted to the needs of financial and intellectual capital being the optimal base for applying these resources.

The cluster approach underlies the state's economic policy, which creates a competitive innovation system. In many countries, governments are striving to create innovative clusters on the territory of their states, while making significant adjustments to their production and transport investment activities and moving from personal optimization of the activities of enterprises and industries to a policy of creating conditions for free competition, developing relations between participants in the buying and selling process.

The state policy to support clusters is implemented in four directions: through direct budgetary support for the development and implementation of innovative technologies and products; indirect support by changing tax legislation and application of administrative regulation; support of innovation links being critically important for the implementation of the economic infrastructure; investment in the education system.

In many countries, governments are striving to create innovative clusters on the territory of their states, while making significant adjustments to their industrial and investment activities and moving from personal optimization of the activities of enterprises and industries to a policy of creating conditions for free competition, developing relations between business process participants.

The main goal of implementing the cluster policy is to ensure high rates of economic growth and diversification of the economy by increasing the competitiveness of enterprises, suppliers of equipment, components, specialized production and services, research and educational organizations that form territorial production clusters [3].

Cluster policy implementation contributes to the growth of business competitiveness by realizing the potential for effective interaction between cluster members associated with their geographically close location including expanding access to innovations, technologies, know-how, specialized services, and highly qualified personnel, as well as reducing transaction costs, providing prerequisites for the implementation of cooperation projects and productive competition.

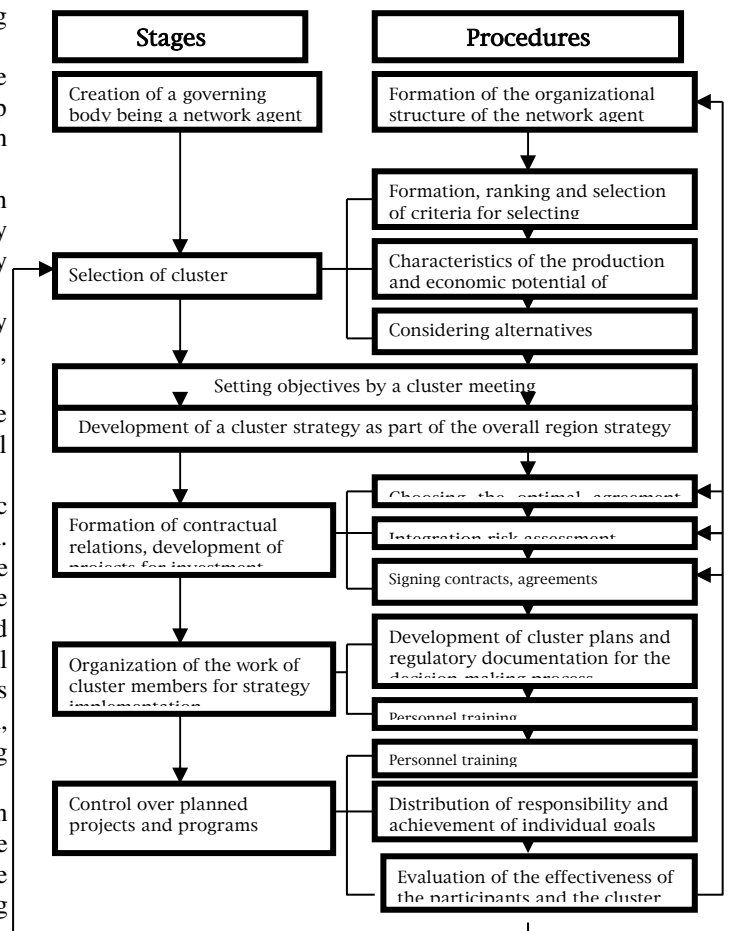


Fig. 1. Main stages of cluster formation from the perspective of potential participants [2].

The formation and development of clusters is an effective mechanism for attracting foreign direct investment and enhancing foreign economic integration. The inclusion of domestic clusters in the global value chains can significantly raise the level of the national technological base, speed up economic growth and improve the quality by increasing the international competitiveness of enterprises that are part of the cluster.

The internal factors are the management strategy accepted by the cluster members, its scale and geographical location, technological and production potential, management structure and distribution of tasks.

The management strategy should consider the degree of authority delegation from the cluster members to its

management system and the tasks of maintaining mobility in management.

As a rule, intra-cluster interactions reflect only key positions, requirements ensuring the system goal-orientation of individual elements. This means that the most holistic economic cluster can be represented at the strategic level of management. At the tactical level, it is necessary to coordinate the actions of the cluster members, excluding the confrontation of individual elements, and consistency in achieving strategic goals. At the operational level, a cluster can be considered as a set of individual business entities, each of which independently chooses solutions and a way to implement them from a variety of alternative options.

In the processes of managing the clusters formation, it is necessary to consider the peculiarities of the conditions existing in the region, the goals of regional development. Modifications in the regional management system are caused by the need to implement the cluster approach and require modification of the existing management system, in particular, the scheme for organizing situational analysis and decision-making procedures. One of the features of cluster structures in the regional economy is the preservation independence, integrity, and freedom of choice of decisions by each of the participants (Fig. 2).

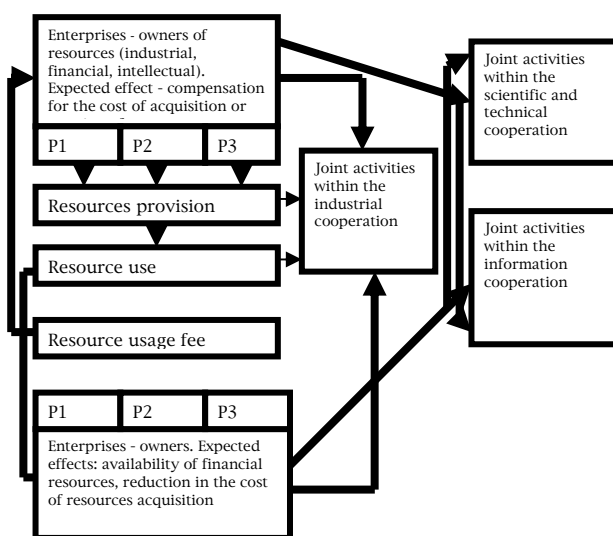


Fig. 2. Structure of economic mechanisms of cooperative interactions of an integrated group of industrial enterprises [5].

The concept of self-organization is currently widely used in the framework of a system analysis of technological, natural, and socio-economic objects functioning. V. Druzhinin and D. Kontorov consider self-organization to be the system of interactions of materialized objects [6].

In several cases, the methodology of studying complex objects is associated with the concept of self-organization. Various methodological aspects of the complex systems self-organization are considered in the works of Gig J [3], Zadeh L. [7] Kunz G., O’Daniel S.

[8] etc. The issues of using the mathematical apparatus for the study of self-organization were studied by domestic scientists Ivanova V.V., Yanenko V.M., Lyabakh N.N. [9]. Economist Anfilatov V.S. considers self-organization to be the ability to change personal structure, parameters, algorithms of functioning, behavior to increase efficiency [2] in relation to complex systems. Obviously, this ability manifests itself amid the change of external conditions, control actions or environment functioning conditions. In world experience, two main approaches to clusters formation can be distinguished.

The classical liberal (Anglo-Saxon) approach was proposed in the 80s – 90s by M. Porter and bases on the self-organization of economic agents within the framework of the free market mechanisms. The use of such mechanisms does not imply direct government intervention and/or support.

The modern European approach, called “competitiveness poles”, has been developing since 2006 in France [1] and is based on partnership between business, central and local authorities. The state is interested in the global competitiveness of its economy and the achievement of a world-class “competitiveness poles”, which is expressed in the provision of various forms of state support. Such support is provided as part of territorial development strategies.

Maximizing the group’s mobility without detriment to its manageability is a general criterion for the effective cluster structure. The problems on the way of clustering also include the underdevelopment and low innovative activity of small businesses, many of which are characterized by non-competitive (according to modern standards of technologies and methods) organization of production, high costs and a significant level of fixed assets depreciation.

The possibility of creating a cluster requires, firstly, a formal institutional structure (both vertically and horizontally integrated) coordinating the development of the cluster, created with the participation of its member companies; secondly, sectors of the economy that are attractive in terms of demand, supply and development forecasts; thirdly, natural resources, developed industrial and scientific and technical potential, broad strata of the educated population, access to external sources of information; fourth, the regional development strategy.

Increased competition contributing to stable long-term cooperation ties; changes in business conditions (tax, legislative, political and other changes) that increase the efficiency of the enterprise associations functioning; an external sanction and pressure on sectoral economies, requiring joint efforts aimed to successfully resist the sanctions; the emergence of innovative technologies, which predetermines the formation of an association of companies based on core technology; the need for scientific and technical cooperation in high-tech sectors of the economy.

Thus, a cluster is a system of enterprises, organizations, infrastructure facilities, financial institutions, research, development, and investment firms interconnected by a technological and territorial community, which ensures the optimal functioning of all

structural elements based on innovative products and technologies.

Territorial clusters are an association of enterprises, suppliers of equipment, components, specialized production and services, research and educational organizations connected by relations of territorial proximity and functional dependence in the production and sale of goods and services. At the same time, clusters can be located on the territory of one or several constituent entities of the Russian Federation.

Due to seaports specificity, as well as having a city-forming function in many regions of the country, they are an important social factor in the development of coastal regions of the Russian Federation; it is proposed to form territorial clusters based on seaports. Fig. 3 shows the marine cluster management scheme developed by the authors.

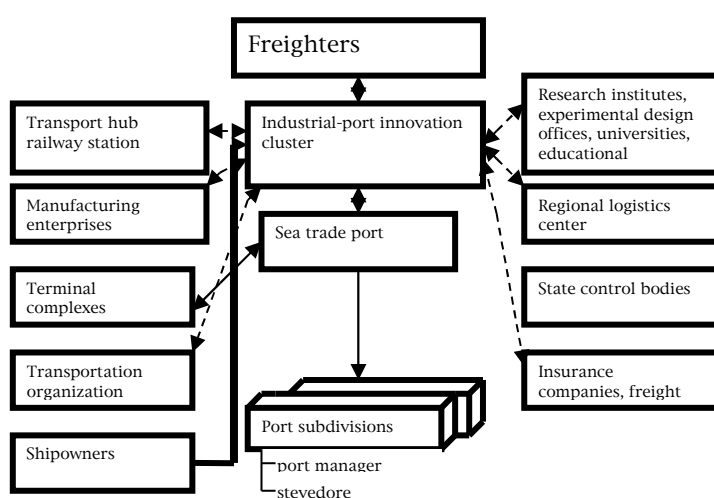


Fig. 3. Principal organizational – economic scheme of managing industrial – port cluster.

To date, the use of the cluster approach has already taken one of the key places in the strategies of socio-economic development of several constituent entities of the Russian Federation and municipalities. A few projects for the development of territorial clusters are being implemented on an initiative basis.

At the federal level, several mechanisms have been formed to provide flexible funding for cluster development activities.

The major task of such formations is to increase the efficiency of seaports through the introduction of integrated innovative solutions.

Clusters arise at the junction of land and sea areas and form the most important competitive advantages of the economies of individual regions. Favorable opportunities for the development of cluster projects are opened by the use of the potential of special economic zones of the port type.

According to the transport strategy of the Russian Federation, the main cargo base, which gravitates towards the Northwestern and Southern federal districts and is largely handled in the ports of the Baltic countries and Ukraine, should be reoriented to Russian seaports.

To meet the needs of the Russian Federation in the implementation of foreign trade and transit cargo transportation, it is planned to form an industrial and port cluster in the southwestern part of the Krasnodar in the Temryuk District, which includes a complex of transport infrastructure facilities and related enterprises [11].

The primary tasks of the cluster project should be the following: development and modernization of transport infrastructure (roads and railways, roadside service facilities being food and trade points, hotels, parking lots, advertising objects); creation of modern cargo terminals; improvement of container transportation; improvement of the organizational and economic mechanism for the construction, repair and maintenance of roads, their rational use; modernization and development of the network of republican and local highways to connect rural settlements with the backbone road network; creation of complex traffic service points that meet modern requirements and international standards; expanding the geography of road transport; stimulation of innovation activity and introduction of new technologies with a large-scale economic effect; reducing the negative impact of road transport on the environment through an environmental protection policy; development of industry science, design organizations.

The cluster participants will be represented by freight forwarding companies, logistics centers, logistics terminals, customs authorities, insurance companies, manufacturers and suppliers, engineering and consulting firms, research organizations and universities, credit organizations and banks, administrations regions, professional and public organizations.

The core will be made by companies and organizations located in the most important centers of intersection or origin of goods and goods flows, delivery routes.

3 Results and Discussion

The implementation of the cluster project will provide a cumulative effect of maintaining competitive advantages, in comparison with the regions of raw material orientation. In our opinion, the basis for an economic effect will be the result of the following: the use of infrastructure facilities, whose costs are of a permanent nature; fuller use of fixed production assets; creation of logistics divisions in small market segments; expansion of interregional export relations.

Separate cluster segments, such as transport and logistics centers, terminal complexes, information networks, container transportation can give their micro-effects as part of the overall result of the program. From an effectively operating cluster, the state will receive additional budget revenues, new jobs, an increase in the international image and internal economic stability, and the development of transport routes. The transport and logistics cluster will allow private business to increase the volume of work and the possibility of extracting additional income, increase the production and economic potential and the level of competitiveness, international prestige, and investment attractiveness. The system for

interpreting the management process of an innovative cluster of a regional transport system (Fig. 4)

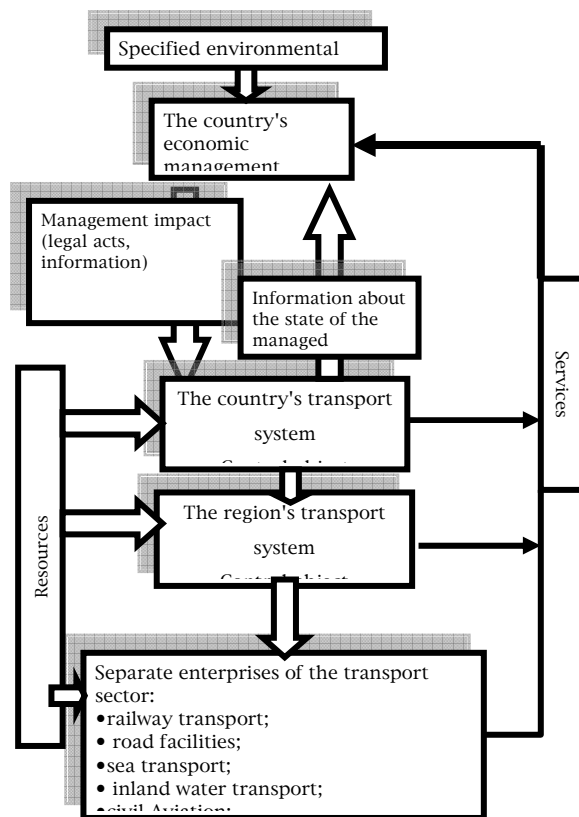


Fig. 4. System interpretation of managing the region's transport complex [10].

One of the priorities of the Transport Logistics cluster is the creation of a Regional Center for Transport Logistics and a network of transport and logistics centers in the region in the form of a mechanism for implementing an object-oriented approach in a logistics foresight project based on modern management of commodity, information, and financial flows. The creation of this consolidating complex will contribute to attracting new resources, developing the service and social spheres, and ensuring the minimization of monetary and time costs for both the transportation organization and the freighter. In addition, the economic component of this project will be supported by the social aspect of the multiplier effect due to the active development of adjacent territories [11].

The creation of a single logistics complex of the region with further integration into interregional and international logistics systems should basically have a developed logistics information system as a set of intelligent transport systems. For this purpose, tools for the development of innovative activities in the management of the transport and logistics complex of the region (the use of information and infocommunication technologies: monitoring and transport management systems; systems for the implementation of reverse and passing loading; ACS "Transport Logistics"; fuel consumption monitoring systems FMS). Automation of key processes and their

management based on data from information systems enable not only to make timely management decisions, but also bring transport enterprises to a qualitatively new level of management.

The use of modern information and telecommunication technologies will contribute to implementing an object-oriented approach in planning and managing transportation: to improve the quality of control over the implementation of transportation activities, to increase the safety of the process of transporting goods and passengers, to reduce the delivery time of goods to the end consumer, to reduce the costs of cargo transportation, maximize profits (through the process of outsourcing as well), and, thereby, increase the capitalization of the transport and logistics business.

4 Conclusion

The relevance of applying the cluster method at the regional level is dictated by the need to organize strong cooperation between cluster members, which is best achieved on a single administrative territory. The need to increase the role of the regional management system in the market development of the economy requires innovative methods offered by the cluster approach. The advantages of using the cluster method in the management of the region lie in the inherent ability of the cluster to promote competition, ensure effective inter-industry cooperation, and maximize assistance in the dissemination of innovative technologies, methods, and information exchange. Being a system that unites similar industries, the cluster promotes the development of such mechanisms as standardization and internal specialization, which increase the effective exchange of innovative ideas, specialists and, ultimately, increase labor productivity. By creating a concentration of competing enterprises, suppliers and buyers, clusters contribute to the development of specialization of large and medium-sized industries, at the same time providing activities for small enterprises and creating a special form of innovative activity, called the aggregate cluster product.

The result of the successful development of the cluster should be the participation of the regional management system in the process of its investment.

The above methodological aspects enable to form clusters of the regional transport system, produce, classify, and obtain the main directions of their strategic development on the example of an industrial port cluster with a cumulative effect.

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