

METHODOLOGICAL ASPECTS OF CONSTRUCTION OF THE DYNAMIC MODEL FOR THE DEVELOPMENT OF THE INSTITUTIONAL ENVIRONMENT OF THE INNOVATIVE MULTICLUSTERS

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Abstract

The study of the processes of development of the institutional environment of the innovative multiclusts allows to determine the stage of its life cycle and the direction of the development of the processes of clustering the economic system of the region. The models of interaction among the economic agents of the innovative multiclust at the various stages of development of its institutional environment, proposed by the author, allow to monitor the effectiveness of the regional cluster policy over the long term. The study shows that the structure of the interactions among the economic agents in the framework of this model of formation and development of the innovative multiclusts is due to the institutional aspects of the regional cluster policy. The classification of the economic agents of the innovative multiclust, which are the main subjects of the processes of modernization of the institutional environment of the regional economic system, is provided.

Keywords: economic modeling, cluster policy, institutional environment

JEL classification:

1. Introduction

The process of formation of the innovative multiclusts at the sub-federal level is the consistent implementation of a set of interrelated activities in order to organize the effective economic interaction among the subjects of the regional economic system. The analysis of the Russian practice of clustering of the regional economic systems revealed a number of trends and patterns of formation and development of the innovative multiclusts.

The formation and development of the integrated cluster formations at the sub-federal level is performed "from the top down" with the active use of the administrative resources; moreover, the processes of formation of the innovative multiclusts are implemented most effectively in the regions with traditionally prevailing high scientific and technical potential (Achenbach, 2012). The development of the clustering process is impossible without the formation of the regional mechanisms and institutions of interaction among the scientific and educational institutions and the business community (Feldman, 1994); at the same time, the mandatory condition for the development of the innovative multiclusts is the structural diversification of the regional economic system, based on the formation of an effective institutional environment of the generation and transfer of the innovative technologies (Boush, 2010). Hereat, in the process of development of the innovative multiclust, the increase in the number of the economic agents occurs, forming therein the production chains of the added value creation (Kleiner, 2008).

2. Data And Method

The methodological advantages of the tools for the institutional direction of the economic thought make it possible to simulate the changes in the structure of the interactions among the economic agents of the innovative multiclust, depending on the dynamics of the innovation environment development. Based on the grouping of the economic agents, involved in the formation and development of the scientific and industrial clusters, the systematization of the main participants in the institutional relations within the internal environment of the innovative multiclust was performed. The classification of the economic agents of the innovative multiclust, involved in the formation and development of its institutional environment, is shown in the Table 1.

Table 1. The classification of the economic agents of the innovative multicluster

Type of the economic agents of the innovative multicluster	Characteristics of the main organizational forms of the economic activity
Agents-provocateurs	Enterprises of the "core" of the multicluster, the regional development agencies, the associations of industrialists and entrepreneurs, the regional chambers of commerce
Agents-facilitators	The suppliers of the specialized resources for the enterprises multicluster; logistics, engineering and other service organizations, providing the infrastructure support to the processes of formation and development of the multicluster, venture capital funds
Agents-innovators	The scientific research and educational institutions, as well as the small innovative enterprises and the innovative infrastructure enterprises, based on them
Agents-imitators	The subjects of the innovative business, distributing and implementing new technologies on the basis of the license agreements; the centers for the commercialization of the innovations and transfer of the technology
Agents-integrators	The independent enterprises of the innovation infrastructure, integrating the efforts of the innovative businesses (business-incubators, technology parks, industrial parks, venture), the structural units of the regional executive and local self-governing authorities, regulating the processes of the socio-economic development of the territory

Consequently, the solution to the problem of constructing of the model for the clustering of the economic system in the region should be based on a study of the relationship of competition and cooperation, preconditioned by the processes of distribution of the internal resources of the multicluster of both material and immaterial nature.

4 types of institutionalization of the vector of the interactions of the cluster economic agents were identified based on the theory of mathematical graphs. Based on the dialectical nature of the development of the cluster formations, it can be assumed that in the framework of the intracluster interactions the economic agents implement in relation to each other a strategy, either stimulating or restricting the development. Therefore, each pair of economic agents of the innovative multicluster, when considering it as the directed mathematical graph, can belong to one of three types of interactions, summarized in the Table 2.

Table 2. The types of institutionalization of the interaction among the economic agents of the multicluster

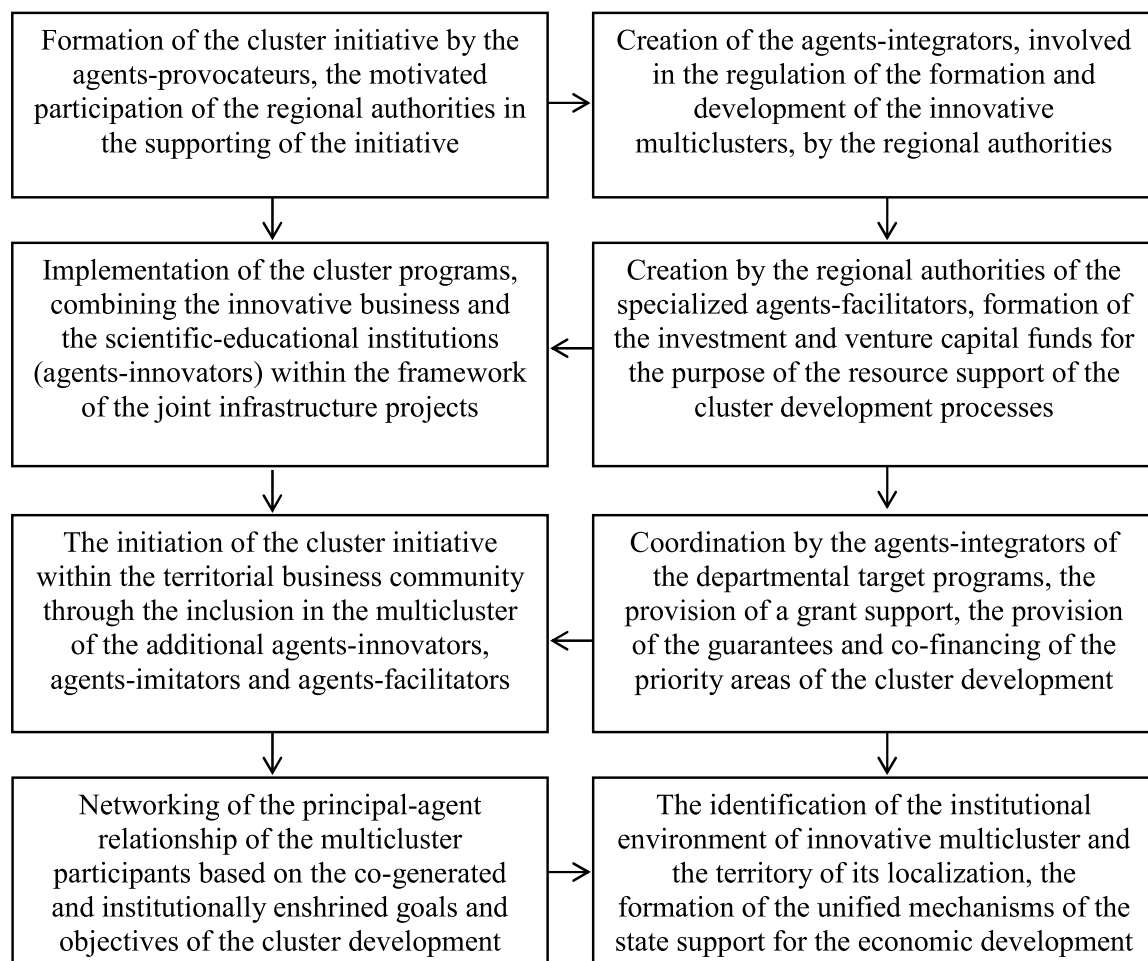
Vector of the interaction among the economic agents	Result of the interaction among the economic agents	Direction of the institutionalization of the type of interaction
++	The mutually beneficial cooperation of the economic agents aimed at the development of the competitive advantages of each other and the innovative multicluster as a whole.	Broadcasting of the experience within the multicluster, its incorporation in the form of a tradition. Formation of the mechanisms for the internalization of the positive externalities of this type of interactions.
+-	The support is provided by one economic	Formation of the compensatory

	agent to the second one through the limitations of the own resources and opportunities for the economic growth.	mechanisms, based on the distribution of the risks and benefits for the long term. Implementation within the cluster of the public-private partnership mechanisms.
--	The economic agents of the multicluster block each other's development, limiting the competitiveness of the cluster formation as a whole.	Implementation of the system of "checks and balances" in the framework of the internal environment of the multicluster. The establishment of the institutional platforms for the regulation of the economic interests.

3. Analysis And Results

On the basis of this approach, it is possible to analyze the structural changes in the territorial network of the institutional relations with the participation of the innovative businesses, the scientific research and educational institutions and the public authorities, complementary and reinforcing the competitive advantages of each other as a result of the distribution of the positive externalities of the clustering processes within the adaptive model of interaction among the participants of the multicluster. The structural and institutional scheme of interactions among the economic agents within this model of the formation and development of the multiclusters is shown in the Figure 1.

Figure 1. The structural-logical scheme of the formation and development of the innovative multiclusters

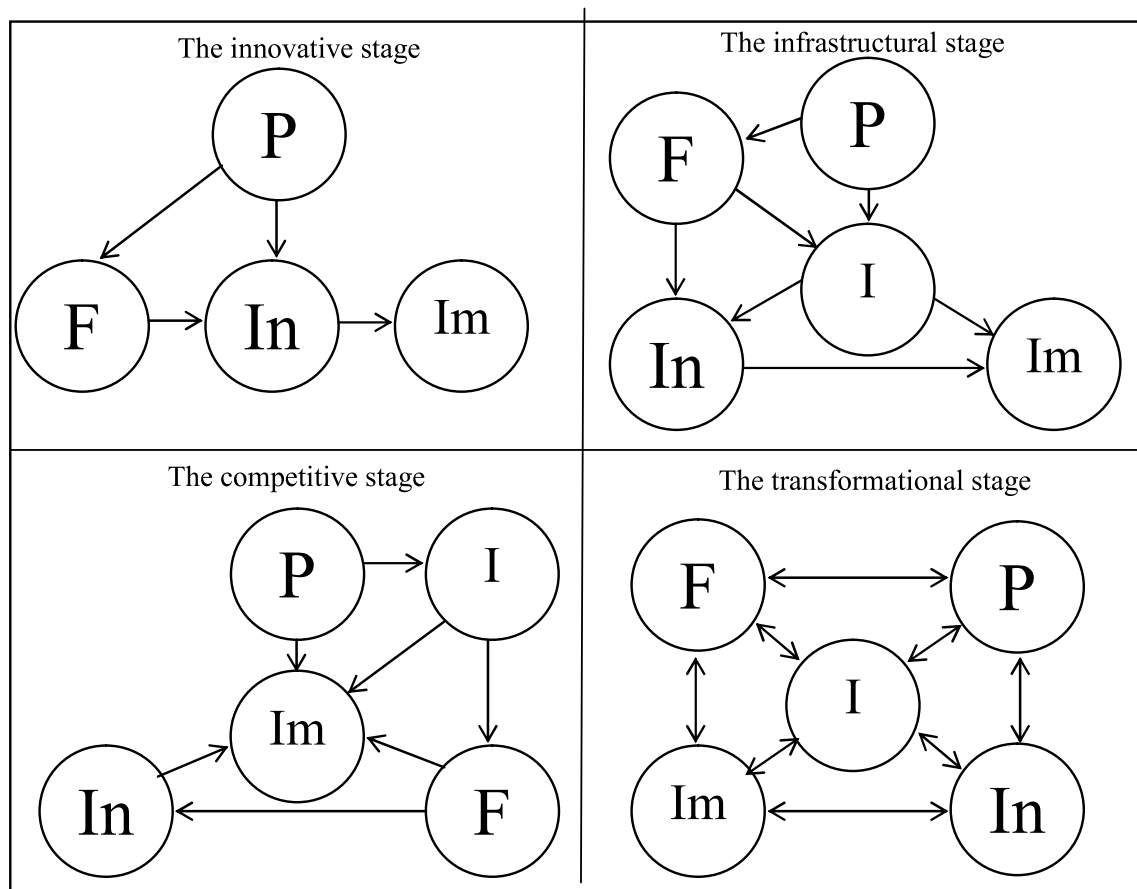


From the point of view of the evolutionary direction of the economic thought, where the subject of the study is the historical background and conditions complicating the organizational forms of the economic systems, the innovative multicluster is the evolving

institutional system, gradually transforming the socio-economic system of the territory of its localization. As part of the institutional dynamics of the interaction among the participants of the multicluster, four stages of the multicluster life cycle were identified: innovative, infrastructural, competitive, and transformational.

Let us consider the models of interaction among the economic agents of the innovative multicluster at the various stages of development of the institutional interaction environment in the form of the directed graph, consisting of a number of peaks – the economic agents of the multicluster). The models of interaction among the economic agents of the innovative multicluster at the various stages of development of its institutional environment are shown in the Figure 2.

Figure 2. The models of interaction among the economic agents of the innovative multicluster at the various stages of development of its institutional environment



P – economic agents-provocateurs; F – economic agents-facilitators; In – economic entities-innovators; Im – economic agents-imitators; I – economic agents-integrators.

In the course of implementation of the cluster initiative, the gradual integration of the economic space takes place, moreover; the coordinating role in formation of the innovative cluster with each successive stage is gradually transferred from the agents-provocateurs to the agents-integrators, the regional development corporations and the managing companies of the clusters play.

4. Discussion

The solution to the problem of construction of the dynamic model of the innovative multicluster assumes its consideration as the network organizational structure with the specific elements of the hierarchy and the institutionalization of the interactions (Enright, 1996). The previously considered essential features of the innovative multiclusters allow the consideration of the network relationship formed within its framework as relatively homogeneous, equal and mutually beneficial (Porter, 2003).

However, the complex economic structure of the multicluster formation presupposes the existence of two overlapping levels of the network interactions. The first (cluster) level

includes the network interconnections, formed within the individual industry segments of the multicluster based on the implementation of the related activities and processes by the economic agents (Dritsaki and Adamopoulos, 2005). The second (multicluster) level of the network interactions is represented by the economic relations arising among the diverse economic subjects, belonging to different segments of the multicluster (Liu and Chen, 2004).

The specific nature of the hierarchization and institutionalization within the network structure of the multicluster lies in the leading role of the cluster-forming components: the core of the multicluster formation (the innovation cluster as it is) and the organizations, being the formal/informal leaders within the industry segments of the multicluster and influencing the development of the segment as a whole (Solvell, 2008). The unity and the interrelation of the segments of the innovative multicluster are ensured by the flows of the resources of various types, optimally distributed within the multicluster formation among the industry segments (Kim et al., 2014).

5. Conclusion

The key essential feature of the innovative multiclusters is the complex two-level structure of the cluster-forming "core", acting as the central system-forming element of the inter-sectoral cluster formation and the independent cluster of the innovation type at the same time. The two-level structure of the multicluster core determines the nature of the processes of the integration of the economic agents into the multi-cluster formation.

The features of the processes of integration of the economic agents are also determined by the presence of the structural intercomponental contradictions and the contradictions caused by the presence of the competition among the economic agents of the multicluster. The main factors of the formation of the set of contradictions among the multicluster agents are: the distribution of the organizational and institutional functions within the domestic environment of the multicluster; the contradictions among the industry segments, the multi-level nature of the set of sectoral interests and strategic goals of the territorial development.

The construction of the dynamic model of development of the institutional environment for each territorial unit can improve the effectiveness of the interactions among the agents-innovators, generating the ideas, the susceptibility of the agents-imitators, distributing and implementing the new technologies, and to extend the participation of the agents-facilitators in the innovative projects, providing the financial and other resources. The flexible network structure of the principal-agent interactions of the economic agents-integrators with the subjects of the innovative business contributes to the effective transformation of the results of basic scientific research into the industrial and managerial innovations, and the innovation into the competitive socio-economic advantages of the territory.

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References

- [1] Achenbach, Y.A., 2012. Modelling of the mechanism of interaction among the subjects of the regional economy based on the concept of formation and development of the scientific and industrial clusters. FES: Finance. Economy. Strategy, 11(62): 17-23
- [2] Boush, G.D., 2012. The clusters of the enterprises: structural and functional analysis: monograph. Publishing House "Nauka", 82 p.
- [3] Dritsaki, C. and A. Adamopoulos, 2005. A causal relationship and macroeconomic activity: Empirical results from European Union. Am. J. Applied Sci., 2: 504-507. DOI: 10.3844/ajassp.2005.504.507
- [4] Enright, M. Regional Clusters and Economic Development: A Research Agenda. In: Business Networks: Prospects for Regional Development, Walter, D.G. (Ed.), 1996, Berlin, pp: 190-213 ISBN-10: 3110151073
- [5] Feldman, M.P., 1994. The Geography of Innovation. 1st Edn., Springer Science and Business Media, Dordrecht, ISBN-10: 0792326989, pp: 154.

- [6] Kim, Y.D., S. Yoon and H.G. Kim, 2014. An economic perspective and policy implication for social enterprise. *Am. J. Applied Sci.*, 11: 406-413. DOI:10.3844/ajassp.2014.406.413
- [7] Liu, C.C. and C.Y. Chen, 2004. A computable general equilibrium model of southern region in Taiwan: The impact of the Tainan science-based industrial park. *Am. J. Applied Sci.*, 1: 220-224. DOI:10.3844/ajassp.2004.220.224
- [8] Kleiner, G.B., 2016. The synthesis of the cluster strategy based on system-integration theory. Georgiy Kleiner website. URL: <http://www.kleiner.ru>
- [9] Porter, M.E., 2009. Clusters and economic policy: Aligning public policy with the new economics of competition. White Paper. Institute for Strategy and Competitiveness.
- [10] Solvell, O., C.H.M. Ketels and G. Lindqvist, 2008. Industrial specialization and regional clusters in the ten new EU member states. Special issue on macro and micro level competitiveness. *Competitiveness Rev.*, 18: 104-130.
- [11] Tsvetkova, G.S., N.G. Bagautdinova and A.Z. Novenkova, 2013. The Interaction of formal and informal market Institutes. *World Applied Sci. J.*, 25: 58-61.