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Methodological Approaches To Design Of Dynamic Model For Development Of Natural Resource-Based Multicluster At The Regional Level.

Napolskikh Dmitry Leonidovich*.

Department of Management and Law Volga State University of Technology Yoshkar-Ola, pl. Lenin, 3,

ABSTRACT

The author proposes the «neuron-synapse model of institutional environment» of natural resource-based multi cluster as a development of methods for design institutional environment of industrial clusters. This model allows to expand the methodological approaches to the identification of multi cluster formations at the regional level. The proposed algorithm for development a comprehensive economic-mathematical model of clustering processes allow to monitor the effectiveness of the regional cluster policy in the long term. The study shows methodological advantages of combination of micro and macro approach to research natural resource-based multi clusters due to a two-component composition of the multi cluster «core».

Keywords: natural resource-based multicluster, economic modeling, cluster policy, neuron-synapse model, institutional environment.

**Corresponding author*

INTRODUCTION

Widespread implementation of cluster projects in the strategic program of economic development of Russian regions are not able to adequately offset the negative impact of foreign policy instability and accession to the World Trade Organization (Kolesnikova, 2014). Due to the fact that one of the attributive signs of cluster formations is a qualitative growth of the natural resource-based component of economic activity, clusters residents and economic agents of their location are more effective in the face of international competition (Porter, 2003).

However, a key challenge to the expansion and scaling of effective clustering practices in Russian regions is the discrepancy between economic theory, that offers a variety of theoretical concepts of the formation of natural resource-based clusters at the sub national level (Feldman, 1994; En right, 1996) and methodological problems of provision for qualitative and quantitative analysis of cluster initiatives (Konovalova and Danchenko, 2014). At the same time there is a retention of the practical significance of the problem for involving innovative enterprises in purposeful transformation of the old-industrial economy of Russian regions, the core of which is natural resource-based cluster (Yalyalieva, Murzina, Larionova, 2015; Yalyalieva, 2014). Solution of these scientific and practical problems requires the development of a unified methodology for integration into natural resource-based economic agents, which differ in the legal form, economic activity scale and focus on technological way (Solvell, Ketels and Lindqvist, 2008).

DATA AND METHOD

Design of dynamic model of natural resource-based multicenter for a particular area should be based on the following methodological principles.

1. A comprehensive multi-disciplinary approach to the problem. Modern institutional theory is able to use methodological approaches of related scientific disciplines, adequately and organically using evolutionary and sociological methods to study the economic problems of the post-industrial society.
2. The combination of system and process approaches in the dialectic process. The dialectical approach also allows for a more detailed analysis of the two main levels of hierarchical organization of economic systems: micro- and macro levels.
3. The principle of historicism. The historical approach to the evolutionary dynamics of economic systems suggests their research in terms of the stages of their «institutional transformation».

Taking into account the principles above search of the organic medium, similar for institutional environment of multicenter in type of organization of matter, was made. In applying the method of scientific abstraction it was concluded that the nerve tissue of living organisms has the most similar parameters to the institutional environment. The author proposes the «neuron-synapse model of institutional environment», graphic interpretation of the «neuron-synapse model» is shown in Figure 1. The choice of model's name is due to the similarity of the functions of neurons and synapses with the functions of institutions in multicenter internal environment.

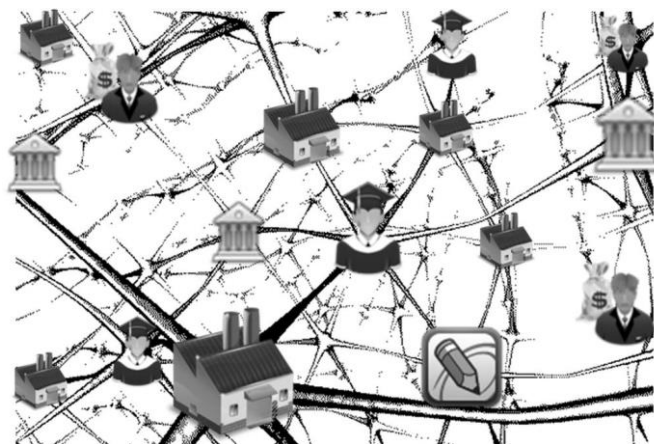


Figure 1: Graphic interpretation of «neuron-synapse model of institutional environment» of multi cluster

In frames of this model institutional environment of multi cluster is considered as a directed graph, consisting of a number of vertices (economic agents of multi cluster). Assessment of the dynamics of the institutional cluster environment was carried out in the framework of «neuron-synapse model of institutional environment» using the tools of mathematical graph theory.

ANALYSIS AND RESULTS

A key feature of natural resource-based multi cluster is a two-level composition of cluster-forming «core», when it acts as a central element of the interbranch interactions in multi cluster formation and substantive cluster of innovation type. Duplex structure of natural resource-based multi cluster «core» determines the nature of the integration processes in a multi-cluster formation.

Consequently, within the framework of an universal approach to the multi cluster network structure can be identified_a wide variety of forms of cluster initiatives, which differ in the composition of the component industry segments, the nature of network communications links, as well as the nature of distributed resources within multi cluster formation. However, an important scientific and practical problem of the implementation at the regional level of cluster initiatives is the lack of empirical data for a complete study of multi cluster forming from any of the cluster components. These components subsequently initiate socio-economic interactions with other potential residents and form the multi cluster core or its segment.

It should be noted that the features of integration processes of natural resource-based multi cluster are determined by structural contradictions caused by competition between economic agents of multi cluster. The main factors of the formation of contradictions between economic agents in frames of natural resource-based multi cluster are: distribution in the domestic organizational of environment and institutional functions; contradictions between industry segments, multi-level nature of the sectoral interests and strategic territorial development.

Resolution of considered scientific and practical contradictions actualizes the need to develop methodological approaches to cluster policy for development of the regional economy systems. Development algorithm of an integrated economic-mathematical model of clustering processes in the general form_is shown in Figure 2. The proposed algorithm is based on simulation modeling of the economic system and can vary depending on the number of regional industrial clusters that make up the multicluster formation.

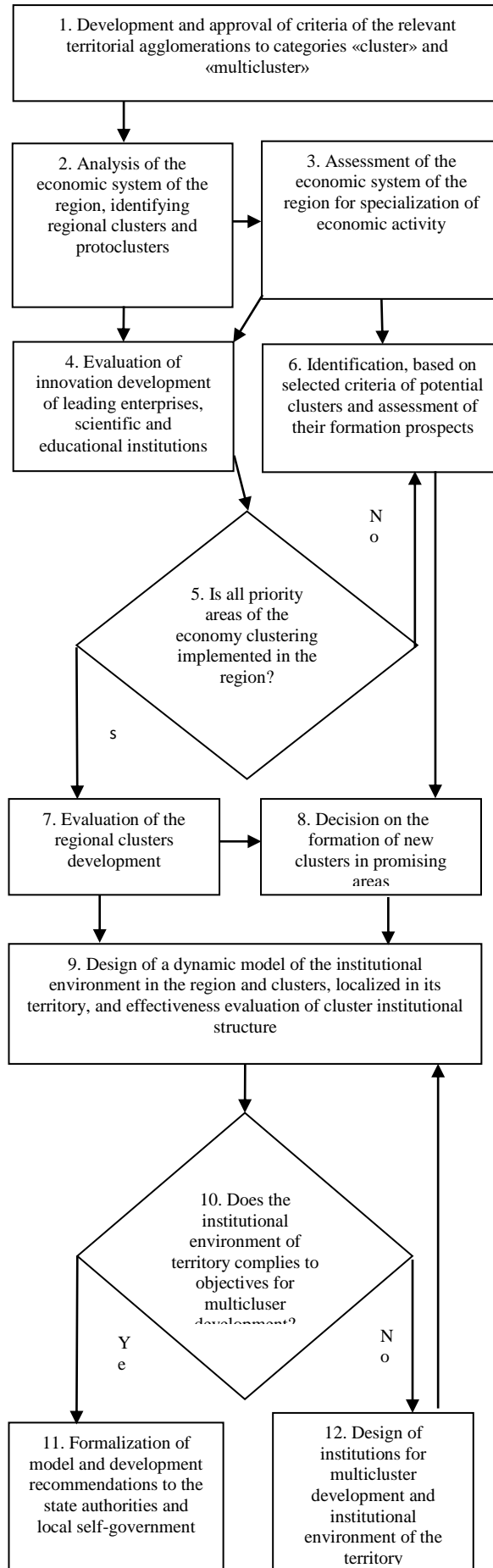


Figure 2: Algorithm for development of an integrated economic-mathematical model of clustering processes

DISCUSSION

The analysis of existing in the Russian economic literature different methodological approaches to the development of innovation clusters showed that the models and algorithms for clustering Russian regions economic systems are elemental association processes of economic development of the region as a whole and form a separate cluster (Ahenbah, Belokonskaja, Boush). It should be noted that this approach does not fully implement the methodological advantages of the economic concept of the cluster and is largely focused on the formation of clusters on the basis of already existing industry agglomeration (Rosenfeld, 1997). This approach hinders the implementation of cluster initiatives in the leading scientific and educational institutions, which form the innovative potential of Russian economy (Liu, 2014).

However, the complex economic structure of the natural resource-based multi cluster 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 multi cluster based on the implementation of the related activities and processes by the economic agents (Dritsaki, 2005). The second (multi cluster) level of the network interactions is represented by the economic relations arising among the diverse economic subjects, belonging to different segments of the natural resource-based multi cluster. The unity and the interrelation of the segments of natural resource-based multi cluster are ensured by the flows of the resources of various types, optimally distributed within the multi cluster formation among the industry segments (Kim, 2014).

CONCLUSION

The proposed algorithm for development of an integrated economic-mathematical model of clustering processes in Russian regions combines micro and macro approach to the study of the clustering process, the choice of which influences to the character of used methodological tools Using the micro approach for design of regional model of clustering economy characterized by a lack of accurate criteria for the division of economic activities used in the formation of the official statistics Consequently, the solution to the problem of design of a clustering model should be based on a study of the relationship of competition and cooperation, caused by distribution processes of internal cluster resources with both material and immaterial nature.

The design of the dynamic «neuron-synapse model» of development of the multi cluster 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 «neuron-synapse model» 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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