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Information Technologies as a Tool for Increasing Clustering Effectiveness

Las Tecnologías de la Información como una herramienta para aumentar la efectividad de Clusters

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Content

ABSTRACT:

The purpose of the work is to determine the perspectives of increase of clustering effectiveness by means of development of information technologies by the example of modern Russia. In order to determine the quantitative influence of information technologies on cluster processes in modern Russia, which is manifested in growth of the number of clusters, we use regression analysis. In order to study qualitative influence of the process of development of information technologies on clustering in modern Russia, we use the methods of induction, deduction, synthesis, systemic, problem, and logical analysis, and formalization – for visual reflection of the obtained results. As a result of the research, the authors prove that information technologies are a perspective tools for increasing effectiveness of clustering, as they do not allow for development of institutional provision of this process. The authors develop a logical scheme of increase of effectiveness of clustering under the influence of information technologies development.

Keywords: information technologies, increase of effectiveness, clustering, economy of modern Russia.

RESUMEN:

El objetivo del trabajo es determinar las perspectivas de aumento de la eficacia de los clusters mediante el desarrollo de tecnologías de la información con el ejemplo de la Rusia moderna. Con el fin de determinar la influencia cuantitativa de las tecnologías de la información en los procesos de clúster en la Rusia moderna, que se manifiesta en el crecimiento del número de conglomerados, utilizamos el análisis de regresión. Para estudiar la influencia cualitativa del proceso de desarrollo de las tecnologías de la información sobre la agrupación en la Rusia moderna, utilizamos los métodos de inducción, deducción, síntesis, sistémico, problema y análisis lógico y formalización, para la reflexión visual de los resultados obtenidos. Como resultado de la investigación, los autores demuestran que las tecnologías de la información son una herramienta de perspectiva para aumentar la eficacia de la agrupación, ya que no permiten el desarrollo de la provisión institucional de este proceso. Los autores desarrollan un esquema lógico de aumento de la eficacia de la agrupación bajo la influencia del desarrollo de tecnologías de la información.

Palabras clave: tecnologías de la información, aumento de la eficacia, agrupamiento, economía de la Rusia moderna.

1. Introduction

Integration processes have become very popular and are widely used at all levels of economic systems, from formation of regional integration association of countries and to integration of entrepreneurial structures. The most popular form of integration of enterprises is clustering.

Under the influence of global tendencies and pressure of authority and successful experience of developed countries, developing countries also conduct cluster policy, being confident in a priori high effectiveness of this mechanism for the interests of stimulation of development of entrepreneurship and acceleration of the rate of economic growth.

However, very often clustering is conducted by the initiative of the state – not entrepreneurial structures - and is met with their passivity, and in the worst case – opposition. Unpreparedness of public authorities and entrepreneurial structures for participation in cluster processes is a reason for institutional problems in the sphere of clustering of economy which reduce the effectiveness of this process.

This explains the topicality of studying the scientific and practical problem of increase of effectiveness of clustering, which is urgent in developing countries that started using this mechanism only recently. In this article, we offer and verify the hypothesis that a perspective tool of increase of effectiveness of clustering is information technologies, as they allow for development of institutional provision of this process.

The purpose of the work is to determine the perspectives of increase of effectiveness of clustering by means of development of information technologies by the example of modern Russia.

2. Materials and method

In order to determine quantitative influence of information technologies (x) on cluster processes in modern Russia (y), which is expressed in growth of the number of clusters, we use regression analysis. A model of paired linear regression is built, which reflected the dependence between these indicators, and coefficient of determination is calculated which shows reliability of this model. Dynamics of values of initial indicators according to the Russian Cluster Observatory and the International Telecommunication Union is given in Table 1.

Table 1
Dynamics of the number of clusters and values of the index of development of information and communication technologies in Russia in 2008-2017

Indicators	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Number of clusters	2	6	13	17	38	50	76	100	108	110
Index of development of information and communication technologies	4.42	5.12	5.38	5.97	6.14	6.34	6.58	6.91	7.12	7.24

Source: compiled by the authors by the materials (International Telecommunication Union, 2017), (Russian Cluster Observatory, 2017).

For studying qualitative influence of the process of development of information technologies on clustering in modern Russia, this work uses the methods of induction, deduction, synthesis, systemic, problem, and logical analysis, as well as formalization – for visual reflection of the obtained conclusions.

3. Discussion

The sense of cluster processes in economy is studied in the works (Bogoviz and Mezhov, 2015), (Przhedetskaya and Akopova, 2015), (Sadovnikova et al., 2013), (Bogoviz et al., 2017), (Sozinova et al, 2017), (Popkova et al., 2017), (Sozinova et al, 2016), and (Sozinova et al, 2016). Theory and practice of influence of information technologies on increase of effectiveness of various economic practices is given in publications (Sandu et al., 2017), (Popkova et al., 2016), (Popova et al., 2015).

At that, despite the high level of elaboration of certain aspects of the studied topic, the logic of influence of information technologies on effectiveness of clustering is not sufficiently studied in the modern economic science, which determines the expedience and necessity for further scientific research in this direction.

4. Results

As a result of regression analysis, we received the following model of paired linear regression: y=43.99x-217.332. This means that increase of the value of index of development of information and communication technologies in modern Russia leads to increase of the number of clusters by 43.99. Determination coefficient constitutes 0.86812, which shows statistical significance of the obtained model and reliability of connection between the studied indicators.

In other words, development of information technologies is one of the factors that stimulate cluster processes in the modern Russia's economy. At the same time, despite the important of this conclusion, it does not reflect the sense of influence of information technologies on effectiveness of clustering in Russia.

For that, let us supplement quantitative analysis of influence of information technologies on cluster processes in modern Russia by qualitative analysis. Effectiveness is traditionally determined as ratio of result to costs. Increase of effectiveness takes place by means of increase of result and reduction of costs. We have determined the following main indicators of effectiveness of economic clustering:

- growth of the total share of Russian enterprises in the internal markets with the corresponding reduction of the share of foreign rivals (indicator of result): clustering stimulates the increase of competitiveness of Russian enterprises and thus the strengthening of their market positions, being a method of import substitution and support for domestic entrepreneurship;
- reduction of costs of economic activities of cluster members (indicator of result): unification of enterprises into a cluster according to the sectorial feature allows reducing expenditures due to unification of resources, conducting the common marketing activities, and developing more profitable relations with suppliers and intermediaries;
- increase of innovative activity of cluster members (indicator of result): unification of financial resources of the cluster, increase of accessibility of credit resources due to clustering, cooperation with R&D institutes in a cluster, as well as unification of knowledge, information, and efforts during implementation of innovations, ensure reduction of the risk component of innovative activities and opens wider possibilities for its conduct;
- costs of managing the processes of clustering (indicator of costs): expenditures of public authorities for regulation of cluster processes in economy, as well as expenditures of members of clusters for intra-cluster management.

In order to understand how these indicators change under the influence of development of information technologies, let us view the key institutional problems of development of cluster processes in modern Russia. We distinguished three main institutes involved in the process of clustering of economy and determined the problems peculiar for them.

Firstly, the institute of state management of cluster processes in economy. They include selection of entrepreneurial structures for participation in economic clusters and management of clusters. In modern Russia, it is peculiar for such problems as imperfection of information and strong negative influence of "human factor", which is manifested in high level of bureaucracy and corruption, which leads to non-optimal selection of cluster members, selection and application of managerial tools.

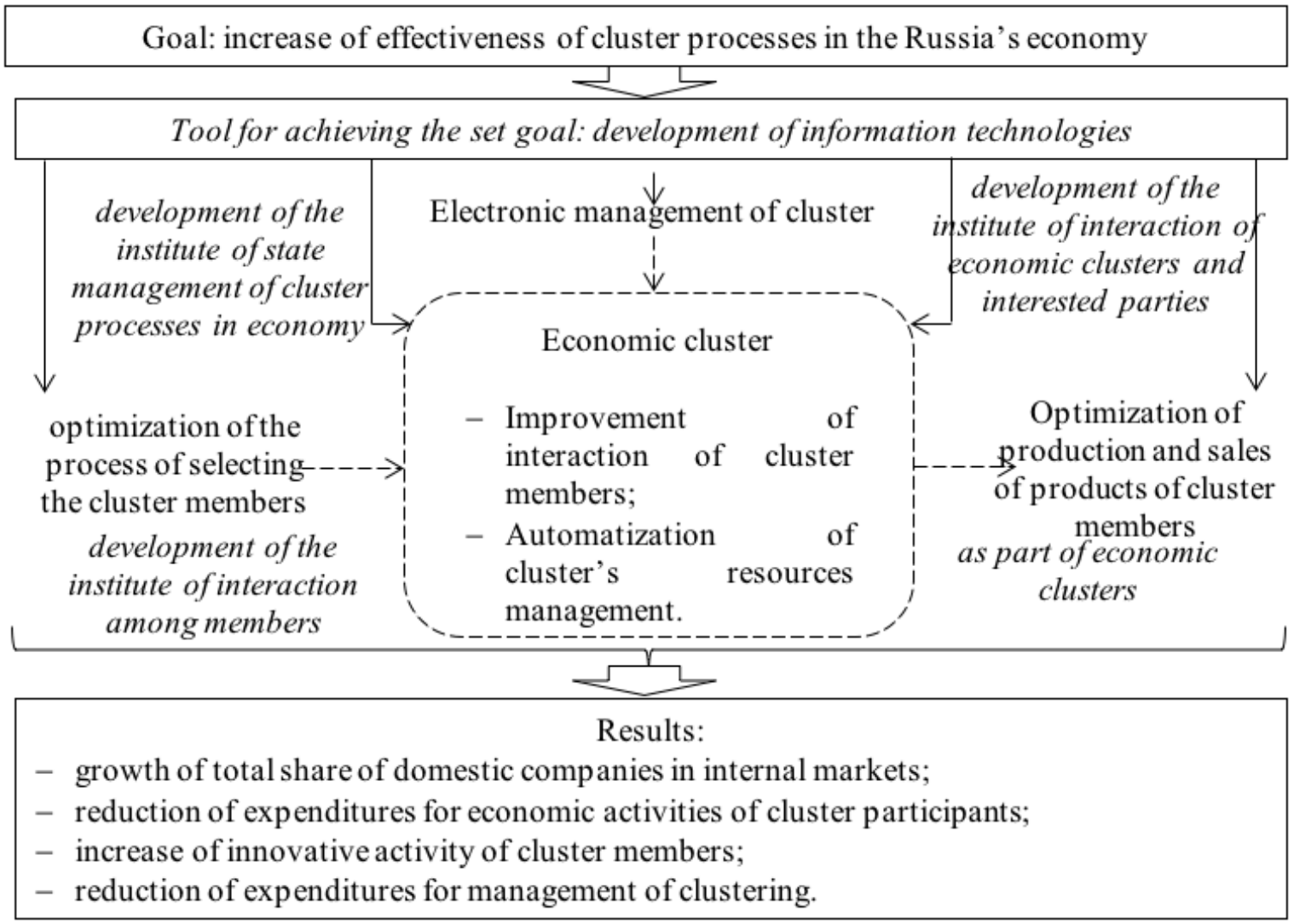
Secondly, the institute of interaction of members in economic clusters. This interaction is to ensure advantages from clustering by means of unification of efforts, resources, and information. In the Russian economic practice, functioning of this institute is related to such problems as imperfection of information exchange and complication of its processes, which are the reasons for weak interaction between cluster members.

Thirdly, the institute of interaction between economic clusters and interested parties. It includes interaction with suppliers, intermediaries, and consumers. This institute faces such problems in modern Russia as imperfection of information on available resources and effective demand. The complications are caused by collection of information due to weak communications with interested parties and its processing.

Logical analysis was used to determine that development of information technologies leads to optimization of all three viewed institutes, which ensures growth of effectiveness of economy's clustering. Thus, development of information technologies leads to development of close communications among all members of an economic system, acceleration and simplification of information processing, and reduction of the role of "human factor" in the process of state management of economy.

The logical scheme of increase of effectiveness of clustering under the influence of development of information technologies is shown in Table 1.

Figure 1
The logical scheme of increase of effectiveness of clustering
under the influence of development of information technologies



Source: compiled by the authors.

As is seen from Figure 1, information technologies lead to development of all institutes involved in cluster processes that take place in economy. This ensures optimization of the process of selecting members of cluster, electronic management of cluster, improvement of interaction of cluster members, authomatization of cluster's resources management, and optimization of production and sales of cluster's members' products.

As a result, growth of the total share of Russian enterprises in internal markets, reduction of expenditures for economic activities of cluster members, increase of innovative activity of cluster members, and reduction of expenditures for management of the processes of

clustering are achieved. That is, effectiveness of clustering grows, which confirms the offered scientific hypothesis.

5. Conclusions

Thus, information technologies could be the tool of increase of effectiveness of clustering and possess wide perspectives in this direction. Modern information technologies develop very quickly and receive new applications, due to which is it possible to expect their successful use with cluster processes in economy, as is shown in the logical scheme of increase of effectiveness of clustering under the influence of development of information technologies.

It should be concluded that realization of this scheme requires development and mass distribution of information technologies, which allow developing s quick and continuous interaction between economic subjects in economy and implementing these technologies into the economic practice of institutes that participate in implementation of cluster processes.

Apart from technological and managerial barriers on the path of realization of this scenario in the short and mid-term perspective in modern Russia, there are also financial barriers related to the deficit of the federal budget's assets and lack of financial resources with entrepreneurial structures. The search for methods of eliminating these barriers determines the perspectives of conduct of further research on the basis of this scientific work.

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