Economic Development of Regions and Innovative Engineering Clusters

Oksana Kulikova, Svetlana Neyman, Vitaliy Shamis and Elena Usacheva

Abstract: The hypothesis of the research assumes that innovative engineering clusters have a positive impact on the development of the regions in which they are located and are able to accelerate economic development of these regions. The results of the research: 1) indicators and an algorithm for evaluating the economic development of the regions (territories) are developed; 2) indicators and identification algorithms of innovative engineering clusters and their stage in the life cycle of a cluster are determined; 3) an algorithm for evaluation of the impact of innovative engineering clusters on economic development of the regions is suggested. Approbation of the developed algorithms is conducted on the example of the Russian regions and innovative engineering clusters operating in them.

Key words: Economic Development of Regions • Innovative Engineering Clusters • Stage In The Cluster Life Cycle • Cognitive Visualization

INTRODUCTION

Accelerating innovation processes in recent years increases the demand for economic development of regional systems and updates the mechanisms to increase intensity of this development.

At the same time in the conditions of high turbulence and uncertainty of modern economy [1], the processes of cluster formation and development result in such economic clusters that function largely as self-organizing nature systems with emergent properties and synergetic effect [2-4].

Modern research [3-7] reveals that economic clusters have sufficient potential to influence on the development of a region (territory), forming a point of economic growth for it. This is facilitated by the fact that economic clusters in the process of their formation and development shift the center of the production to their part and affect the processes implemented in the region of their location or the processes in the other regions, for example the neighboring ones [3].

Today innovative engineering clusters are actively developing to change the current technologies [9, 10]. The question arises whether it would be possible within the framework of the economic cluster management to solve the task of regional (territorial) development, in the first place especially for those regions in which they are located, because economic clusters management is mainly realized on the level of a control system of the region where these clusters are located [3].

To solve this problem, it is necessary to determine whether the innovative engineering clusters influence on the development of the region or territory of their location.

Our Research Is Intended to Implement this Task: The research use data mining techniques and chaos theory that allow describing precisely the creation and diffusion of innovations, the economic clusters
functioning, including innovative engineering clusters and their impact on other economic structures [8-13].

All ideas mentioned above define the objective of this research – to evaluate the impact of innovative engineering clusters on the development of the regions (territories) of their location, with the help of data mining techniques and chaos theory.

MATERIALS AND METHODS

The works of many scholars, such as J. Schumpeter, D. N. Kondratyev, S.A. Ayvazyan, W.C. Wheaton, H. Shishido, etc. are devoted to the formation of the theory of regional economic development, as well as to the influence of various factors on this process.

The combination of progressive changes in a region mainly in the economic field refers to the regional development [14].

The research in this area reveals that the level of economic development of a region can be determined through many different indicators. They define the level of production development [15], human capital [16], financial capacity [17], changes in gross domestic product and per capita income, geographical location [18], environmental conditions [19, 20].

We should also note that regions develop nonlinearly; high turbulence and bifurcation points characterize them [21, 22]. The bifurcation points that launch or accelerate the development of the regions can be random events, such as the discovery of new mineral deposits for example [21]. The bifurcation points also determine and change conditions in developing regions, transform the patterns of regional development and therefore, while evaluating the development of the region they should be taken into consideration.

To account the above-mentioned patterns, the methods of the theory of chaos and data mining can be used, which allow with sufficient precision describing the complex stochastic systems that are typical to the regions [10, 12, 13, 23, 24].

Economic clusters including the innovative engineering clusters are considered as the complex stochastic systems.

Innovative engineering clusters represent a non-institutional association of independent businesses for joint activities in the field of innovation machine-building engineering, based on proximity (territorial, sectoral, cultural), complementarity (product, resource, process), interconnectivity (material, immaterial, informational). Cluster is confined with geographical location: all actors in the cluster are located in the same territory within, for example, one region [3, 4].

A developed innovative engineering cluster contains a core based on industrial enterprises producing cluster products. With the core of the cluster through communication links, other entities or actors that are included in the cluster interact: resource providers, intermediaries participating in sales processes within the cluster and cluster products consumers. Development of a cluster enhances communication links and, therefore, information processes in the region or territory of cluster location. For innovative engineering clusters, as well as for any innovative clusters, the interlinkages of production processes with innovative activity are typical, realized not only in the investigated area, but also in other areas of science and production, i.e. at the macro level.

An innovative engineering cluster in its life cycle passes the following stages: diffuse group, latent cluster, developing cluster, mature cluster and collapsing cluster. Diffuse group is not an economic cluster per se; it is characterized by the presence of the actors of innovative market productions, but they are not interconnected with each other. There is also no connections with innovative production processes at the macro level, which does not allow emerging the processes of cluster formation. A special form of diffuse group is the chimerical structure, which differs only by its large size and high production volumes that sometimes have a tendency to grow.

A latent cluster is characterized with formation of links between production and innovation processes at the macro level, which creates conditions for cluster formation processes, the links of production with information processes at this stage are usually missing.

The developing cluster is characterized by growth, increased production volumes, the existence of linkages with production innovation processes at the macro level and with information processes as well, which determine the intensification of cluster formation processes. At this stage of development, the cluster potential is actively developed, allowing the cluster to transform to the stage of maturity.

At the stage of the mature cluster, the processes of cluster development are slowing, but links of innovation engineering production with innovative processes at the macro level and information processes still exist. At this stage, innovative engineering cluster has its most potential.

Collapsing cluster is characterized by loss of the links in the production sphere with innovative processes at the macro level, as well as with information processes;
production volumes have already decreased and the cluster is gradually moving into a phase of a diffuse group. In the stage of destruction, the cluster capacity is gradually decreasing.

Hence, the more developed innovative engineering cluster is, the greater is its potential to influence on the processes, including the economic development, which is realized in the region where the cluster is located.

To solve the problem of evaluating the impact of innovative engineering clusters on the development of the regions of cluster location with the help of data mining techniques and the chaos theory, we should provide a problem statement for the research.

**Problem Statement for the Research and Calculation Algorithms:** To evaluate an economic development in the region, where an innovative engineering cluster is located, the following indicators are used to set time series during the investigated period (taking into account the duration of the development of the region):

- Gross regional product (GRP) in the region; 
- Average wages in the region; 
- Registered level of unemployment in the region; 
- Emissions of hazardous substances into the atmosphere in the region; 
- Water pollution in the region.

The economic development of the region based on the above-mentioned indicators presupposes GRP and average wage rising, lowering the level of registered unemployment, water and atmosphere pollution.

Evaluation of the economic development of the investigated region based on the above indicators may be defined with the help of the algorithm developed by the authors. This algorithm involves the following steps:

- Formation of a finite set of regions.
- Setting the period of time – T and the time distance – t for the evaluation of the economic development of the regions included into the finite set developed in the previous step.
- Building the original matrix values of indicators used to evaluate the economic development of the regions, given for a finite set of regions during the investigated period:

\[ X^r = \| x^r_{ij} \|, \]  

where \( x^r_{ij} \) - the values of the indicators used to evaluate the economic development of the regions included in the analyzed finite set of regions for specified time distances during the investigated period.

- Using the matrix of the baseline values \( X^r \) splitting the original finite set of the regions into the group of regions with the help of hierarchical clustering method.

- Formation of the matrix of baseline indicators or benchmarks used to evaluate the economic development of the regions, for each group of regions:

\[ X^r_{ij} = \| x^r_{ij} \|, \]  

where \( x^r_{ij} \) - the values of the indicators used to evaluate the development of the regions that are the members of the specified group of regions.

- Calculation of average values for each of the indicators used to evaluate the economic development of the regions, for each group of the regions according to the following formula:

\[ \overline{x}_{ij}^r = \frac{\sum_{t=1}^{T} x_{ij}^r}{T}, \]  

- Formation of the average values of the matrix indicators used to evaluate the economic development of the regions, for each group of regions:

\[ \overline{X}^r_{ij} = \| \overline{x}_{ij}^r \|, \]  

- Formation of the average values of the matrix indicators used to evaluate the economic development of the regions based on vector matrix \( \overline{x}^r \), calculated at the previous step:

\[ \overline{X} = \| \overline{X}^r_{ij} \|, \]  

- Setting ranks for each indicator used to evaluate the economic development of the regions. Each region based on matrix \( \overline{x}^r \), subjects to the following rules:

indicators “ \( x^r_1 \) - GRP”; indicators “ \( x^r_2 \) - average wages in the region” have ranks from minimum to maximum with growth of indicators; indicators “ \( x^r_3 \) - the level of registered unemployment in the region”, “ \( x^r_4 \) - water pollution in the region”, “ \( x^r_5 \) - emissions of hazardous substances into the atmosphere in the region”, on the contrary, rank from maximum to minimum.
• Evaluation of economic development groups of regions based on the results of stage 9 with the lexicographic ordering (order of indicators \( x_1^k \)) is consistent with their ranking by relevance) [25]. According to the ordinal scale, Group 1 corresponds to the most economically developed regions; Group 2 corresponds to less economically developed regions, in comparison with the previous one, etc.

In problem statement of the research objectives, we should introduce the admission that only one innovative engineering cluster operates in the region. The main indicators of its functioning are:

- Volume of innovative engineering products at a time distance during the investigated period:
  \( x_1^k \)

Auxiliary indicators used to identify life-cycle stage of innovative engineering cluster are:

- Volume of products and services created in the sphere of innovation at the macro level (the State level or the Global level):
  \( x_2^k \)

- Intensity of information flows promoted in the region where the innovative engineering cluster operates:
  \( x_3^k \)

To solve the problem of identifying innovative engineering clusters within many regions in which innovative engineering products are manufactured, the authors developed a set of indicators calculated on the basis of indicators \( x_1^k \) and \( x_3^k \):

- A significant difference of the regions with the innovative engineering products from other regions included in a finite set of the examined regions (this indicator is calculated using the algorithm FRIS-RATING [26] dividing the set of examined regions into two groups based on index \( x_1^k \). The value “Yes” is assigned to index \( x_1^{NM1} \) for the regions, if they are included in the group with the highest values \( v \), otherwise the value “No” is used;

- Linkage of the production output in the examined region with innovative engineering cluster, the value “Yes” is assigned to index \( x_2^{NM1} \) in the case revealing a significant link between index \( x_1^k \) for the examined region and regions included in the set;

- Linkage of the production output in the examined region with existing information processes (this indicator is determined using cross-correlation analysis [27] by indicators \( x_2^k \) and \( x_2^k \) for the region and other regions included in the analyzed set; the value “Yes” is assigned to index \( x_2^{NM1} \) in the case revealing a significant link between index \( x_1^k \) for the examined region and regions included in the set);

- Existence of a positive trend in the time series specifying the production output in the region (this indicator is determined using cross-correlation analysis [27] and calculating the values with index \( x_3^k \) in terms of growth rate for the region; the value “Yes” is assigned to index \( x_3^{NM1} \) in the case revealing a significant link between index \( x_1^k \) and \( x_3^k \); the value “No” is used;

- Time series memory specifying the production output in the region (this indicator is determined using the method of calculating the Hurst index [23, 24]; the value “Yes” is assigned to index \( x_6^{NM1} \) if the Hurst index is greater than 0.5, otherwise the value “No” is used.

Identification of innovative engineering cluster life cycle is carried out based on the values of a complex set of indicators shown in Table 1.

To identify innovative engineering clusters operating in regions and determine the stage in their life cycle, the algorithm with the following stages is used:

• Formation of a finite set of regions with innovative engineering products (this set must be a subset including into a finite set of regions formed at the step 1 of evaluation algorithm of economic development of the regions).
Table 1: Values of the set of indicators used to identify innovative engineering clusters and determine the stage in their life cycle

<table>
<thead>
<tr>
<th>Stage in the life cycle of an innovative engineering cluster</th>
<th>Indicator</th>
<th>Diffuse group</th>
<th>Latent cluster</th>
<th>Developing cluster</th>
<th>Mature cluster</th>
<th>Collapsing cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes/No</td>
<td>No</td>
<td>Yes *</td>
<td>No, Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes/No</td>
<td>No</td>
<td>Yes *</td>
<td>Yes</td>
<td>Yes *</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes/No</td>
<td>No</td>
<td>No Yes *</td>
<td>No, Yes No, Yes</td>
<td>Yes *</td>
<td>Yes *</td>
<td>No</td>
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<tr>
<td>Yes/No</td>
<td>No Yes *</td>
<td>Yes *</td>
<td>Yes, No</td>
<td>Yes</td>
<td>Yes, No</td>
<td>Yes, No</td>
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<tr>
<td>Yes/No</td>
<td>No Yes</td>
<td>Yes *</td>
<td>No</td>
<td>Yes *</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes/No</td>
<td>No, Yes</td>
<td>Yes *</td>
<td>Yes</td>
<td>No, Yes No</td>
<td>Yes, No</td>
<td>No</td>
</tr>
</tbody>
</table>

* - Characteristic for chimeric structures.

- Specifying the investigated period of time-T and the time distance-t (the time period T and the time distance t should correspond to the period of time and the time distance specified at the step 2 of the algorithm to estimates the economic development of the regions).
- Formation of the matrix of benchmarks $X_{i,t}^{per}$ for a finite set of regions based on the step 1, to identify innovative engineering clusters and to determine the stage in their life cycle:

$$X_{i,t}^{per} = \| x_{i,t}^{per} \|$$  \hspace{1cm} (6)

- Formation of the matrix of complex indicators $X_{i,t}^{NMT}$ used to identify innovative engineering clusters and to determine the stage in their life cycle:

$$X_{i,t}^{NMT} = \| x_{i,t}^{NMT} \|$$  \hspace{1cm} (7)

- Identification of innovative engineering clusters in the set of regions included in the investigated set and defining the stages in cluster life cycle based on matrix $X_{i,t}^{NMT}$.

To meet the challenge of evaluating the impact of innovative engineering clusters on the development of the regions in which they are located, the algorithm with the following steps is used.

- Identifying the impact of innovative engineering clusters on basic development indicators in the region (exploring the influence of the basic indicator $x_{i}^{k}$ characterizing innovative engineering cluster and indicators, which determine the development of the region $x_{i}^{1} \ldots x_{i}^{5}$ using cross-correlation analysis [27]).
- Correlating the innovative engineering clusters with the groups of regions identified in step 4 of evaluation algorithm for economic development of the regions.
- Cognitive visualization of results of calculations.

**RESULTS AND DISCUSSION**

The research of the influence of innovative engineering clusters on the regions of their locations is developed taking the regions in the Russian Federation as the example.

To evaluate the development of the regions in the Russian Federation, the indicators taken from statistical compendium entitled “Regions of Russia. Socio-economic Indicators for the Period 2006-2015” [28] taking into account the indicators specified while setting the problem statement for the research:

- $x_{i}^{1}$ - Gross regional product (CPG) produced in the region per year, in mln rubles;
- $x_{i}^{2}$ - Nominal average monthly wages for employees in the region in a year, in rubles;
- $x_{i}^{3}$ - Number of unemployed in the region per year, in thou. pers.;
- $x_{i}^{4}$ - Emissions of polluting substances into atmospheric air coming from stationary sources in the region per year, in thou. tons;
- $x_{i}^{5}$ - Dumping of contaminated water wastes into surface waters in the region per year, in mln cubic m.

The study is conducted for 81 regions of the Russian Federation, on the basis of which the original set of regions is formed.

Using the hierarchical cluster analysis method based on matrix $X^*$ the Russian Federation regions are divided into six groups.
Table 2: Assessment of economic development for groups of regions

<table>
<thead>
<tr>
<th>Groups of regions</th>
<th>Indicators</th>
<th>Rank of regional group's economic development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group of regions 1</td>
<td>4 4 4 3</td>
<td>4 4 4</td>
</tr>
<tr>
<td>Group of regions 2</td>
<td>3 3 6 5</td>
<td>5 5 3</td>
</tr>
<tr>
<td>Group of regions 3</td>
<td>2 2 5 6</td>
<td>2 6 3</td>
</tr>
<tr>
<td>Group of regions 4</td>
<td>5 5 2 3</td>
<td>3 2 5</td>
</tr>
<tr>
<td>Group of regions 5</td>
<td>6 6 1 1</td>
<td>1 1 6</td>
</tr>
<tr>
<td>Group of regions 6</td>
<td>1 1 4 2</td>
<td>2 6 1</td>
</tr>
</tbody>
</table>

The First Group Is Composed of the Following Regions: Belgorod Oblast (region), Voronezh Oblast, Komi Republic, Arkhangelsk Oblast, Leningrad Oblast, Volgograd Oblast, Stavropol'sky Kray (territory), Orenburg Oblast, Saratov Oblast, Omsk Oblast, Republic of Sakha (Yakutia), Primorsky Kray, Sakhalin Oblast, Rostov Oblast, Permsky Kray, Nizhniy Novgorod Oblast, Samara Oblast, Chelyabinsk Oblast, Irkutsk Oblast, Kemerovo Oblast, Novosibirsk Oblast, Khabarovsk Kray.

The Second Group Includes the Regions: Moscow Oblast, St. Petersburg, Krasnodarsky Kray, Republic of Bashkortostan, Tatar Republic, Sverdlovsk Oblast, Krasnoyarsky Kray.

The third group includes Tyumen Oblast: The fourth group is composed of the following regions: Bryansk Oblast, Vladimir Oblast, Ivanovo Oblast, Kaluga Oblast, Kursk Oblast, Lipetsk Oblast, Ryazan Oblast, Smolensk Oblast, Tambov Oblast, Tver’ Oblast, Tula Oblast, Yaroslavl’ Oblast, Republic of Karelia, Vologda Oblast, Kaliningrad Oblast, Murmansk Oblast, Novgorod Oblast, Astrakhan Oblast, Republic of Dagestan, Chuvash Republic, Kirov Oblast, Ulyanovsk Oblast, Republic of Buryatia, Republic of Tyva, Altai Kray, Zabaikalsky Kray, Amur Oblast, Tomsk Oblast.


In the sixth group includes Moscow: Table 2 presents the results of 9-10 steps of the evaluation algorithm of economic development for six groups of regions.

On the basis of the calculations carried out (Table 2), we can conclude that the most economically developed regions are in Group 1; Group of regions 3 is in the second place, Group 2 is in the third place, the latest is Group of the regions 5. Economically developed regions are characterized by high levels of GRP, a high level of wages in the region, which contributes at the same time to the quite high levels of unemployment and the deterioration of the ecological situation in the region.

The regions with low economic development are characterized by a low level of GRP being created in the region, low wages and, consequently, low unemployment but good environmental situation.

To identify the innovative engineering clusters, taking into account the problem statement of the research, the following indicators taken from the Unified Interdepartmental Information System [28, 29] for the period 2006-2015 are used [28]:

\[ k_1 \] - Volume of innovative goods and services (value per year) for engineering activity “Production of machinery and equipment (without ammunition and production) in the region”, in thou. rubles.

\[ k_2 \] - Volume of innovative goods and services (value), only the Russian Federation, in thou. rubles.

\[ k_3 \] - Cost of information and communication technologies in the region per year, in thou. rubles.

The research is conducted for the 61 Russian region that manufacture innovative engineering products. Using the developed algorithm based on statistics of the Russian Federation, 10 innovative engineering clusters are revealed. They include one collapsing cluster (Moscow Oblast regional innovative engineering cluster), two latent cluster moving to the stage of cluster development (Moscow-city innovative engineering cluster, Chuvash innovative engineering cluster), seven latent clusters (Krasnoyarsk innovative engineering cluster, Perm innovative engineering cluster, Lipetsk innovative engineering cluster, Leningrad Oblast...
innovative engineering cluster, Yaroslavl’ innovative engineering cluster, Samara innovative engineering cluster, Chelyabinsk innovative engineering cluster).  

Table 3 provides innovative engineering clusters, values of their indicators and the stage in their life cycle. Cross-correlation analysis reveals the presence of (lack of) the impact of innovative engineering clusters on the indicators characterizing the development of the regions in which they are located. The results of the calculations are listed in Table 4.

**Based on the Performed Calculations the Following Conclusions Can Be Made:**

- A small number of regions of the Russian Federation has the great economic development. These regions include Moscow and Tyumen Oblasts (regions), which are located in regions of Groups 3 and 6 respectively.
- Cluster formation processes in the Russian Federation in the sphere of innovation engineering are insufficient. Currently there are no cluster structures having been formed in the Russian Federation. Using the developed algorithm there can be identified one collapsing cluster that is Moscow Oblast innovation engineering cluster, two latent clusters in the stage of transition to the developing clusters-Moscow innovative engineering cluster and Chuvash innovative engineering cluster; seven latent clusters-Krasnoyarsk innovative engineering cluster, Perm innovative engineering cluster, Lipetsk innovative engineering cluster, Leningrad Oblast innovative engineering cluster, Yaroslavl’ innovative engineering cluster, Samara innovative engineering cluster, Yaroslavl’ innovative engineering cluster, Chelyabinsk innovative engineering cluster.

- Innovative engineering clusters in the Russian Federation have in most cases a positive impact on the development of regions in which they are located. However, these clusters can provide a negative impact on the ecological situation: functioning of the Perm engineering cluster leads to pollution and contamination of water with harmful substances. The greatest impact of innovative engineering clusters is on economic development indicators in the region, such as GRP, produced in the region and on the level of wages. The least impact of the clusters is on unemployment and on the ecological situation in the region.

- It is quite difficult to make a conclusion that the innovative engineering clusters in the Russian Federation accelerate the economic development of the regions in which they are located, because there are no the already formed clusters in the investigated areas. Location of the investigated patterns of clusters in the regions with different economic development has not been identified. Group 6 includes Moscow innovation engineering cluster; clusters are absent in the Group of regions 3. There are two clusters in Group 2: Krasnoyarsk innovative engineering cluster, Moscow Oblast innovative engineering cluster, there are 4 clusters in the Group of regions 4: Perm innovative engineering cluster, Leningrad Oblast innovative engineering cluster, Chelyabinsk innovation engineering cluster. The Group of regions 4 includes three clusters: Lipetsk innovative engineering cluster, Yaroslavl’ innovative engineering cluster, Chuvash innovative engineering cluster, there are no clusters in the Group of regions 5.
Table 4: The results of the calculations to explore the presence or absence of the impact of innovative engineering clusters on the indicators characterizing the development of the regions of their location.

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Cluster index</th>
<th>Direction of links</th>
<th>Region indicator</th>
<th>Time lags of influence</th>
<th>Impact on the region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moscow Oblast innovative engineering cluster</td>
<td>No relationships</td>
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<tr>
<td>Moscow innovative engineering cluster</td>
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<td>Chuvash innovative engineering cluster</td>
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<td>Krasnoyarsk innovative engineering cluster</td>
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<td>Perm innovative engineering cluster</td>
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<tr>
<td>Lipetsk innovative engineering cluster</td>
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Table 4: Continued

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Cluster index</th>
<th>Direction of links</th>
<th>Region indicator</th>
<th>Time lags of influence</th>
<th>Impact on the region</th>
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<tr>
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<td></td>
<td>$x_1$</td>
<td>$x_2^r$</td>
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<tr>
<td></td>
<td>$x_1$</td>
<td>$x_3^r$</td>
<td>-</td>
<td>-</td>
<td></td>
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<tr>
<td></td>
<td>$x_1$</td>
<td>$x_4^r$</td>
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<td>$x_1$</td>
<td>$x_5^r$</td>
<td>0</td>
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<td>$x_1^r$</td>
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<td>Yaroslavl’ innovative engineering cluster</td>
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<tr>
<td>Samara innovative engineering cluster</td>
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<tr>
<td></td>
<td>$x_1$</td>
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<tr>
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<td>$x_1$</td>
<td>$x_2^r$</td>
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<tr>
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<td>$x_5^r$</td>
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<tr>
<td>Chelyabinsk innovative engineering cluster</td>
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<td></td>
<td>$x_1$</td>
<td>$x_5^r$</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

* - A two-way impact: innovative engineering cluster affects the development of the region and the region affects the development of innovative engineering cluster.

** - Influence, leading to the economic development of the region.

*** - Unilateral influence innovation engineering cluster indicators in the region.

**** - Influence, leading to a deterioration in the economic development of the region.

- Unilateral influence: the region affects the development of innovative engineering cluster.

**CONCLUSIONS**

The research has revealed the impact of innovative engineering clusters on the indicators of the regions, which determine their economic development. At the same time, it cannot be said with any certainty that the clusters are able to accelerate the economic development of the regions in which they are located. This is because there no already formed clusters to be investigated in the regional entities of the Russian Federation: the only clusters in latent or collapsing stage of development can be identified.

However, at the same time with sufficient development of innovative engineering clusters and their potential to be developed, they will be able to facilitate and accelerate the economic development of the regions in which they are located.

The authors hope that the results of the research may be useful for developing strategic and operational plans for the development of economic entities-regions or territories.

**REFERENCES**