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Management of Intracluster Formations Interaction of the Chemical Industry Enterprises

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Abstract: Urgency of the issue-problems of forming of regional economy development cluster strategy by detecting of intracluster stable formations on the level of enterprises in the system of clusters-stipulates interest both of practitioners and scientific community. Many methodical issues, in particular, concerning identification and creation of managerial decisions of enterprise progressive development within cluster formations, are under discussion. In the article approaches to cluster detecting are performed; the advantages of cluster formations in increasing of regional economy competitiveness are defined; a methodic of enterprise intracluster interactions assessment is suggested; sectors of management of enterprise intracluster interactions in regional economy are worked out.

Key words: Cluster · Cluster formation · Cluster approach · Cluster interaction · Identification of cluster formation · Cluster policy

INTRODUCTION

As world experience shows, activation of innovational processes in economy and, consequently, intensification of competitive advantages of all levels economic systems are provided directly through stable interaction of several economic entities (enterprises, companies, state authority organs), that is through forming and functioning of industrial clusters.

Problems of enterprise development in the cluster system, its entry, stability of functioning, first of all, genesis of formation of intracluster stable interactions in the level of economic entities, regions and national economy are not studied deeply enough. A scientific approach to analysis and development tendencies both of enterprises in the industrial clusters system and economy of regions in whole with using of common methodology of clusters-'pillars' detecting is needed. Solution for this problem in scientific-theoretical aspect is attempted within this research.

MATERIAL AND METHODS

Theoretical and methodological basis for the research were the fundamental points of the economic science, works by Russian and foreign economists on the problems of regional developments and cluster strategies.

The cluster approach is based on the works of A. Marshall and J. Schumpeter, F. Perroux, J. Tolenado and D. Soulie, E. Dahmen, E. Leamer, S. Rosenfeld, M. Enright, Doeringer and Turkle, Jacobe and De Mann, Louren, A. Young, V. Price.

Problems of identification of cluster activity assessment are considered in the works of E. Bergman, R. Coase, E. Frezer, P. Samuelson and F. Hayek.

Yu.K. Permskiy, O.A. Romanova, Yu.G. Lavrikova, S.N. Kotliarova, T.V. Miroliubova, T.V. Karlina, T.Yu. Kovaleva and others are among Russian leading researchers working on fundamental problems of territorial organization of economy, distribution of productive forces, regional development management, whose studies were the basis for methodology of current research.

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RESULTS AND DISCUSSION

In the economic literature the term 'cluster' is widely used during the last decade of 20th century, firstly it was introduced by American economist M.Porter in 1990, who gave a definition of 'cluster': 'Cluster, is a group of geographically close associated enterprises and organizations, related to them which act in particular sphere and are characterized by the identity of activity and complementary to each other' [1, p.258]. M.Porter has paid attention to that fact most competitive in the international scale companies of one sector are not distributed haphazardly on different developed countries, but have a property of concentrating in the same country and sometimes even in one region of the country. One and some companies, achieving world market competitiveness, extend their impact on their closest environment: suppliers, consumers and competitors. Success of the environment in turn has a positive impact on the further increasing of competitiveness of the company. As a result, a 'cluster' forms-a community of companies of closely related sectors, who mutually stimulate the growth of each other competitiveness.

The theoretical basis of the cluster strategy was set in the beginning of the 19th century in the works on agglomeration economy by J. von Thunen and his followers W.Laundhart and A.Weber, who studied enterprise and its geographical allocation in the economical area relative to the sources of raw and markets and also factors, which have impact on it [2].

The cluster approach is based on the works of A. Marshall and J. Schumpeter. A. Marshall was one of the first who declaimed that the rise of stable net of interactions of economic entities encourages growth of their competitiveness. J.Schumpeter defined further development of agglomeration approach by introducing the term of 'innovations', which, in his opinion, are the main instrument of regional economic growth. A. Weber considered that entrepreneurs establish their companies in the regions, where costs of transporting and employee wages are minimal and the only factor of allocation becomes the economic benefit of plant location [4].

Theories of Marshall, Schumpeter and Weber were based on that fact that companies are located nearby in order to decrease the transaction costs, to raise the profit and to maximize informational flows.

The follower of Schumpeter was Frenchman Francois Perroux [5], who performed the idea of 'growth poles' or 'development poles'. Under the 'poles' he considered the territorial concentration of enterprises, which due to their geographical allocation, innovational and entrepreneurial activity become the center of development of the whole economic system, which influence on other territories, being the centers of 'pole' development of economy.

French scientists J. Tolenado and D. Soulie used a restricted interpretation of cluster, called it 'filiere'. They were explaining forming of filieres by creation of technological links between sectors and sectors of economy for realization of their potential advantages.

Cluster approach was studied also by E. Dahmen with the aim of detecting and studying of interconnections of big Swedish transnational corporations. In Dahmen's opinion, cluster are formed in 'blocks of development' and 'the basis of competitive success development is the presence of connection between possibility of one sector to develop and provide progress in another'.

The modern theory of competitiveness based of clusters was worked out by V. Feldman [9]. The essence of the theory is the following: diversification is often ensued the contacts between the sectors, connected by relations of supplies and purchasing, what agrees with mechanisms, which lead to cluster formation. In turn clusters of innovational activity are formed on the basis of diversification.

Almost all researchers specify territorial-sectoral partnership of enterprises and subjects, consolidated by the innovational program of introduction of advanced technologies, as the main factors of cluster forming. This regularity is explained by the decreasing of transaction costs, effecting usage of innovations and information interchange, which encourage the competitiveness growth of each of the cluster participant.

Approaches of cluster formations, discussed above, set the foundation for cluster scientific direction to region development and increasing of its competitiveness.

Detecting of these approaches allowed giving definition of cluster association or cluster: 'Cluster is a stable territorial-sectoral voluntary association of enterprises, different spheres of industrial and service sectors of economy, directing to increasing of their competitiveness both in internal and external markets' [10].

Thereby, summarizing cluster definitions listed above, we can detect the following essential features [11]:

- The presence of leading companies, capable to possess a substantial share in the internal and external markets, supplemented by specialized serving organizations;
- Concentration of cluster participants on a restricted area, representing unique advantages;

- Interaction of cluster participants with each other in order to manufacture production, competitive in the internal and external markets;
- Presence of competition between cluster participants;
- Accelerated spread of innovations due to developed information transmission net.

In the contemporary world of high technologies clusters have an important role. Due to timely support of existing clusters and development of new clusters, developed countries of the world increase their competitiveness and , as consequence, the common welfare of the world community is rising.

The cluster impact on the economy competitiveness occurs in three directions (Table 1):

Though, the problem of cluster formations identification for their support by the means of cluster policy remains open for discussion of scientist-economists.

In the foreign practice of conducting scientific-applied researches different methods, both qualitative and quantitative, are used for identification and assessment of clusters, among them: expert estimates, questioning, interviewing, industrial intersectoral balances, technological intersectoral balances, network analysis, special surveys, SWOT and PEST analysis, calculation of indicators of geographical concentration and localization, analysis of agglomerative effects, 'input-output' matrix. Each of these methods has its own advantages and disadvantages, there is no universal model of cluster detecting [12].

In Russian practice one of the thresholds of cluster identification is detecting of its core, which includes one company or group of enterprises, achieving competitive advantages and exporting their goods outside the region (country) [13]. Thereby, the cluster core is formed by leading industries, possessing the biggest development potential. In the order of detecting clusters and their cores, it is possible to use a whole range of qualitative and quantitative methods [13]. Though within Russian researches, quantitative analysis, oriented on detecting of cluster cores, is not paid enough attention to, suggested methods of identification are mostly oriented on some particular instrument (e.g. evaluation of specialization of industry sectors according to the number of employees, evaluation of geographical agglomeration of regions according to sectoral indicator) and don't correspond with difficulty extent of the research subject [14, p.30].

At the same time according to M.Porter the necessary condition of cluster determination is detecting of stable interactions between economic agents, encouraging growth of their competitiveness [1]. On the assumption of given principle, we have worked out a methodology of intracluster interactions stability of industrial enterprises evaluating, which is based on calculation of integral indicator-stable interaction index [15, p.68].

Table 1: Positive effects of cluster

Cluster		
Increases productivity of companies and sectors	Creates opportunities for innovative and industrial growth	Stimulates and relieves forming of a new business, supporting innovations and cluster expanding
✓ Competition creates more effective specialization within a cluster. ✓ Appearance of more exacting customers. Higher level of specialization in the manufacturing process creates possibility to use economy of scale. ✓ Access to technologies, suppliers, skilled labour, information, business-services, etc. ✓ High level of expertise helps to improve logistic chain and encourages the process of cluster improving. ✓ Cluster development can improve the infrastructure of professional, financial and other services.	✓ Create channels for effective cooperation of potentially new resources for innovations. ✓ Early determination and predicting of technological tendencies. ✓ Environment, favorable to appearance of combinations of previously existing qualifications (abilities). ✓ Favourable assumptions for risk distribution.	✓ Best competence in venture capital handling and development of rapidly growing companies. ✓ Connections and channels within cluster encourage appearance of complementary skills, technologies, subsidies. Opportunity of the companies to attract complementary skills allows the participants to take part in bigger transactions, in which individual companies are not competitive. ✓ Support of new participants' appearance. ✓ Consolidating of social and other informal connections, encouraging appearance of new ideas and business. ✓ More advanced informational flows within cluster.

Table 2: Complex of administrative measures from the position of two participants

	Directions of activation	
Factors	Enterprise policy	Regional authorities policy
1. Number of contracts	*Increase of contracts due to:* -participating in tradefairs, tenders in the regional and international markets, social-economic regional programs and projects, conducting of advertising campaigns; -standardizations of production for entering the new markets; -studying of dynamics and structure of demand; -enforcement of competitive positions on the basis of growth, quality, environmental friendliness; -introduction of outsourcing.	*Increase of contracts due to:* -annual holding of tradefairs, contests, conferences, lobbying of the local producers interests, providing access to different data bases; -assistance for license import for the cluster participants; -establishment of dialog between private business and authorities, development of partner relations between the cluster participants; -creation of favourable business-climate on the legislative level; -development of supporting infrastructure; -decreasing of tax payments and duties and administrative barriers; -introduction of standardization procedure for enterprise-exporters.
2. Investment activity effectiveness	*Increase of investment attractiveness due to:* -designing of long-term strategy of an enterprise in the terms of market competition; -enforcement of competitive positions on the basis of introduction of new technologies, activity spheres expanding; -issue and distribution of securities.	*Increase of investment attractiveness due to:* -investment tax credit (on the term till 1 to 5 years) for enterprises, investing in the form of capital investments while realizations of cluster projects; -compensation (subsiding) for the enterprises, participating in realization of cluster project; -realization of target investment into development of enterprises-participants of cluster formation; -assistance to forming of efficient bank system, fund market, institutions of collective investments; -removal of barriers for entering sectoral or territorial cluster; -assistance for export to the interregional, national and world markets.
3. Innovative activity effectiveness	*Increase of innovative attractiveness due to:* -expenditures to researches and development, purchasing of intellectual property (know-how, licenses, patents, etc.; -investment for external R and D;	*Ïîâûøeíèe èííîâàöèîííîé ïðèâëeKàòeëüíîñòè çà ñ÷eò*: -decrease of tax burden for venture enterprises; -realization and financing of R and D projects, creation of business-incubators, centres of technologies and information transfers; -increasing of efficiency and development of universities, scientific-research institutes and technic-research organizations; -providing of enterprises' access to risk and venture capital; -designing of system of competitive grants; -increasing of adequacy and quality of educational programs (for clusters) in secondary and high professional educational institutions (e.g. through creation of sectoral standards); -designing of specialized programs for increasing qualification; -organization of student practice in the cluster enterprises; -designing and realization of programs of labour sources attraction (including from abroad); -providing of tight interaction between sectoral and university science with specialists from the cluster enterprises.
4. Financial strength	*Increase of financial strength due to:* -increasing of financial responsibility of an enterprise; -optimization of enterprise capital structure.	*Increase of financial strength due to:* -financing R and D projects by the means of regional budget; -creation of favourable business-climate on the legislative level; -development of supporting infrastructure; -decreasing of tax payments and duties and administrative barriers

The stable interaction index formula, based on the additive model, in general form is the next:

$$I_{si} = a_{f1} \bullet I_{f1} + a_{f2} \bullet I_{f2} + a_{f3} \bullet I_{f3} + \ldots. + a_{fn} \bullet I_{fn}$$

where I_{fn}-index of stable interaction factors change of analyzed period as compared with basic;

n-amount of factors;

a_{fn}-weight of appropriate factor in determination of stable interaction.

Stable interaction factor change ($I_{ôn}$) in turn is calculated according to the formula:

$$I_{ôn} = b_{i1} \bullet I_{i1} + b_{i2} \bullet I_{i2} + b_{i3} \bullet I_{i3} + \ldots. + b_{in} \bullet I_{in}$$

$$I_{\Pi n} = \frac{\text{current value}}{\text{basic value}}$$

where n-amount of indicators in stable interaction factor composition;

b_{in}-weight of appropriate indicator in appropriate stable interaction factor.

Obtained result will be an index, reflecting extent of interactions stability of an enterprise in the cluster during estimating period in comparison with the basic level, if the last is taken as one.

We have worked out the methodological statements of enterprise interaction stability index for cluster structure.

On the first stage the key factors, defining the interaction stability of a cluster structure enterprise are marked out. As such factors we have defined:

- Forces of enterprise interaction with other subject within the cluster;
- Volume of investments to innovative activity;
- Effectiveness of innovative activity;
- Financial strength.

Thereby, the formula of cluster enterprise stable interaction index is the following:

$$I_{fi} = a_1 \bullet I_{if} + a_2 \bullet I_{iv} + a_3 \bullet I_{iae} + a_4 \bullet I_{fs}, \text{ где}$$

a_n-weight of appropriate factor in determination of stable interaction of an enterprise within a cluster.

- I_{if}-index of interaction force of an enterprise with other objects within a cluster;
- I_{iv}-index of volume of investments to innovative activity;
- I_{iae}-index of investment activity effectiveness;
- I_{fs}-index of financial strength.
- If $I_{fi} > 1$-it says about stable interaction of an enterprise with other elements of the cluster system;
- $I_{ôà} = 1$-it means conservation of interaction stability of an enterprise with other elements of the cluster system;
- $I_{ôà} < 1$-decreasing of interaction stability of an enterprise with other elements of the cluster system.

The dynamics of interaction stability of an enterprise within cluster characterizes the general state of an enterprise, reflects the tendency of its economic growth and its influence on the stable cluster position in whole. The tendency direction (positive or negative) serves as the basis for taking particular decisions on management of existing interactions of enterprises with cluster elements [17].

As main directions and methods of reinforcement of enterprise interactions within cluster a complex of administrative measures from the position of two participants is offered: both the enterprise due to internal impact and representatives of regional authorities from the external side [16, p.13].

Thereby, suggested directions of management of enterprises intracluster interactions in regional economy suppose multilateral and multilevel relations between economical entities and authority organs. At the same time each of interested parties, orienting on achieving of long-term economic interests, realizes its own complex of administrative measures on following directions: increase of number of contracts, concluded by the company, increasing of effectiveness of investment and innovative activities, enforcement of financial strength. At the same time organs of state authority of regions are orienting, at bigger extent, on creation of conditions through forming of institutional environment, effective business-environment as external macroeconomic factor.

CONCLUSION

The results of conducted research allowed us to define a cluster as a system of interconnected enterprises, organizations, infrastructural objects, financial institutions, scientific-research, innovation and investment firms by the means of technological and territorial community, which provides optimal functioning of all structural elements on the basis of innovative products and technologies.

However, the term ‘cluster’ is not wide-spread in administrative circles, in our opinion, associations of industrial enterprises, financial institutions, organs of state authorities form additional advantages (access to specialized manufacturing factors and labour, access to information, complementarity, access to organizations and public benefits, stimulating and evaluating of productivity) for each economic entity, participating in it, on the basis of voluntary interactions, what, eventually, assistance for increasing of its competitiveness in the regional interregional and world market.

For the further cluster development such state policy is needed, which should be oriented, according to the foreign experience, to competitiveness support in the sector, assistance for promoting domestic companies in the abroad markets for getting new technologies, setting of high educational standards and introduction of new methods of education, assistance for development of cooperation between companies and scientific-research institutes for fastest commercialization of the new knowledge, basic infrastructure development, setting of strict ecological and technical standards.

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