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CLUSTER INTERACTION MECHANISM IN THE FORMATION OF INNOVATIVE MODEL OF REGION'S ECONOMY

The article reveals the meaning, essence, functions and peculiarities of innovation clusters. The examples of clustering in Germany, Austria and Ukraine are given. The interaction mechanism, which indicates the effectiveness of the mentioned forms of multilateral cooperation between the members of innovation cluster, has been formed. The factors hindering the development of domestic innovation clusters are determined.

Keywords: *clusters; interaction; science; innovations.*

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КЛАСТЕРНИЙ МЕХАНІЗМ ВЗАЄМОДІЇ У ФОРМУВАННІ ІННОВАЦІЙНОЇ МОДЕЛІ ЕКОНОМІКИ РЕГІОНУ

У статті розкрито значення, сутність, функції та особливості інноваційних кластерів. Наведено приклади кластеризації в Німеччині, Австрії та Україні. Сформовано механізм взаємодії, який вказує на ефективність вказаних форм багатосторонньої взаємодії між учасниками інноваційного кластера. Виявлено фактори, які стримують розвиток вітчизняних інноваційних кластерів.

Ключові слова: *кластери; взаємодія; наука; інновації.*
Рис. 2. Табл. 2. Літ. 23.

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КЛАСТЕРНЫЙ МЕХАНИЗМ ВЗАИМОДЕЙСТВИЯ В ФОРМИРОВАНИИ ИННОВАЦИОННОЙ МОДЕЛИ ЭКОНОМИКИ РЕГИОНА

В статье раскрыты значение, сущность, функции и особенности инновационных кластеров. Приведены примеры кластеризации в Германии, Австрии и Украине. Сформирован механизм взаимодействия, который указывает на эффективность указанных форм многостороннего взаимодействия между участниками инновационного кластера. Определены факторы, сдерживающие развитие отечественных инновационных кластеров.

Ключевые слова: *кластеры; взаимодействие; наука; инновации.*

Problem statement. Under the current conditions of globalization, providing permanent economic development of a country depends heavily on innovations enhancement in regions.

One of the most effective forms of territorial organization of innovation activity are clusters that provide opportunities to unite enterprises, state institutions, educational and scientific organizations, financial and credit institutions to create efficient mechanisms of cooperation between them. This is a major background in the process of creating an effective regional innovation system and improvement of business competitiveness.

The development of clusters in Europe is quite important. This can be visible in the approval of "Vienna Cluster Manifesto" (ec.europa.eu) in 19 April 2012 and in the

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adoption of the "European Cluster Memorandum" (www.clustercollaboration.eu) during the European presidential conference on innovation and clusters on the 21st of January 2008 in Stockholm (Bilyi, 2010).

The legal acts of the EU, mentioned above, contain the examples of clustering development in Europe and the positive experience of cluster development in the regions of Ukraine, including Podillia, Polissia, Prykarpattia and Sevastopol.

In its appeal to the EU Council on September 13, 2006, European commission emphasized "being a part of a cluster is an important competitive advantage of any business. Clusters help to fill in the gap between business, research and resources and, therefore, they deliver the knowledge to the market faster. Successful clusters promote intensive competitiveness together with cooperation. They increase capacity, attract investments, promote research, improve industry, elaborate special products and services and become the foundation to develop skills" (Voinarenko, 2000).

Clustering is relevant because under the conditions of world globalization and economic restructuring, competitiveness increase for particular regions and whole countries should be based on the integration program. Clusters are not just trendy notions of the 21st century. They have become an effective instrument in developing particular areas and regions, which are considered to be "magnets" in attracting investments in the projects on a local level of production.

One of the main conditions of cluster activity success is its orientation on innovation. Without innovations, a cluster union will be a prototype of territorial and production associations and will manage to exist for a limited amount of time before restoring its production potential.

Recent research and publications analysis. Challenges and different aspects of cluster formation and detection have been researched by the following foreign scholars: M.E. Porter (2001), E. Dahmen (1950), E.E. Leamer (1984), A. Marshall (1920), K. Nadvi (2006), V. P. Feldman and D.B. Audretch (1999), M. Gulati (2003), H. Verbeek (2000). They developed the classic notions of a cluster. The works of prominent Ukrainian scholars like V. Tsukerman (2008), S. Sokolenko (2010), M. Voinarenko (2000), C. Kolodynskyi (2004), D. Zavadska (2012) and others have contributed to the research of new forms of production systems and their role in the improvement of state and regional economies.

The scientific objective of this article is to reveal the peculiarities and significance of cluster interaction mechanism in the system of managing the regional economy.

Key research findings. The notion of cluster as an independent phenomenon in economics appeared during the research of the emergence of geographically localized groups of companies and unities in particular areas of economic activity. A. Marshall (1920) was the first to pay attention to this phenomenon. He was studying the peculiarities of industrial regions and noticed the tendency of specialized companies density in these regions.

Nevertheless, the author of the cluster approach in economics is M. Porter (2001), who in the theory of national and local competitiveness, has determined that the most competitive transnational companies are not located unsystematically in different countries but have a tendency to be located in one country, and sometimes in one region. This process can be explained by the fact that one or several companies, competitive at the world market, distribute their positive influence on their clo-

sest surroundings: suppliers, consumers, and competitors. Achievements of the environment influence further increase of company's competitiveness.

In the classic interpretation by M. Porter (2001): "Cluster, or industrial group, is a group of close, geographically interdependent companies and organizations connected to them, which mutually act in a particular sphere of business, are characterized by the unity of activity spheres and complement each other".

The main purpose of a cluster is to increase inner and international competitiveness of its members by means of commercial and non-commercial cooperation, scientific research and innovation, education, learning and support policy.

The process of uniting into a cluster or an industrial network is conducted on the foundation of interdependence between different business subjects and is based on the principle of synergy (Figure 1).

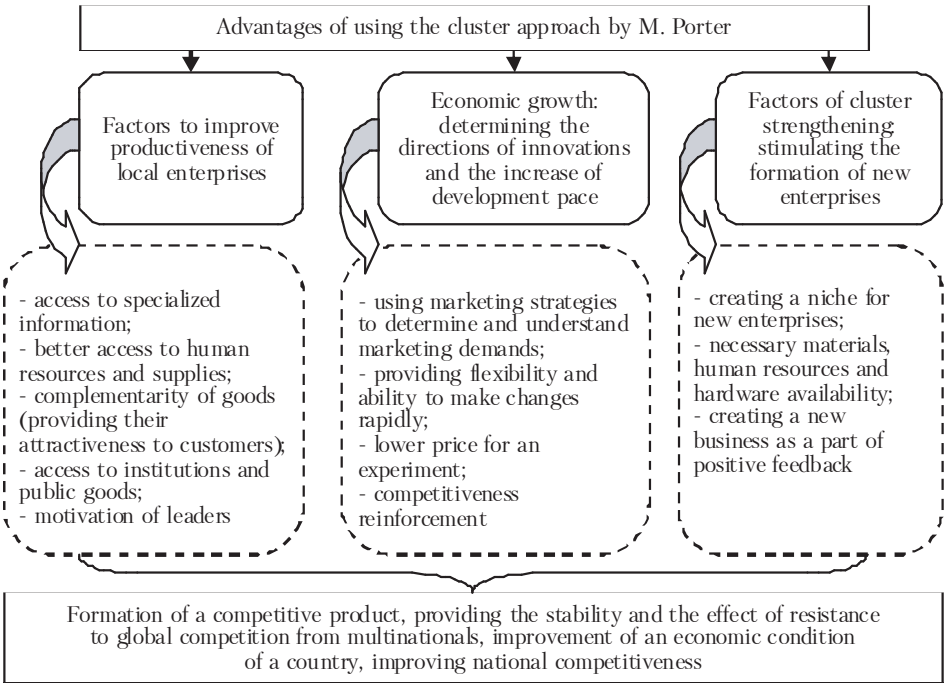

Figure 1. **Advantages of clusters** *according to* M. Porter (2001)

Cluster approach is used in the works of Swedish theoreticians. Their cluster theory is built on the structure of national economy (the study of interconnections between big Swedish transnational corporations). Clusters are based on the theory of E. Dahmen about the "blocks of development" where the foundation of development is the connection between the ability of one sector to grow and provide progress in the other (Zavadska, 2012).

V. Feldman and D. Audretsch (1999) have developed theories of competitiveness development based on clusters. They view a cluster as a diversified complex of spheres that are interrelated by supplies and purchases, based on the matrix "costs – production" (Zaets, 2010).

S. Sokolenko (2010) claims that "clusters create a unique foundation for innovation development, improvement of productiveness and profitability of small- and medium-sized enterprises" for Ukraine's economy. Clusters, truly born in the process of globalization and the important role of regions, create a foundation for foreign investments flow, education for numerous businessmen and a strong development of small- and medium-sized entrepreneurship, companies' flexibility and mobility improvement, and formation of a wide range of network structures. Clusters also create a forum, where the dialog between legal, government and scholarly circles takes place. This dialog is about the ways to develop competitive advantages in one city, province, state, country and even on an international level".

Experts from the State Investment Agency of Ukraine claim that innovation clusters will become an institutional mechanism to realize certain innovation priorities. They plan to create a national innovation cluster in Odessa aimed to develop a transit potential of Ukraine by building and reconstructing transport systems (Kanishchenko, 2009).

In June 2000, on the International conference on innovation policies and technologies, a new typology of clusters was introduced (Kolodynskyi, 2004). This typology contains innovation and industry clusters and their subtypes (Table 1). This classification can be used to conduct a practical cluster policy, because it contains cluster evaluation based on long-term competitiveness, where industry peculiarities will also be considered.

Table 1. **Types of innovation clusters,** *authors' own development based on* (Kuzmin and Zhezhukha, 2010)

Innovation cluster type	Description
Truncated	Consists of levels of technologically interdependent companies, sometimes in different locations. Activity is limited to a certain set of functions (resource extraction, processing etc.) Contemporary but not advanced technologies are in use. New technologies appear in the production in the form of a ready-made product.
Sectoral	A group of companies that work mutually and produce typical goods or services. The use of new technologies is limited by quality control and personnel management.
Innovation-sectoral	A group of businesses operate together to produce goods or services that always need to be restored, improved, upgraded. Permanent and stable connections with research centers and educational institutions
Proinnovation	Innovation cluster of companies, which is based on a rapid gain of knowledge and technologies in order to improve current competitiveness.
Innovation-oriented	A cluster of companies that determines industrial, investment and social structure of a region. Creates dynamic groups of companies which use advanced knowledge and technologies, invite gifted resources from all over the world, is a consumer and a generator of venture capital, determines and leads scientific research of universities and other educational establishments.

The experience of developed countries proves that the development of innovation clusters is becoming a strong impulse to intensify innovation activity. Germany plays an important role in economy's clustering. It is a priority to implement new

technologies through consolidated efforts of industry and scientific centers. There are 3 best clusters of high technologies in Germany. They are called "21 century Silicon Valley" and they are located in Munich, Hamburg and Dresden. Moreover, there are numerous industrial clusters in the country, for instance automobile clusters in 10 regions. A special German program on creation and development of biotechnological clusters (www.igbf.gr) based on regional arrangement of firms is also worth mentioning here. Industrial clusters receive financial resources from federal and local funds (Kuzmin and Zhezhukha, 2010).

Another impressing example of a successful clustering can be the development of Austrian economy in the last 20 years. The clustering program of this country was elaborated by the Austrian Institute for Economic Research (www.wifo.ac.at) together with the national research center. The following modules have been used in the program: a system of stimulating innovation; productiveness improvement; employment increase; regulation of technological policies; consulting. Clustering was controlled by an Austrian legal agency and a public consulting company, which has branches across the state. With the help of these organizations a new infrastructure has been created, industrial branches have been developed and clusters have been formed. As a proof of this program being effective one can notice the rapid development of cars construction industry in Austria (Kuzmin and Zhezhukha, 2010).

High technology clusters are also being actively created in the countries of Central and Eastern Europe. The example of successful functioning of a high-tech cluster in Russia is Naukograd. From 1999 till 2006 the number of firms in this cluster has grown 16 times, the sales have increased 33 times, and the level of investments has become 15 times bigger (Ivanova et al., 2008). Despite the quantitative indicators of cluster activity, there are also qualitative results: higher quality of education due to hands-on education at enterprises and the decrease of "brain drain" among the engineers. This means that it is necessary to develop further different kinds of innovation infrastructure that will interact and will facilitate innovative development of regions.

There are different models of industrial clusters in 13 regions of Ukraine (ucluster.org). However, they have a weak innovation orientation because of the lack of cooperation with research organizations and education institutions. The majority of clusters in Ukraine have been created unsystematically or using a foreign pattern, without proper economic and organizational grounding.

Hmelnychchyna was the first region in Ukraine where a cluster model of economic growth was used. It was used as a cooperation and unity of efforts of businessmen, state organizations and scholars with the aim of reviving domestic manufacturing in Podillia. The cluster "Podillia. Pershyi" (www.ppngo.org) has been created there and it still plays an important role in regional development of Ukraine. Besides, this cluster has developed programs on housing in Khmelnytskyi region and in the city of Khmelnytskyi for the years 2005–2015 using new technologies and the experience. Several clusters have been developed in other regions of Ukraine (Table 2).

The main things to restrain the development of domestic innovation clusters are: the absence of legal basis, low level of interaction with education, science and manufacturing, irrelevance of curriculums, underdeveloped cooperation between enterprises and low effectiveness of cooperation between filed associations, low level of innovation culture between cluster members.

Table 2. **The biggest cluster unities in Ukraine,** *authors' development based on* (Zavadska, 2012)

Cluster location	Cluster specialization
Zakarpattia	"Zakarpatskyi avtomobilnyi" – producing automobiles
Cherkasy region	"Silikonova dolyna po-ukrainsky" – green tourism and crafts
Prykarpattia	"Suzirya" – art crafts
Volyn region	Clusters in farming, tourism and recreation, education, flax growing, transport, wood processing
Rivne region	"Polissia Rokytnivshchyny" – wood processing
Khmelnytskyi region	Association "Podillya. Pershyi" which unites sewing, building and tourism enterprises
Lugansk region	"Luganskleginvest" – contains trade and light industries
Zaporizhzhia region	Melitopol cluster – green tourism, beekeeping and agricultural machinery
Herson region	"South gates of Ukraine" – transport and tourism
Odesa region	Transport and logistics, tourism and recreation, fishery, machine building
Crimea	Association for stable development of Sevastopol "Aura" – unites clusters like "Ekoenergo", "Baydary tur", "Vodni resursy", "Zdorovya".

More active use of cluster approach will give an opportunity to improve the integration of education, science and manufacturing, intensify innovation activity in the regions, that is why the state has to enhance the stimulation of formation of these structures. Enhancing cluster formation does not demand any kind of financial support from the state but requires tax reductions and lowering the bureaucratic barriers using the state as a member in these unities and creating state guarantees, which will all contribute to cluster development.

We argue that the mechanism of cluster formation and functioning should have a structure, which is presented in Figure 2.

Goals, principles, members, and forms of cooperation are brought together in the given mechanism. Besides, the results of cluster formations are determined.

The given mechanism confirms that for cluster development it is not enough for two members of a cluster to just cooperate among themselves: copperation should be multilateral.

Forms of interactions contribute to the development of the following relations:

1. Management – aimed to create legal foundation and information support for clusters, intensifying the development of infrastructure, formation of simplified conditions of business registration. Civic associations can play a role of monitoring the effectiveness of management, control the commitment, and contribute to the formation of new and relevant programs.

2. Supply and sale – mutual exchange of all the resources among cluster members, based on sale, lease, rent or free use.

3. Production and cooperation – creation of innovation goods, improvement of cooperation relations between companies, an opportunity to benefit from specialization. It is important to develop relations of large- and small-sized business and to search for partners and suppliers for national and international clients.

4. Finances – special credit support from banks and other investors of innovation projects; tax reductions; mutual credit mechanisms, risk insurance; opportunities for creating mutual investment funds using some finances from project realization; mutual warranties that will contribute to a long-term interaction between cluster members.

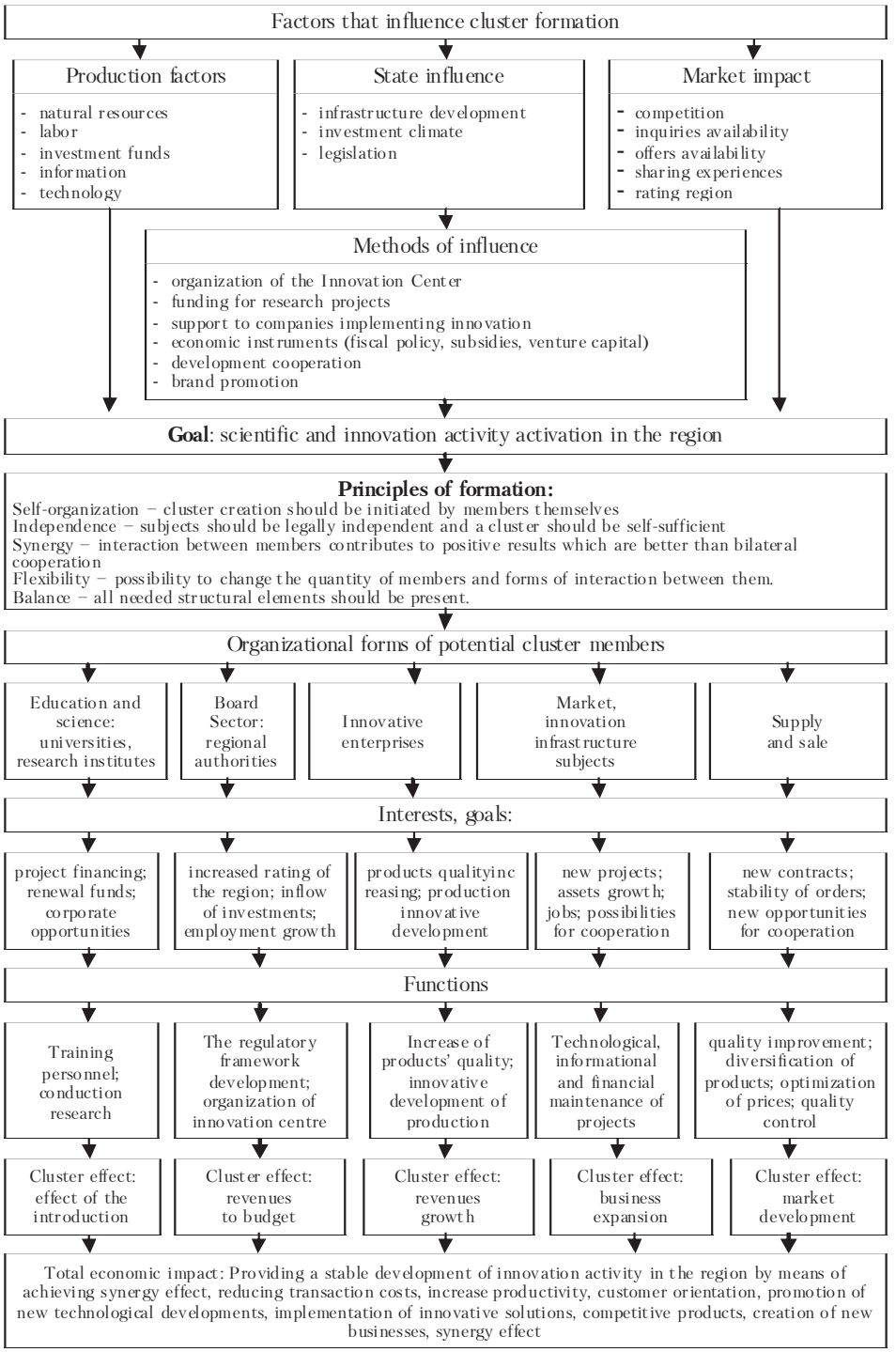

Figure 2. **Mechanism of innovation cluster formation and functioning,** *developed by the authors*

5. Education and science – relevance of education system to economic needs; specialists with relevant professional skills; research institutions participation in problem-solving to decrease the need for creating special committees in companies to do that. Students can join the project development as a part of open contest. This will improve scholarly potential of young people and will give them an opportunity to influence the areas of improvement in the production process, improve the flexibility of curriculums.

6. Information – formation of common information space in a cluster that will improve the effectiveness of communications and intellectual property rights, help to provide quality control, create unified database, internet portals, conduct special research. A part of cluster infrastructure is the coordination center which monitors and corrects information database, provides consultations and information services.

Conclusions. Clusters contribute to the development of innovation activity in the regions where they are located. This is possible because of the synergy effects when the result of networking association exceeds the sum of components. Instead of competition, regions will cooperate to reach the joint ambition. Transnational cooperation will be fruitful when technology, design and marketing are combined. These combinations offer new chances for economic and social profit: sustainable economic growth, employment, comfort, safety and care.

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