

**O. Kuzmin**

Doctor of Economic Science, Professor

**N. Stanasyuk**

Ph.D. in Economics, Associate Professor

Lviv Polytechnic National University

**M. Olikhovska**

Ph.D. in Economics, Associate Professor

Lviv Institute of the Interregional Academy of Personnel Management

## APPLICATION OF CLUSTER APPROACH TO THE DEVELOPMENT OF INDUSTRIAL POTENTIAL: INNOVATIVE POLICY AND MANAGEMENT SUPPORT

**Abstract.** In modern conditions, the role of industrial potential is increasing, which will ensure the modernization of the national economy. The emergence of crisis phenomena of clusterization in the industrial sector of the state is deepening due to the lack of directions in the management of its development. Therefore, the purpose of our article is to study the peculiarities and benefits of using the cluster approach in the management of industrial potential, to identify the main disadvantages of domestic clustering, taking into account foreign experience, and to elaborate of proposals for the development of industrial clusters in Ukraine.

The article deals with the economic interpretation of the term "cluster" and highlights the main characteristics and factors of the cluster problem presented in the scientific papers of scientists. The authors ground the main advantages of the cluster approach to the development of industrial potential and identify the main obstacles to the successful application of clustering in Ukraine. The relationship between the benefits and results of the application of the cluster approach for the formation of innovation-industrial policy in the state is established. During the research, the world experience in applying the cluster policy mechanism has been studied, and the directions of state support in the formation of favourable conditions for the development of clusters in industry have been proposed.

**Keywords:** cluster, cluster approach, clustering, industrial cluster, industrial potential.

**Formulation of the problem.** The role of the industrial potential as the basis of state functioning is rising nowadays, ensuring modernization of the national economy. Ukraine tries to reach the economic level of the developed countries of the world, targeting the European direction. Ukraine has insufficient, but its own experience of clusterization of certain

regions. In future the country needs to think it over, compare it with the experience of other countries and try to define its own problems and outline possibilities and prospects of expanding the national industrial potential under the conditions of cluster approach application. The absence of the clearly defined strategic directions in the management of its development is one of the reasons of the origin of clusterization crisis in the industrial sector of the state.

**Analysis of recent research and publications.** Considerable contribution to the research of cluster approach application in the management of industrial potential development was made by the leading domestic and foreign scientists and economists, among them being N. V. Dehtiarenko [1], R.O. Kulyk [3], T. Y. Nakonechna [3], M. Porter [4], Young Louren [5], E. Bergman, E. Feser [6], G. Spencer [7] and others.

Notwithstanding multi-aspect scientific publications on the mentioned theme and the availability of a great number of practical recommendations aimed at increasing the level of industrial potential development, the issues of forming directions of the state support of its development including the application of cluster approach in management, in particular, able to optimize the prospects of domestic industry in the

context of modern vectors of national economy development are still insufficiently researched.

**The purpose of the research** is to study peculiarities and advantages of cluster approach application in the management of industrial potential development, to determine the main drawbacks of the domestic clusterization, taking into account foreign experience, and to elaborate proposals for the industrial clusters development in Ukraine.

**Materials and results.** The concept of a “cluster” was introduced in scientific circulation by the American scientist Michael Porter in his fundamental work “Competitive edges of countries” (1990), and appeared as a result of the systems study of the activities of successful American and European corporations.

The founder of the theory of clusters, the professor of Harvard business school M. Porter determines a cluster as a network of suppliers, producers, consumers, elements of industrial infrastructure and research institutions interconnected in the process of creation of added value. This approach is based on the account of positive synergetic effects of regional agglomeration, i.e. closeness of consumer and producer, network effects and diffusion of knowledge and abilities due to migration of personnel and allocation of business. There are no boundaries between sectors and types of activities, and all of them are considered in interconnection. The main characteristics and factors of the cluster problem, which were considered by the scientist, are generalized and presented in Table 1.

Table 1

**Main characteristics and factors of the cluster problem in the works of the American scientist Michael Porter**

Characteristics of clusterization	Factors of achieving the effect of clusterization
Clusters raise the enterprises efficiency in the places where they are created	<ul style="list-style-type: none"> <li>• Better access to the workforce and suppliers;</li> <li>• Access to the specific information;</li> <li>Complementary products that become due to this more attractive for consumers;</li> <li>Access to institutions and public commodities;</li> <li>Better motivation of managers who want to get respect of local colleagues;</li> <li>Satisfaction of the market requirements in regular deliveries of goods and services that are produced within the framework of cluster enterprises and meet the latest quality requirements.</li> </ul>
Clusters increase the rates of innovations and determine their direction, thus creating the basis for the future economic growth.	<ul style="list-style-type: none"> <li>• Better market understanding;</li> <li>• Ability to implement rapid changes and sufficient flexibility;</li> <li>• Lower cost of the experiment;</li> <li>Provision of personnel teaching, market research, logistic and technological research;</li> <li>Pressure of the competitors and other producers of the cluster</li> </ul>
Clusters stimulate creation of new enterprises, thus promoting cluster growth and strengthening.	<ul style="list-style-type: none"> <li>More noticeable niches for new enterprises;</li> <li>Entrance of new markets of distribution on the basis of active marketing activity and policy of innovations;</li> <li>Availability of necessary raw materials, complementary parts and workforce;</li> <li>Creation of a new business is a part of the positive feed-back chain;</li> <li>Steady contacts with financial and credit institutions on the basis of the created image of a cluster.</li> </ul>

*Note: Generalized and composed by the authors on the basis of [1, 2, 3, 8, 9].*

Louren Z. Young offers almost the same definition of clusters, his works being devoted to the role of clusters in the innovative development: "Clusters of firms are groups of companies located close to each other. In some cases, groups of companies form such concentrations that belong to the same industry." [5, p.4]. In addition to the above cited general characteristics of clusters, Louren Z. Young also characterizes them with the following features: location of companies near larger research universities; their formation mainly of small private companies; employees having work experience in many firms.

An American scientist Wolfgang Price notes: "Creation of clusters and introduction of cluster model of enterprises amalgamation is a method of renewing trust between the government and business, as well as transformation of the isolated firms in an enterprise unity" [10, p.7].

For example, foreign scientists-economists E. Bergman and E. Fether define industrial clusters as an amalgamation of firms and industries by different aspects of joint activity, for example, by geographic location, sources of innovations, suppliers, resources etc. Regional industrial clusters, in their opinion, are industrial clusters concentrated geographically within a certain region [16].

The Japanese scientist Nakamura Suidzi believed that clusterization had an identical positive effect on the increase of productive efficiency, retail and wholesale trade in Japan and Great Britain [11].

The English philosopher Herbert Spencer got the similar result of the research, pointing out that regions with higher percentage of employment in clusters attain better economic outcomes (level of earnings, indicators of employment) than regions with low cluster employment [7].

It's worth mentioning that application of the cluster approach in certain territories foresees the formation of clusters of the enterprises that perform different functions. They are united by a common technical productive process. Such a cluster includes the enterprises that performed scientific design and personnel training, as well as technologists, packers, and a dealer network. A

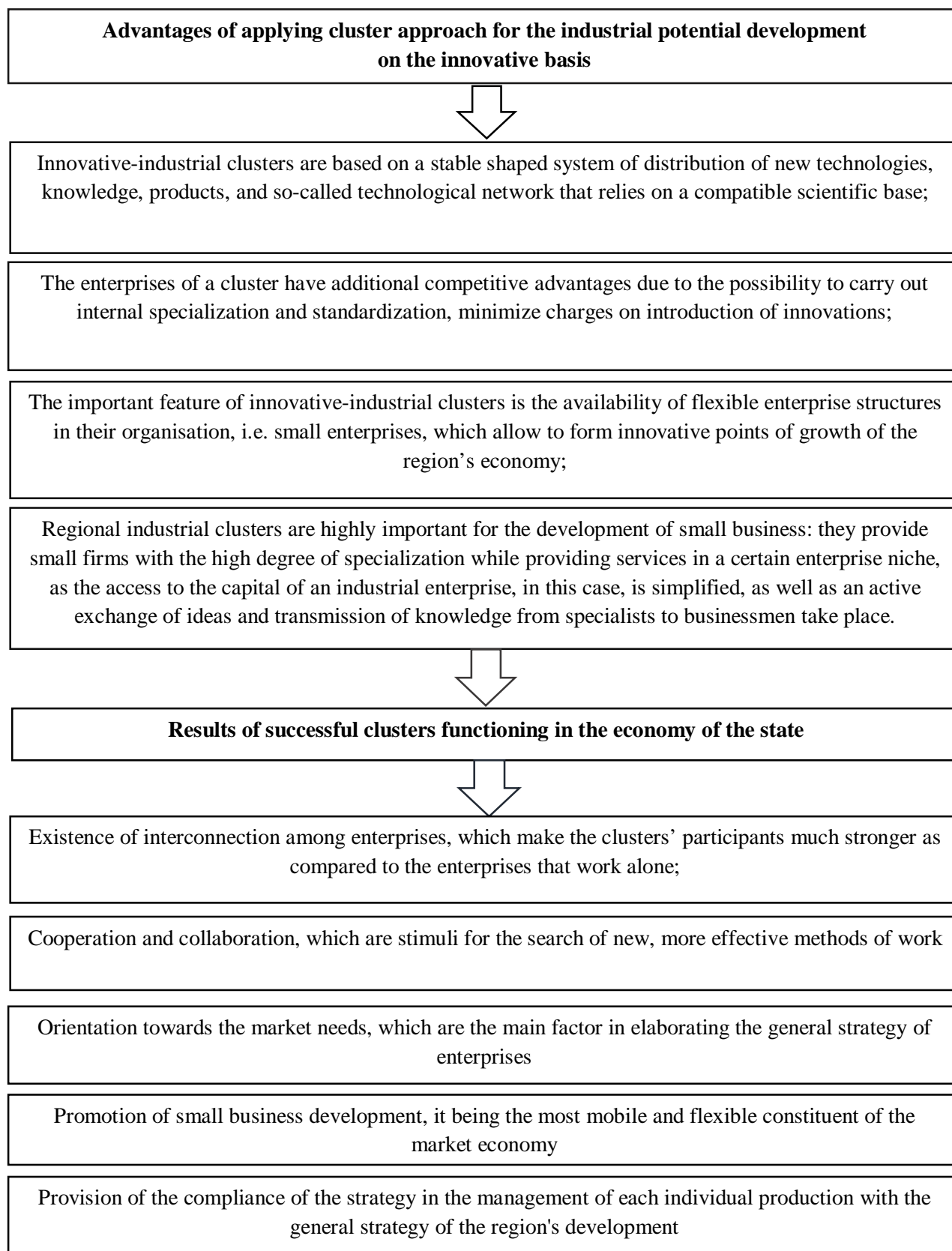
special feature of the cluster approach is that it takes into account the positive synergetic effect of the territorial agglomeration, a network principle of productive process organization and diffusion of knowledge and abilities due to the migration of the personnel. In this case, sectors of the economy and types of activities that are participants of a cluster are considered to be interconnected and complementary.

According to N.V. Dehtiarenko, "it is possible to expect that, in the nearest future, cluster development policy will play the main role in providing steady competitiveness of economies." [1, p.112].

An effect of collaboration among cluster participants will be noticeable at once. The advantages of application of the cluster approach for the development of the industrial potential on the innovative basis is possible to see in the results of its introduction. We show it schematically in Fig. 1.

Clusters are able to increase the level of the productive efficiency and economic growth. Having examined 218 industrial districts, the economist Vernon Henderson found out that location of an enterprise of the same industry on their territory extremely increases its efficiency [12, p.28].

Among all the advantages of cluster approach, the most essential is an access to the innovations, knowledge, and "know-how". In a knowledge-based economy, characterized by knowledge-intensive traditional industries as well as emerging industries, companies search for their main competitive advantage in ideas and talented workers. So this requires geographical closeness to skilled colleagues, the best suppliers, estimating consumers, highly qualified human resources, research and instruments of development, as well as leaders of an industry. Special knowledge and "know-how" of the industry are accumulated and spread through entrepreneur spheres and innovative companies. Cluster approach provides companies with quicker access to the information about advantages in technologies and changes in the benefits of customers and consumers. It stands to reason that it decreases transaction costs.



*Fig.1. Interconnection of advantages and results of cluster approach application for formation of innovative industrial policy of the state*

*Note: Authors' own project*

However, notwithstanding the apparent advantages of the economy of cluster construction for a certain territory and for the state as a whole, there are various obstacles on this way, such as bad infrastructure, lack of capital and skilled workforce, a hierarchy of clusters that causes difficulties for the suppliers of a lower level, effect of blocking, i.e. certain companies can be more competitive in comparison with the cluster companies, a threat of hyper specialization of a cluster and excessive “branding”; indifference of state authorities, misunderstanding of benefits from the cluster approach.

Thus, in our opinion, the main problems of industrial cluster development today in Ukraine are:

- lack of qualitative organizational conditions for the development of clusters, in particular, of the practice of strategic planning of its support, quality management;

- imperfection and inaccessibility of transport and engineering infrastructure;

- lack of effective collaboration of business structures with education and scientific research institutions and the state;

- organizational structures of management and information communication systems among the cluster participants are not optimally constructed;

- limited access to the international market, the lack of a well-established regulatory framework for the organization and standardization of clusters;

- lack of interest of the state authorities in organization and financial support of clusterization.

The peculiarity of the development of clusters in Ukraine is the lack of well-established effective mechanisms for the interaction of industrial enterprises, scientific research, educational organizations and state authorities: the key partners of innovative enterprises are suppliers of equipment, materials, components or software, with only 17.1 % of enterprises and 9.9 % of clients or consumers maintaining close connections with them; whereas cooperation with the state scientific research institutes and educational establishments remains undeveloped: only 4.7 % and 3.4 % of enterprises have close connections with them, respectively [13].

The problem of creating clusters, the orientation of spatial development on a cluster model is a matter of state importance. It is the state level that has the necessary resource for conducting previous research, in particular, finding an effective relationship between industry, agriculture and the service sector, since it is not possible to move at the same time in all directions at one speed. The formation of clusters stimulates the development of industrial potential on an innovative basis. Therefore, the state itself should begin this work by creating an appropriate legislative framework with clearly understandable rules.

In 1998, Ukraine first tried to apply the concept of business clusters. This concept was absolutely new for Ukraine at that time. In order to improve conceptual economic and methodological knowledge about clusters, their development and management, much effort is needed to popularize the cluster concept [14]. However, in spite of difficulties in organization and support of the state, thousands of clusters are created and successfully operate in different branches of the economy in the world. It's worth remembering and agreeing with Bernard Show's saying that wisdom of people is not in their experience, but in the ability and desire to be enriched with this experience.

Interest in cluster innovation development in the second half of the twentieth century has steadily grown until it became explosive and reached North America and Europe in 1980 - 1990, and later, new industrialized countries. This interest was primarily due to the merger of Silicon Valley companies (California, USA). Within the framework of the “Silicon Valley” cluster only for the period from 1991 to 2001 venture capital investments increased from 2 billion dollars up to 68.8 billion dollars. An example of California was followed by other US states, having implemented relevant cluster development programmes: hundreds of cities and territories are implementing their cluster strategies.

In the USA, cluster formation committees are being set up. Necessary analytical work is carried out by scientific centres and universities. The initial capital is allocated by the state administration, and then the funds of private companies are involved. At the beginning of the XXI century in the USA, clusters involved 57 % of

the country's total workable potential, while the share of GDP produced by clusters was 61 %.

The modern economy of Canada was formed in the same way. An agricultural cluster in Saskatoon and a bio technologies cluster in Montreal (Quebec) are referred to its biggest clusters. [15, p. 21].

In the light industry, footwear clusters in Italy, knitwear and leather clusters in the USA, textile in Hungary, textile, knitwear and footwear clusters in Brazil, India, Korea, Mexico, and Peru have become the most widespread. So, for example, productive clusters in the USA, that produce fabrics, combine 27 783 companies and employ 1553.5 thousand people, and those producing knitwear goods bring together 21 073 companies and employ 1516.4 thousand people. In 1999, a cluster of knitted fabric and stocking wears in Tirupuri (India), which unites more than 7000 small and medium-sized enterprises, exported cotton stocking to the countries of the EU, Japan and the USA for about 650 million dollars, more than 80 % of all Indian exports of this product group [14].

An interesting example of clusters creation is the experience of the Japanese economy. In 1983, the law that confirmed the concept of technopolises, was adopted in the country and provided support to organization of centres of integration of industry, science and authority. A typical large Japanese cluster (there are about 600 clusters in Japan) consists of one main enterprise, which uses services of two or three levels of firms that are located, as a rule, geographically close to it.

Analysing world experience, a lot of researchers will come to the conclusion, that cluster models of amalgamation of enterprise structures can be effective and up-to-date for domestic enterprises, especially in times of Ukraine's exit from the protracted economic crisis.

Clusterization is widely spread in Italy and was legally adopted by law. Clusters unite small and medium innovative enterprises that specialize in the same industry and are located in the same geographical region. Firms cooperate with each other, share skills in different spheres, ideas and resources for a mutual benefit. There are plenty of very small enterprises in Italy due to this, and also

due to the existing favourable conditions for entrepreneurship [16].

Well-known examples of the cluster approach in the world are Silicon Fen (Cambridge, United Kingdom), Valley of Technology (Albany, USA), Finnish Marine cluster (Finland) [17].

Mechanisms of cluster policy to enhance the innovation potential of industry are actively used by many developed countries in the world. So, cluster politics is an important part of the national development strategies of Germany, Denmark, Norway and Finland, which are leaders in innovation development in Europe [18]. According to a study by Danish experts, companies that become cluster members have four times more opportunities to improve innovation activity than those outside the network, thus playing the role of innovation growth pillars in the country's economy [19].

The role of Germany in the development of clusterization of the economy is significant. Priority is given to the introduction of high technology through the consolidation of efforts of industry and research centers. In Germany, there are three of the world's top clusters of high technology, known as the "Silicon Valley of the 21st Century", they being Munich, Hamburg, and Dresden. In addition, there are many industrial clusters in the country, such as car clusters in 10 regions. Particular attention deserves the German program for the creation and development of biotech clusters based on the regional placement of firms. Industrial clusters get financial resources from federal and local sources.

Another striking example of successful clustering can be the development of the economy of Austria over the past 20 years. In the programme of clustering the following modules are involved: the system of stimulation of innovations; productivity growth; increase in employment; regulation of technological policy; consultancy [20, p.395].

The experience of Finland shows that the methodological basis for its development should be innovation chains of creating additional value in the region, rather than artificially defined priorities [21].

World experience has shown that a cluster approach can increase the effectiveness of

interaction between the private sector, the state, trade and professional associations, research and education institutions in the innovation process.

**Conclusions.** The results of the research indicate that there are negative trends in the development and state support of clusterization in Ukraine. On this basis, we believe that the main tasks of the state in ensuring the formation of favorable conditions for the development of industrial potential on a cluster basis can be:

• reduction or cancellation of administrative charges from clusters' participants;

• provision of subsidies and loans or increase of expenses on creation of new products and technologies;

• increase of effectiveness of the system of professional education and provision of consulting services;

• creation of industrial parks and techno parks as infrastructures for cluster development;

• special purpose investments in engineering and transport infrastructure development, housing construction, taking into account the tasks of cluster development;

• creation of funds for the introduction of innovations with consideration of possible commercial risks.

## References

1. Dehtyarenko, N. (2010). *Cluster concept in the innovative development of territorial-industrial complexes as an opportunity for post-crisis development. Modeli postkryzovoho rozvytku derzhav: analiz i prohnoz: materialy Mizhnarodnoi naukovo-praktychnoi konferentsii molodykh vchenykh i studentiv [Models of post-crisis development of countries: analysis and prognosis: Proc. Int. Applied Research Conf. Young Scientists and Students] (pp. 14-23). May 13-14, Tallinn, Estonia: Economics and Management Institute of Economics. [in Russian].*
2. Kulik, R. O. (2008). *Forms of interaction of large and small enterprises in the cluster structure. Ekonomika i rehion [Economy and region], 1(16), 41-45. [in Ukrainian].*
3. Nakonechna, T. YU. (2010). *Clustering as a catalyst for economic development of the regions and increasing the competitiveness of the country. Ekonomichni nauky. Seriya: Rehionalna ekonomika. Zbirnyk naukovykh prats [Economic sciences. Series: Regional Economics. Collection of scientific works], 7 (27). Retrieved from [http://archive.nbuv.gov.ua/portal/soc\\_gum/en\\_re/2010\\_7\\_4/14.pdf](http://archive.nbuv.gov.ua/portal/soc_gum/en_re/2010_7_4/14.pdf) [in Ukrainian].*
4. Porter, M. E. (2006). *Konkurentsia. [Competition]. Moscow: Williams. [in Russian].*
5. Lawrence, E. Young (1995). *Tekhnoparky y klasteri firm. [Technoparks and clusters of firms]. Kyiv. PERU. [in Russian].*
6. Bergman, E. M. & Feser, E. J. (1999). *Industrial and Regional Clusters: Concepts and Comparative Applications. Regional Research Institute: WVU Retrieved from <http://www.rri.wvu.edu/WebBook/Bergman-Feser/chapter3.htm> [in English].*
7. Spencer, G., Vinodrai, T., Gertler, M. & Wolfe, D. (2000). *Do clusters make a difference? Defining and assessing their economic performance. Regional Studies, 697-715. [in English].*
8. Kuzmin O. & Zjeuhha, V. (2010). *Clusters as a factor in the innovation development of enterprises and territorial entities. Ekonomika Ukrayiny [Ukraine economy], 2, 14-23. [in Ukrainian].*
9. Kvach, Ya. P. & Borisova, L. P. (2013) *Development of innovative entrepreneurship within clusters as a source of economic growth in the region. Zovnishnya torhivlya: ekonomika, finansy, pravo. [Foreign Trade: Economics, Finance, Law], 1, 127-132. in Ukrainian].*
10. Wolfgang Pr. (1999). *Human Behavior: The Factor in Applied Economics. Perspektivnye yssledovannya. [Perspective Studies], 2, 3-16. [in Russian].*
11. Nakamura, R. (2008). *Agglomeration Effects on Regional Economic Disparities: A Comparison between the UK and Japan. Urban Studies, 45 (9). 1947-1971. [in English].*
12. Henderson, J. V. (2002). *Marshall's Scale Economies. Journal of Urban Economics, 53, 20-28. [in English].*
13. Shchodo derzhavnoyi polityky pidtrymky rozvytku innovatsiynykh klasteriv u promyslovosti Ukrayiny [As for the state policy of supporting the development of innovation clusters in the Ukrainian industry] (2012). Retrieved from [http://www.niss.gov.ua/articles/1069/#\\_ftnref10](http://www.niss.gov.ua/articles/1069/#_ftnref10). [in Ukrainian].
14. Stvorenniya ta funktsionuvannya innovatsiynykh klasteriv [Creation and functioning of innovative clusters]. (2009). Retrieved from [http://old.dkni.gov.ua/?q=system/files/sites/default/files/images/Stvor\\_ta...klaster](http://old.dkni.gov.ua/?q=system/files/sites/default/files/images/Stvor_ta...klaster) [in Ukrainian].
15. Vyshlova-Pileva, I. (2012). *Territorial clusters as a tool for improving efficiency regional management: foreign experience. Klasteri yak instrumenty*

- rehionalnoho rozvytku: Materialy naukovo-praktychnoho seminaru. [Clusters as tools of regional development: Proc. Applied Research Seminaru. (pp. 21-25). July 16-20, Feodosiya, Ukraine.: Kharkiv Regional Institute of Public Administration [in Ukrainian].
16. Sokolenko, S. I. (2009). *Modern economic development of the region on the basis of innovative industrial clusters. Rozvytok terytorialnoyi hromady na osnovi klasternoyi modeli vyrobnytstva: Seminar-Narada. [Development of a territorial community on the basis of a cluster model of production: Seminar-Meeting], January 23, Smila, Ukraine. Retrieved from <http://www.sokolenko.com/clusters/51>. [in Ukrainian].*
  17. *Kontsepsiya stratehiyi rozvytku intelektualnoho potentsialu Ukrayiny [Concept of the Strategy of Intellectual Potential Development in Ukraine] (2008). Retrieved from [http:// www.niss.gov.ua/Table/3006006/ConceptSID.ppt](http://www.niss.gov.ua/Table/3006006/ConceptSID.ppt). [in Ukrainian].*
  18. *Innovation Union Scoreboard – 2011. (2011) European Commission. Retrieved from: [http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011\\_en.pdf](http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011_en.pdf). [in English].*
  19. *Cluster and Network Policy Programmes in Europe. Retrieved from [http://files.conferencemanager.dk/medialibrary/f13db635-416d-4cbc-a465-78f2ff8796c6/images/Cluster\\_policy\\_programmes\\_in\\_Northern\\_Europe\\_Article\\_2\\_.pdf](http://files.conferencemanager.dk/medialibrary/f13db635-416d-4cbc-a465-78f2ff8796c6/images/Cluster_policy_programmes_in_Northern_Europe_Article_2_.pdf). [in English].*
  20. *Semenov, V.F. (2008). Rehionalna ekonomika. [Regional Economics]. Kyiv: "MP Lesya". [in Ukrainian].*
  21. *Klasteri konkurentospromozhnosti - opyt razvytyya klasterov Fynlyandyi. Clusters of competitiveness - the development of clusters in Finland (2009). Retrieved from <http://subcontract.ru>. [in Russian].*