

SPECIFICS OF INDUSTRIAL INTEGRATED SYSTEMS FUNCTIONING



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Abstract. The article deals with the main advantages of the cluster approach in the context of the fact that it makes efficient use of the innovative potential of the regions, stimulates small business development, which in turn improves the living standards, to prove that cluster policies should be selective, that is at the State level it is necessary to decide which economic activities should be supported and which should be left to market forces.

Keywords: *industrial integrated systems, cluster, innovation, integration.*

Introduction

For a full understanding the functioning of industrial integrated systems as effective tools for managing the development of the regional economy, it is necessary to define the characteristics, to provide classification characteristics of the clusters, to provide a cluster model, as well as identifying the main participants.

Literature review. Clustering is not considered to be a very special phenomenon. In the second half of the 19th century the English economist Marshall Alfred identified and highlighted the significance of the emergence of two clusters: the textile cluster in the Manchester area and the metalwork cluster in Sheffield.

A little later, in half 20th century, serious contribution to practical and theoretical researches of development of industrial associations – clusters, under the name «industrial districts» made by Italian practitioners and scientists.

A number of authors (Stupak, Sidun, 2012; Tkachenko, Moroz, 2016; Fedorenko, Tugai, Goyko & Azhabeylo, 2018) used the term «filieres» to describe groups of technologically related sectors of the economy. The formation of the «filieres» was explained by the dependence of one sector on another on the technological level. Thus, the «filieres» foreshadowed the broader concept of clusters, emphasizing at least one of the reasons for their emergence – the need to create technological links between industries and sectors of the economy in order to realize their potential advantages. The term «filieres» is still widely used in scientific literature (mainly French and Italian) to describe these

processes.

Today the cluster approach of regional economic development is being promoted in the economically advanced countries as one of the most justified times of functioning, progressive vectors of industrial development of the economy of a region. Some clusters of small and medium-sized businesses have been well established, namely: furniture production and footwear; meat and dairy farming groups; vegetable and fruit production, sunflower production and agricultural grain production; information technology, Internet and cable television, etc.

A number of economists studying the formation, development and results of industrial integrated clusters are inclined to the opinion that the clusters are the locus of international «centers» of innovation. Therefore, the cluster development of regions is considered as the most balanced and economically justified way of development of «off-line» economy.

Research results. At the joint of the 20th and 21st centuries it is widely believed that strategic plans for the development of a cluster approach to the development of the national economy becomes a regional «prayer» which prevents the identification of a State regional policy programme with a territorial

support programme in some sense. It is clear that Ukraine should not be on the «roadside» of the leading world trends.

Importantly, the cluster is based on a market mechanism and the initiative of the participants, who come together to increase their benefits.

In contrast to vertically integrated corporate structures, which are created with the aim of maximizing the profits of the financial industrial group as a single entity, the cluster preserves, along with cooperation, a competitive atmosphere, autonomy and cluster members flexibility. Here, a single financial relationship does not dispute the realization of their own interests. Clusters have different shapes depending on their depth and complexity, but most of them include:

- company of «finished product» or service;
- suppliers of specialized factors of production, components, mechanisms, services; financial institutions;
- firms in related industries;
- grass-roots firms (with distribution channels or customers)
- by-product manufacturers; specialized infrastructure providers;
- State and other organizations providing special education, education, information, consulting, research and technical support (such as universities, training structures);
- suppliers of raw materials, products, technological equipment, companies producing goods and services, financial institutions and educational organizations for personnel training, carry out marketing and advertising activities, transport companies;
- logistics and export associations, trade

and insurance companies (Oliylyk 2009, p. 258).

The cluster general structure can be considered as a living organism having a «core» and a «complement», «serving» and «auxiliary» objects. The core is formed by large industrial businesses that are involved in the main type of production, the result of which is the final product through which the cluster has its own defined positioning on the market. In addition, businesses operating around the main businesses guarantee the success of the core members. They are directly related to the operation of the cluster kernel. Service providers are grouped around.

The auxiliary businesses attached to the core have no direct influence on the activities of the cluster, but their presence is desirable as auxiliary to the other members of the Other Clusters adopted by the European Union. They include both large, core-building cluster and small companies – the «Scottish model» (e.g., Hollywood or German chemical industry cluster). Some clusters are based on university research, while others have no significant links with universities. These differences in the nature of clusters affect the economic and technological levels of development of the clusters' industries. Some clusters may be in the shadows or recognized altogether, cause the cluster's parts often belong to different traditional industry or service categories. For example, in the Massachusetts more than 400 companies providing at least 39,000 high-paid jobs, so workers are somehow involved in medical engineering.

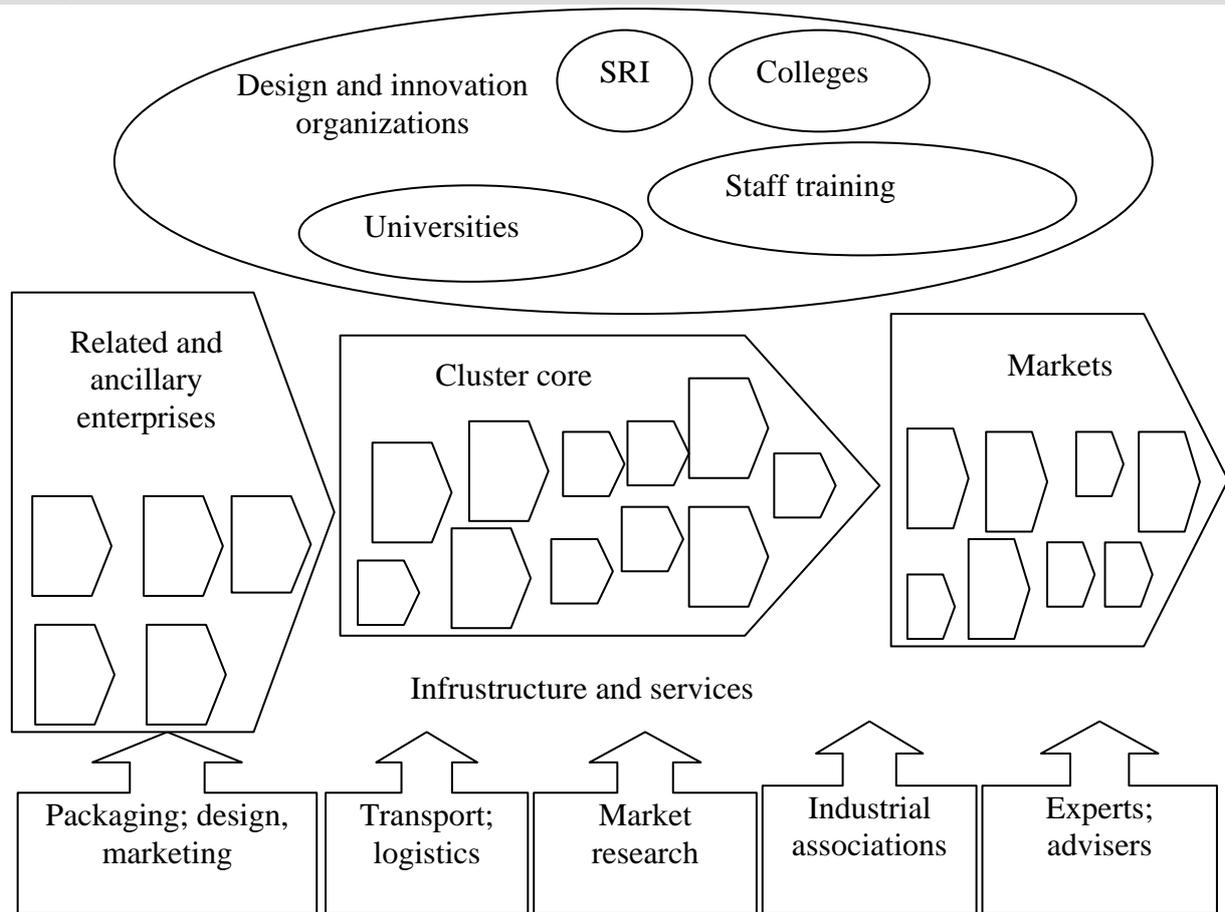


Figure 1. Cluster model

Source: (Moroz, Okorkova, 1998, p. 15).

It is possible to consider the possible structure of the cluster and its purpose in more detail, to present the interface scheme of the different structure in the cluster.

Clusters have the ability to respond quickly, in addition to, and sometimes even in a dramatic way, changes in management principles, to adapt to today's realities, making them more flexible and effective. Clearly, the creation and operation of clusters require certain environmental conditions. We consider the main ones that actually support the existence and successful development of cluster industrial production systems.

The essence of this concept consists in providing the totality of «five – I» (hereinafter – «5-i») important circumstances that are needed for the cluster to take place as an association and position itself on the market of a competitive and efficient organization. Thus, these «5-i» are (Belima, 2002, c. 28):

1. The initiative is an initiative staff with an entrepreneurial and progressive view of production and a professional image, the staff who are able to cooperate with the authorities, preferably members of the team of social organizers, representatives of scientific and educational institutions with high

organisational abilities, who have proved the advantages of the operation of the cluster by their infatuation and ability to combine and create, both for each participant and for the region as a whole. I believe that this is an essential factor for the success of the clusters, as the lack of initiative precludes even the implementation of the project.

2. Innovation – learning and translating into industrial production, marketing, organization, management, learning of the latest technologies – opens up new opportunities for the formed association to improve the self-improvement and competitiveness of businesses. I believe that exceptionally new ideas and unconventional, unique solutions can make the attractive cluster for investment and introduce a new fresh stream of economic development.

3. Information – phrase «who possesses information, that owns the world» has not lost, but has sharpened its relevance in the present. The saturation, and sometimes even over-saturation of information, of resources, especially on the Internet offers a tremendous opportunity to analyse, to exploit, to benefit, to be ahead. In turn, businesses are able to exchange useful information in a timely

manner, have wide access to new supply and markets, find and train qualified staff online and cooperate with industry internationally. The Internet provides an opportunity for an accessible, open information to the general public about the advantages, promising possibilities of development of regional industrial production and investment attractiveness. The participants in the exchange of information have the opportunity to quickly adopt the previous, agree on the starting points of the strategic cooperation and the final decision. But there is a considerable time saving and it is vital.

4. Interest provides the basic condition for the existence of life, in principle. The basis of clustering is the mutual interest, the existence of economic interest in each of the members of the group, which manifests in the form of material remuneration and economic reciprocity in the cluster life. The attracting key for the investors to the region and to the successful implementation of investment projects is the return on invested funds.

5. Integration – involves the use of new cluster methods of cooperation between businesses, firms, organizations and institutions at the regional level in the various sectors of the national culture, with the active assistance of the authorities and the practical application of the scientific innovations technology development and information and innovation technologies also. This combination is the guarantor of investment attractiveness and investment in clustering, and hence regional development.

As we can see the cluster is an industrial complex (group, cooperation of industrial and production businesses, which complement each other and allow for development), formed on the territory of local concentration of businesses of leading production, as well as systems specializing in the supply, marketing, logistics and marketing of products and are intertwined by technological schemes and chains. Real-life clusters unite 3-5 participants in 12-15 thousand independent businesses.

The cooperative activities of cluster entities provide an opportunity for businesses and other actors to earn significantly more in the form of a financial result than they would if they worked separately (synergistic effects) (Campbell, 1997, p. 9).

Synergy is the effect of improving performance through the use of linkages and synergistic effects between different activities, where the overall impact exceeds the sum of all resources operating independently. The practical form of synergies between the

elements (subsystems) of a system takes the form of the new qualities emergence, functions or mechanisms for the functioning of the composite entity. The appearance of new qualities and properties makes it possible to achieve a much greater effect from the combined action of subsystems than the mechanical sum of the results of their independent work. Each system – acquires necessarily new positive properties that are not present in its constituent elements. The value of the synergistic effect is determined by the difference between the value of the effect obtained by the combined action of the elements of production activity of the system again and the simple sum of the effects of the individual constituent elements of production. Synergistic features: synergistic effects occur only in complex systems that are not in a stable equilibrium, which allows them to develop; synergistic effects are possible only in systems, which are capable of harmonious internal interaction without external management influence; active cooperative interaction of many elements of the existing system is necessary to create synergies, the unifying factors of their successful interaction, the existence of unique properties and functions, the combination of which expands their possibilities (Gugler, Keller, p. 44).

The specific characteristic of the clusters functioning, which is the main result of the long-term impact, is the ability to conduct business negotiations and agreements in a constructive manner, reasoned, supported by mathematical calculations the dialogue between the participants, which make up «the core» and «complement», «serving» and «auxiliary» elements of the clusters.

In scientific publications of the American V. Price it is claimed that clustering the economy is «a means, a mechanism for restoring trust between the government and business and transforming individual firms into a community of entrepreneurs common goals» (Moroz, 2006, p. 26).

In order to identify it with confidence among other non-profit associations, among the peculiarities of the cluster's activities the following can be distinguished:

- association (non-profit partnership)
- voluntary membership without legal personality;
- trust between participants;
- export orientation of products;
- the availability of quality standards is higher than in the home region (country);
- arbitration tribunal;

- savings on procurement through joint work with suppliers;
- reduce transaction costs;
- collective brand;
- redistribution of production;
- shared distribution network;
- interaction of the cluster with authorities.

I believe that the specifics of cluster functioning have a certain classification characteristic. In general, the following criteria for classifying the identified clusters of businesses can be distinguished:

- business clusters can be distinguished by performance: production clusters, producing or manufacturing business clusters, clusters of service providers;
- industrial integrated clusters can be divided into industrial, traditional product, and intellectual or innovative clusters seeking to create innovative solutions to meet needs;
- industrial business cluster systems can be classified according to industry, for example: mining and processing clusters;
- the size and specialization of aggregate units (Marshall clusters) unite small and medium-sized business in different sectors of

the economy, such as services, restaurants, information technology, etc., in which owners tend to be located in areas where their own business is located;

- in terms of ownership, known government clusters in the territory where the local business serves the needs and interests of unprofitable but necessary institutions or businesses in the region. Examples include military industrial clusters, military bases, institutes and innovative technology research laboratories.

The following types of clusters are also identified, namely: vertical-internal associations within one production line, such as the chain of «supplier – producer – seller – customer»; horizontal (common customers, technologies, intermediaries, manufacturers' associations of different industries in mega-cluster, e.g., agro-industry); regionally defined cluster around a large industrial cluster of production or scientific business (Table 1.).

Table 1.

Cluster typology

Characteristic	Cluster types	Remarks
Openness	open - trans-border; - induction; closed	Open – clusters that interact with businesses in other regions, but: Trans-border clusters – a group of existing businesses whose activities revolve around the circulation of a range, a list of inbound and outbound flows from other regions, and the usage of their internal regional resources; Induction Cluster, which operates on resources in the middle of the region but which induces external flows; Closed – operating only in the region.
Usage of primary resource	Full utilization; substantial; partial; weak	Full utilization – 100% of primary limited resource utilization; substantial – more than 80 per cent; partial – more than 50 per cent; weak – less than 50 per cent
Channel reliability	reliable; long-term; risky	Reliable – provided by cities strategically important to the State as a whole or to the region, in particular by cluster businesses; Long-term – market rules, well-established channels proven over time; Risky – relatively new channels.
State support	substantial; weak; lack of the State support	Substantial State support – a complete set of State programmes to support cluster businesses (grants, preferential taxation, active State investment, etc.); Weak – partial form of State support; Lack of the State support – total lack of support.

Source: (Zhelezniak, Rozhok, 2005, p. 14).

The cluster formation should start with the entities that are structuring, which cannot be bankrupt or in a state close to it. Implementing a cluster mechanism requires certain conditions, as set out in table 1. A cluster is not a grouping of outsiders whose main goal is to survive under modern conditions. Its main objective is to expand markets and stimulate economic development. This does not mean that an business should be a leader in its field, as long as its products satisfy consumers, are in demand and are already being joined by packaging companies that are interested in the new niches in the market, which contributes to the further improvement of the financial situation, lowering the cost of production, which in turn makes it possible to regulate the flows of goods and financial resources and to stabilize the markets.

The opportunity for business and for the region to develop dynamically and comprehensively, not by inertia, is the main offer thing that industrial integrated cluster systems is.

Based on the experience of the developed economies in the cluster economy, it can be concluded that the tangible results of the cluster economic development are not visible at any day. It takes from three to five years to build and develop a cluster system, and it takes decades to develop deep competitiveness and maintain a competitive advantage – a long time. This is linked to the implementation of strategic planning projects, the trust of time-tested results and the achievement of an image.

Natural factors such as resources, location on major trade routes, and the presence of a river may affect the presence of special clusters and may be felt many years after loss of direct influence.

Another premise for cluster development may be the existence of primary institutions, such as companies or universities, which, after a certain period of time, act as a basis for the creation of new companies in the cluster and for attracting investment from companies outside the region. Every cluster goes through certain development stages. They may not be identical, and their pace may change. However, there is an internal system logic of the way in which clusters evolve.

Even though the exact shape and direction will depend on certain circumstances, the cluster passes through certain stages of the

life cycle. It has certain specific characteristics, key elements, benefits of creation, functions provided to both cluster members and the regional industrial integrated cluster system where the cluster is located.

Individual businesses that have conceived of industrial integration systems to address global or regional economic development issues need to spend years organizing them. And any «branch» in which so-called «cluster associations» are created turns into an investment magnet for domestic businessman and foreign investors. The process of ensuring certain advantages of the cluster is connected with the close position of the firms, personal contacts, close and constant ties, «internal» access to information, reduction of costs during conclusion and execution of transactions, simplifying the extraction of information and its exchange, and thanks to constant interaction, the speed with which information is disseminated, the image and the desire to maintain a stable position in society. Local organizations are more responsive to the cluster's specialized needs, and peer pressure and competitive pressure are increasing. In addition, cluster members tend to engage constructively and effectively, which has a positive impact on their long-term interests. Only with this approach Ukrainian industrial production businesses can generate investment interest from prospective investors.

Without a well-functioning system infrastructure, existing industrial producers will not be able to claim development, generate income and remain at a low level, from which the State loses (Oliynyk, 2009, p. 316).

In this context the main advantage of the cluster approach is that it makes efficient use of the innovative potential of the regions, stimulates small business development, which in turn improves the living standards.

Cluster policies should be selective, meaning that the State should decide which economic activities should be supported and which should be left to market forces. The State must choose either an offensive strategy or a protective strategy in the developing cluster policies.

The advantages and disadvantages of modern cluster policy are shown in figure 2.

The advantages and disadvantages of modern cluster policies have been highlighted

for their outstanding role in increasing the competitiveness of the urban and regional economies.

There are various ways to support cluster development, including:

- analysis, cluster mapping;
- priorities in choosing clusters to support;
- State targeted support programs;
- promote specialization and entrepreneurship;

- improve the quality of support services (information, training, consulting, joint initiatives);

- local partnerships (public and private);
- property support (incubators, technology parks, business centres);
- coordination (brokers);
- attracting investment;
- providing training;
- support existing clusters and newborn clusters.

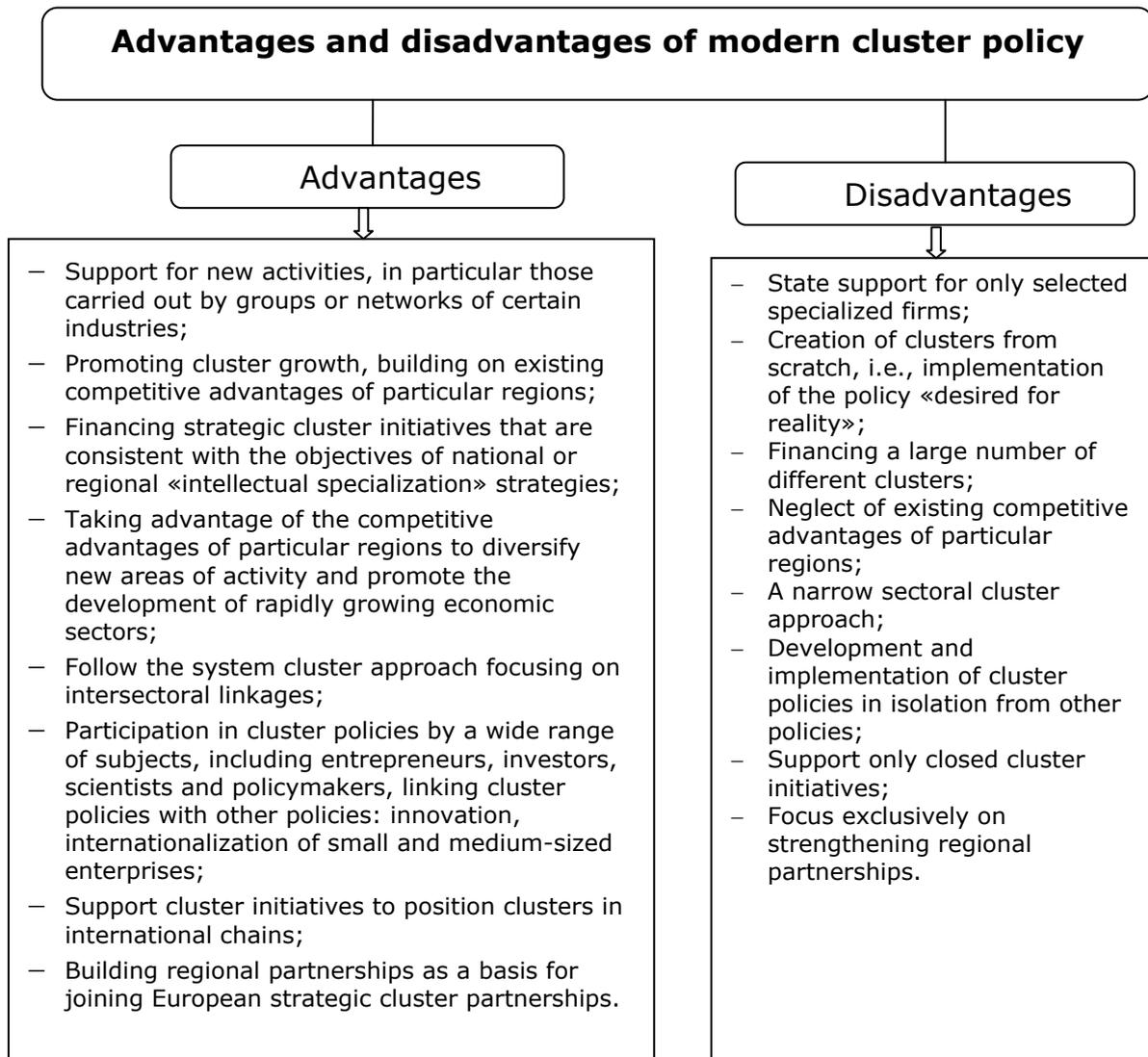


Figure 2. Main advantages and disadvantages of modern cluster policies

Source: by the author based on

(Smart guide to cluster policy. Guidebook series. Belgium, Brussels: European Commission, 2016).

Conclusions

The research findings are as follows:

1. As it is presented in the article the research of theoretical bases of cluster formation and functioning, as effective tools for the regional economy development management made it possible to provide the author's definition of the «cluster», representing the territorial productive form of

integration of locally legal entities, infrastructure, etc., characterized by the industrial production of competitive goods or services; its activities are based on the strategic development program agreed upon by the members of the cluster and harmoniously take into account the personal interests of each member of the group and the activities of which raise the social standards of the population and the growth of the region's economy.

2. The distinctive features and characteristics of the cluster form of the merger that distinguish them from other integrated structures are as follows: unlike the territorial production complex, the cluster is based on a market mechanism and the participants' own initiative, which unite to increase their competitiveness, as opposed to vertically integrated corporate structures that are created to maximize the profits of the financial and industrial group as a single entity, the cluster preserves, along with cooperation, an atmosphere of competition, autonomy, flexibility of the cluster members, and the unified financial relations do not dispute the realization of their own interests.

3. The main feature of the model of the organizational and economic mechanism for regulating regional development on the basis of clusters is the establishment of a systematic and targeted interaction among all the members of the association aimed at achieving the common objective of functioning, which is to improve the management of the region's development and to achieve a high level of regional competitiveness. The internal motives that lead businesses, organizations, institutions to create a cluster and to revitalize it include the economic factors that increase the efficiency of cluster members, the external ones that are negative, instability of regulation by the economic system of the State in general and the region in particular. The prerequisites for the creation of clusters are: appropriate opportunities in the territory (diversified farm structure, availability of related and interconnected production, scientific and human capacity); interest in integration among potential participants, enhanced material, moral and authoritative motivation.

4. Regional governments have a good reason to become a force that supports and unites local economic subject in cluster development. The regional authorities have the advantage of being close to the potential cluster project, to its participants, and of being highly motivated to implement the project, which may lead to economic, budgetary, social impact and additional source of efficient of the regional economy development management.

5. Cluster approach for effective regional economic development management is the improvement of the region's economic growth and competitiveness as a result of the efficient functioning and utilization of the territory's cluster potential and the joint collaboration of the cluster companies, and has significant social and economic relevance to the region has certain advantages and possible difficulties, i.e., pros and cons are presented in the work. Pros: the access to each other's resources, both raw materials and labour, increases access to skilled staff; demonstrates the ability of businesses to take advantage of innovative opportunities; and builds knowledge through a network of suppliers, research centres and educational institutions.

6. The advantages and disadvantages of modern cluster policies highlighted their outstanding role in increasing the competitiveness of urban and regional economies. The main advantage of the cluster approach makes efficient use of the innovative potential of the regions, stimulates small business development. In turn it improves the living standards of the population.

7. The cluster policy should be selective, meaning that the State should decide which economic activities should be supported and which should be left to market forces. In developing cluster policies, the State must choose either an offensive strategy or a protective one.

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