EFFECT OF CLUSTER INITIATIVES ON INNOVATIVE ACTIVITIES IN ENTERPRISES

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The principal aim of this study is to present the findings obtained during theoretical and empirical investigations of the concept of cluster initiative oriented at innovative activities. Growing complexity of innovations requires cooperation between business entities. The entities not involved in close relationships with the environment rarely have necessary competencies and sufficient resources to allow them to implement innovative activities independently. Building competitive advantage often necessitates supplementation of abilities and knowledge with competencies or complementary resources that other market participants have. One of the opportunities to maintain competitiveness is to implement combined activities within cluster initiative. Consequently, the concept is focused on the common goal: faster and more effective creation of innovations. The empirical part of the study presents the results of the investigations concerning cooperation of enterprises in terms of innovative activities carried out within a cluster initiative.

Keywords: Clusters, Innovations, Networks, Cooperation between enterprises.

Introduction

Striving to improve competitiveness is typical of not only individual business units but also the whole regions. One of methods to build competitive position and competitive advantage, especially in the regional context, is to create business clusters. They offer a wide variety of opportunities for different behaviours in a specific area. Their concept corresponds to both activities of cooperation nature, i.e. combining competitive and cooperative relationships between the entities and leading to sustainable development while meeting the economic, social and environmental goals.

Furthermore, it should be noted that contemporary markets are characterized by a dominant role of creative activity in the chain of value creation. An active role of innovative activities in operation of contemporary organizations has also been demonstrated. There have been references in the literature which have unequivocally pointed to the effectiveness of enterprise operation and improvement of organization. Hamel and Prachald (1994) found that achievement of economic effectiveness is possible not only through adjustment to external changes but mainly through active attitude towards challenges of the future and taking radical measures to change the environment. Therefore, the ability of an organization to learn and use science represents one of the basic factors in establishing competitive advantage. Further, Jelonek (2014) indicates that enterprise's competencies in the area of creation and implementation of innovations might determine its competitive position in the market.

However, strengthening competitive advantage often necessitates supplementation of abilities and knowledge with competencies or complementary resources that other market participants have. One of the
opportunities to maintain competitiveness is to implement combined activities within cluster initiative. Creation of clusters of entities with varied character of operation in a specific region (i.e. enterprises, universities or institutions that represent state authorities) is conducive to transfer of knowledge and information, thus immanently supporting innovative activities.

Contemporary market determinants are causing that one of the main factors that affect the opportunities for running business activities and one of the most important challenges that enterprises have to face is technological advances. Innovative activities cause that an organization and its closer and further surroundings are transformed. This situation is becoming an essential impulse for modernization of the technologies used currently and modification of the structure of consumer needs. It also often depends on limitation and is determined by the objectives of development that result in both cases from legal regulations.

Maintaining the competitiveness in the market requires that enterprises have to develop a high level of flexibility that manifests itself in constant adjustment to changes (also technological), which also consists in causing these changes i.e. increasing the innovativeness. Increasing complexity of innovations causes that individual entities more and more often fail to have all the necessary competencies and sufficient resources in order to initiate, implement and perform innovative activities. Being competitive means that the enterprises have to show ability to adapt to changes. This demonstrates the necessity to supplement skills and knowledge with competencies and complementary resources that other entities have i.e. competitors or suppliers.

One of the answers to the requirements of competitiveness are common actions taken by enterprises, organizations that represent science, other institutions and business entities focused within networks of cooperation that function in the form of clusters. Taking actions by organizations focused on shared goals offers opportunities for faster and more effective creation of innovations and introducing them in the economic circle, thus connected with generation of the potential of supply chain.

**Entities in Innovative Activities**

The characteristic feature of the contemporary economy that relates to innovation is that it is highly dependent on the flow and skills to utilize information generated by enterprise environment. This occurs as a result of acquisition, development and improving knowledge and skills and creating beneficial relationships with other entities that operate in the same surroundings. One example of such activities is regional information systems. J. Duraj and M. Papiernik-Wojdera (2010) considered these systems as important concepts that point to integration of the economy and science which emphasize such factors as: industry-related specificity of enterprises that operate in a specific region, level of economic development in a specific area, potential of knowledge and information used by the entities in a specific region and entrepreneurial activities taken by a local society. These systems are created by enterprises that operate in a specific area of the enterprise, universities, research and development institutions, organizations established to support transfer of knowledge and innovations, institutions responsible for supporting innovative activities and representatives of governmental and local government authorities (see M. Dollińska, 2004).

The entities above can cooperate in various areas. One of them is generation and implementation of innovations. This leads to creation of various networks of relationships based both on cooperation of entities in terms of e.g. flow of knowledge and information but also on their competitive activities. Therefore, the conditions are formed in a specific area to promote and develop innovations of organizational, personal, financial, market-related or political nature.

These specific interactions between entities discussed in the literature are characterized by means of *triple helix* model (Etzkowitz, Leydesdorff, 1997) that describes and organizes the relationships and feedbacks which occur between the main actors in innovation activities. Main entities in this model include institutions in the science sector, enterprises (industrial and service providers) and various institutions that represent the state. The supporting actors that help stimulate innovative activities include
such institutions as banks, scientific and professional associations, consulting firms, marketing agencies, fairs or exchanges. A variety and multitude of mutual relationships that occur between the above entities should be emphasized. Configuration of the *triple helix* model is presented in Fig. 1.

![Fig. 1. Triple helix model configuration](image)

Given the Etzkowitz's concept (2002), the *triple helix* model incorporates various interactions between the nodes (main actors in the model) that occur in the process of generation and exchange of knowledge concerning innovations. There are three dimensions to this model:

- internal transformations in the nodes (individual entities)
- effect of the entities of one node on the entities of the other
- establishment of new network structures as a result of interactions between all the nodes

Therefore, a triple dimension of the relationships that occur between the main entities present in the model should be emphasized. The first of them is internal dimension that can be observed in individual entities. The activities are performed within internal reorganization in individual nodes in order to create competitive policies, resources or stimuli to support innovative processes. This contributes to changes or modification of roles and tasks performed by individual actors that lead to e.g. establishment of alliances that ensure transfer and exchange of knowledge or extension of the mission in universities in order to improve openness to the economy.

Mutual interactions between individual nodes i.e. between the government and science, science and industry, and between industry and the government create "a triangle" of relationships that are formed from various assumptions concerning individual entities. They are characterized by the effect on industrial or scientific policies and activities oriented at behaviour of enterprises and scientific entities in terms of flow of knowledge, technology or information. Mutual relationships that occur between organizations that represent the state and organizations that represent science (universities and research centres) concern mainly formation of priorities for scientific and innovative policies. Basic interactions observed in contacts between the government and industry consist in development of industrial policies and setting essential objectives for economic growth in the country or/and a region. Interactions between science and the industry should extend the area of activities that contribute to technology transfer. These relationships can be concentrated on the exchange of knowledge and information in the area of development of technology.

Harmonious cooperation of the three main entities in the *triple helix* model is essential for implementation of sustainable policies of innovativeness in the state or a specific region. The level of involvement and the scope of relationships between the areas of science, industry and the government depends on the level of organization at which cooperation occurs. At regional level, this cooperation might adopt a form of clusters that generate and implement new solutions and ideas that facilitate the economy. It should be emphasized that sustainable development in regions is possible, through ensuring...
specific business conditions the enterprises operate in and through more substantial involvement of scientific entities that create conditions for acquisition and extending knowledge.

It should also be noted that creation of agglomerates of various organizations in the form of clusters represents a multi-stage activity, with individual levels of evolution. Etzkowitz (2002) demonstrated three basic stages in development of the interorganizational space that transforms into relations with network character. The first stage of development is creation of the space of knowledge, which consists first and foremost in supporting regional innovative environments, cooperation towards improvement of local conditions of development of innovative activities and supporting research projects. Another stage is to create the space of agreement, which focuses on creation of the strategy of regional development through cooperation of governmental, scientific and industrial areas as well as improvement of the quality of social capital. The final stage in development of the network is to create innovative space. In this sense, tasks of the previous stages are performed, similar to creation of the capital for common (public and private) initiatives. It is also essential to search for unconventional solutions in the area of science and industry.

Skawińska and Zalewski (2009) emphasized that the above nodes that create a triad of governmental, scientific and industrial zone should be extended with the fourth area that represents consumers. The significance of the fourth link results mainly from its importance to making decisions on buying a new product that manifests itself in involvement of the resources in specific products or services. Consumers look for products that meet their expectations, give them a sense of satisfaction and, consequently, products that offer highest possibly value. Therefore, it can be indicated that consumers who need the products manufactured by enterprises are considered as innovation catalysts. Aspirations, demands and aims of consumers significantly affect the shape and objectives of innovative activities of enterprises. Through expression of their preferences, expectations and needs, consumers are regarded as substantial inspirers of innovative activities. Through modern means of communication and transfer of knowledge and information, consumers are able to actively participate in innovative activities. It should be noted that this leads to a substantial reduction in asymmetry of information, while innovative activities can be not only transferred by also become a market success.

**Strategies for Innovation Transfer**

The investigations of contribution of individual entities to innovative activities stimulate the need for further analysis of the concept and opportunities to spread innovation throughout the market. The problems of innovation diffusion have been reflected in various strategies for innovation transfer. According to Oslo Manual (2008), innovation diffusion should be connected with the method of spreading innovation through market and non-market channels, which starts from the first implementation of the innovation until the contact with different consumers and occurs across countries, regions, sectors, markets and enterprises. It is emphasized that it is only transfer which equips innovations in economic sense and importance.

The diagrams below present the results of the investigations on transfer of new technologies carried out in Polish industrial enterprises in 2012. The data in Diagram 1 represent the number of the entities that purchased new technologies in Poland and EU countries while the data in Diagram 2 illustrate the number of entities that sold new technologies in Poland or EU countries. The study examined the following types of new technologies which were subject to diffusion: licenses, research and development projects, means of production process automation, consulting services.
Diagram 1. Number of industrial enterprises that purchased new technologies in Poland and EU countries in 2012.

Source: author's own elaboration based on: *Działalność innowacyjna przedsiębiorstw w latach 2010-2012 (Innovation activity of enterprises in 2010-2012)*, Główny Urząd Statystyczny (the Central Statistical Office of Poland), Opracowania i informacje statystyczne (Statistical surveys and information), Warsaw 2013

Analysis of the empirical data shows that much more entities purchased new technologies compared to those which sold them. The most of enterprises studied were those that decided to purchase licenses, followed by those that purchased means of automation. The number of these transfers exceeded 800 in both cases discussed. Among other new technologies, the least popular were research and development projects. Their number was below 400. Given the regionalization of the transfer, the greatest activity was recorded for the purchase of these technologies in Poland. The smallest difference between the number of new technologies purchased in Poland and the EU concerned means of automation.

Diagram 2. Number of industrial enterprises that sold new technologies in Poland and EU countries in 2012

Source: author's own elaboration based on: *Działalność innowacyjna przedsiębiorstw w latach 2010-2012 (Innovation activity of enterprises in 2010-2012)*, Główny Urząd Statystyczny (the Central Statistical Office of Poland), Opracowania i informacje statystyczne (Statistical surveys and information), Warsaw 2013

Further, the number of industrial enterprises which sold new technologies is over ten times lower than the number of entities that purchased these technologies. The main product sold by enterprises was means of automation, followed by consulting services. This product was also mainly sold in Poland. Other products sold to the EU countries apart from means of automation were research and development projects.
Transfer of technology which occurred as a result of sales/purchase transactions is only one of many opportunities for diffusion of innovations. Jasiński (2006) distinguished between five types of strategies for spreading innovation characteristic of a specific historical time horizon. With respect to these investigations, it can be indicated that innovations were initially "pushed" by science. This was the case until the mid-sixties of the 20th century. Later, in the sixties and seventies, transfer of innovation occurred through "pulling" by the market, i.e. meeting consumers' needs. In another stage of diffusion of innovations, i.e. in the 70s and 80s of the 20th century, a feedback was observed between science and market. Innovations were spread through research and development activities as well as through marketing surveys on requirements and consumer needs. The fourth strategy of innovation transfer was connected with integration processes of research and manufacturing activity that engaged research teams or the processes which consisted in creation of supply chains that connected manufacturers with suppliers and customers. The above activities were oriented at practical aspects of innovative activities that determine market success. The fifth, current concept of diffusion of innovation is focused on strengthening relations with main suppliers and customers, which represents a source of innovative activity. An essential characteristic of this strategy is simultaneous reactions which consist in vertical and horizontal cooperation between entities. This strategy of innovation transfer is possible through building network organizations.

In similar five-stage context, diffusion of innovations was analysed by Rothwell (1992), who described a supply-based model as initially used. This model represents a concept of "pushing" innovation by science. Customers in the model perform the role of recipients who do not intervene in initiation of the innovation process. The concept of innovation begins from research and development activities. Further stages of innovation transfer are of linear character: running through the area of manufacturing and marketing through to implementation in the market at final stages. Similar vertical character was observed for innovations that occurred according to the demand-based model. However, the market area represents a driver for innovation activities. Innovation process is initiated by analysis of expectations and demands of customers. Market survey and marketing activities are preceded by research and development activities. Furthermore, J. Duraj and M. Papiernik-Wojdera (2010) emphasized that, in general terms, innovations might be popularized through initiation of both by the market (demand factors) and techniques used (supply factors). Nevertheless, the authors cited point to the necessity of enterprises' becoming learning organizations, thus the necessity to approach knowledge as a strategic resource.

Other models of innovation transfer do not have linear character and adopt more and more advanced forms. A model of relationships and an interactive model both focus on integration of the area of research and development with marketing and manufacturing activity and (particularly in the second case) on dynamics and process of continuous interaction between all the groups involved in the innovation process. In this case, relationships have external and internal character and involve continuous exchange of knowledge between organizations. In the interactive model, information from different areas permeates each other in a manner that ensures providing innovation that represents value to the consumer. A.A. Szpitter (2010) argues that the essence of this concept is a multi-faceted nature of the innovation process that is connected with presence of numerous types of feedback between individual parts of the innovation process, both during its creation and diffusion. However, one should indicate further extension of the interactive model into a network model that takes into consideration the necessity of process flexibility and opportunities for adjustment to turbulent surroundings contemporary enterprises have to operate in. Development of the network model was stimulated by more and more popular and more and more complex external relationships between the entities involved in innovation processes, which became possible through development of information technology, new methods of organization and management and new forms of interorganizational cooperation.

The network model of innovation transfer is connected with the fourth-generation innovation policy which, apart from a particular innovation product, also incorporates network cooperation and knowledge management. It has been emphasized in the literature that this orientation of innovative activity is now at its initial stage of development (Łobejko, 2013). It should be noted that contemporary innovation policies are first and foremost based on support for broadly understood innovations and diffusion of technology,
network cooperation and active involvement of the state and public institutions in creation of conditions for innovations. It is also characterized by creation of a climate that supports entrepreneurship and creation of new knowledge. A variety of innovation systems are used to support different forms of relationships between enterprises and R&D area. One of the distinct effects of implementation of such policies is creation of cluster initiatives.

Clusters as Subjects and Tools in Innovative Activities

Focus on clusters as subjects and tools that contribute to implementation of strategies for innovations points to adoption of a regional perspective for investigations of organizational dimensions of innovative activities. Adoption of this perspective is justified by the opportunities for creation, acquisition and implementation of innovations, creation of a wide group of entities that operate in a specific geographic region.

However, it should be emphasized that clusters have a form of organizations with network-based character, although not all networks of enterprises are clusters. The essence of the business network is a wider concept, which involves such forms as strategic alliances, virtual organizations, joint venture, integrated supply chains, holdings or clusters. Organization of the network is based on ties between the entities that form the structure, while the ties are determined by specific relationships. The Thorelli’s interpretation can be adopted in general (1986). This researcher defined the concept of a network as a system of two or more organizations involved in long-term relationships. Czakon (2012) characterized the network using similar dimensions, pointing to a set of actors connected with a set of ties that have a character of friendship, counselling, inclination and business cooperation. Furthermore, Lichtarski (1993) emphasized a complex multi-entity structure of network organizations with different degree of stability, consistency and openness. The evolution of the definitional approach to interorganizational networks should also be emphasized. Initially, this concept was understood to mean independent entities which form a common structure in order to perform specific activities. Currently, the concept of a network can be viewed as any relationships with both internal units of a specific organization and with its surroundings (Witkowski, 2004).

Analysis of these problems in the market context allows for adoption of the viewpoint presented by Bratnicki (2000), who approached a network organization in the context of a bundle of separate enterprises coordinated by means of market mechanisms. Similarly, Jones, Hesterly and Borgatti (2007) defined a network model of organization as a set of autonomous entities involved in the process of manufacturing goods and services. However, these authors pointed to an informal character of these agreements and flexibility that is conducive to adaptation to unpredictable changes in surroundings. Similar approach to the problems discussed in this study was considered by P. Dwojacki and B. Nogalski (1998), who defined a network as a group of entities, or enterprises, with a relatively stable character, while the essence of these relationships is cooperation that occurs based on market principles.

Cooperation between entities is one of the basic features that characterize relationships in an interorganizational network. It also represents a specific difference that occurs between relationships in networks and clusters. The organizations that operate based on cluster initiatives do not only cooperate but also compete with each other. This form of operation is defined as coopetition (Cygler, 2007) i.e. simultaneous competition in certain areas and cooperation within other forms of market activity. However, the type of relationships that occur in the multi-entity structure is only one of the features of these networks and clusters. Closer characterization of clusters demonstrates that territorial aspect is of the principal importance to their operation. Their characteristic feature is geographical focus i.e. fixation in a specific local environment (Skawińska, Zalewski, 2009). Given the above views, a content-related complexity of the concept of clusters should be emphasized. Using the definition of this concept proposed by Porter (1998), it can be indicated that clusters should be considered as groups of mutually related entities that operate in a specific geographical region, such as enterprises based on similar abilities, technologies and resources, suppliers of services, components and infrastructure facilities, governmental
and non-governmental institutions (universities, research and scientific centres, sector organizations, trade associations etc.), which not only cooperate in specific areas but they can also compete with each other. A similar local character of clusters was emphasized by Rosenfeld (1997), who regarded clusters as a geographical group of entities that operate in related sectors, connected with each other and providing complementary services while using the same infrastructure and services of specialized suppliers in the same market.

Analysis of the causes and economic rationale for creation of clusters should be carried out with respect to modern theory of agglomeration (Karlsson, Johansson, et.al. 2005) that distinguishes between internal economies of scale as stimuli for concentration of activity of entities in specific locations. Furthermore, Gorynia and Jankowska (2008) point to external economies of scale, with its characteristic feature being that they represent a sector-specific resource, formed when the entities from the same sector start their activities in the same region. The extent of these benefits depends on the number of entities from a specific sector concentrated in a specific location. The effects of presence of external advantages of scale include e.g. reduction in unit costs in each enterprise from the sector if their number increases in the region. Further, McCann (2001) points to other external advantages, including increased attractiveness of a specific location and attracting new entities to a specific area. It should be also emphasized that the entities that operate within cluster initiative might record a reduction in transactional costs through strong relationships observed between each other.

Relationships and interactions between the entities grouped in a particular area stimulate cost reduction that is not only restricted to reductions in costs of transport and transfer of labour, but they are also conducive to reduction of costs of acquisition of knowledge and information. This aspect is essential for performing, by clusters, the role of subjects and tools for innovative activities in a specific region. Romanowska (2013) finds that "the necessity to solve the problem of innovation growth, which is a prerequisite for competition on an international scale, needs building of a strategy for innovation, either based on internal resources or through searching for the suppliers necessary for innovating the resources". The problem of high costs of creation of unique resources and solutions with innovative character can be solved through building resources together by different entities, whereas forming various relationships of enterprises in the form of e.g. clusters represents the result of searching for competitive advantages through using resources together and creation of "a joint competitive advantage".

Therefore, the importance of cluster structures for innovativeness of enterprises results from their effect on development of interactions and cooperation between business and scientific entities. These factors adopt the principal places in modern concepts that explain creation and transfer of innovations. Nevertheless, Nowicka-Skowron, Pachura, Nitkiewicz and Kozak (2006) find that it is not only network structure that is necessary for creation of innovativeness understood as continuous process of generation and flow of knowledge and information, but the factors that determine function of the network structure, such as quality of cooperation in the network, are also important.

These problems are connected with what is termed "a dominant method of coordination", which determines the methods used by network members for organization and control over cooperation. Due to the character of the relationships which represent the basis for coordination of the whole system, Gandori and Soda (1995) emphasized social networks among various types of interorganizational networks. They are distinguished by low formalization of the agreement between entities, while the type of concentration of these entities can be characterized by both vertical and horizontal situation. One example of this type of networks is clusters. Therefore, due to such features of the relationship observed in clusters, including loose relationships, mutual nature of services or voluntary character of relationships, the increase in importance of social capital and cultural conditions when building and functioning of this form of network is essential.

Furthermore, Duraj and Papiernik-Wojdera (2010) emphasized that cooperation between the entities that form clusters is deeper and planned using a longer time horizon. It was oriented first and foremost at specific technological specialization, used throughout the shared stages of development. Nevertheless, a precondition for cluster development is its constant adjustment to turbulent environment, which causes
the need for investing in creation of mutual relationships that contribute to transfer of resources between the entities and generate value added.

**Clusters in Poland**

Empirical studies were carried out using the data based on operation of clusters in Poland. It should be noted that operation of clusters in Poland is regulated by law. Clusters are considered as geographical and sector concentration of entities that operate towards economic growth or development of innovativeness, including at least ten entrepreneurs who run business in the area of one or several adjacent voivodeships, competing and cooperating in the same or similar sectors and connected within an extended network of relationships with formal and informal character, with at least half of the entities in the cluster being entrepreneurs.

The main factor in division of the statistical population was classification carried out according to regions (voivodeships). The study analysed such variables as number of clusters in the region (voivodeship), structure of enterprises that cooperate within the cluster initiative in percentage terms, enterprises cooperating within innovative activities, type of cluster infrastructure necessary for performance of innovative processes. The analysis of correlations between selected parameters of cluster initiative and innovativeness of enterprises was also carried out.

The study found that there were 158 cluster present in Poland in the period analysed (year 2012). Its regional structure according to location of coordinators were presented in Diagram 3. It should be emphasized that cluster coordinator is considered as an entity that organizes and stimulates development of interactions, relationships and cooperation in the cluster and provides specialized services for all the members of the cluster, particularly in favour of the enterprises.

![Diagram 3. Number of clusters in Poland according to location of coordinators in the voivodeship](image)

The data presented in the chart above point that the greatest number of clusters in Poland was located in Masovian Voivodeship. This number exceeded 30 in this area. Furthermore, a dominant regions were industrialized areas such as Greater Poland and Silesia, with numerous academic centres present. The number of clusters in these voivodeships reached ca. 20. Cluster initiatives in other regions of Poland were not numerous. In the majority of Polish voivodeships, the number of clusters was lower than 10.

With respect to innovative capabilities of clusters, the study analysed the number of research centres, specialized laboratories, conference rooms and training facilities. The data obtained are presented in Diagram 4.
Clusters present in Poland were mainly equipped in training facilities. The greatest number of training facilities, reaching 200, was observed in the Greater Poland Voivodeship. The clusters also declared having conference rooms and specialized laboratories. The greatest number of such facilities was observed in the region of Greater Poland, with the number of 70 and 90, respectively. However, in general terms, the number of specialized laboratories used in clusters in Poland was substantially lower than the number of conference rooms. Research centres were the least numerous in clusters. Only the clusters in two voivodeships declared having such centres (with the number of 20 in each voivodeship). In other regions, this number did not exceed 10, and the regions with no research centres were also observed (e.g. Kuyavian-Pomeranian Voivodeship).

Analysis also concerned the relationships between cooperation within cluster initiative and cooperation within innovative activities. The results of these analyses are presented in Diagram 5.
Given the size of the entities that cooperated within cluster initiatives, it can be indicated that the most of the entities that the cooperation within innovative activities was declared mainly by large enterprises which employed at least 250 employees. A particular relation was also observed: the smaller the enterprise, the lower tendencies for cooperation within cluster initiatives among the entities that cooperate within innovative activities. This property was also observed for both industrial entities and those from the sector of services. However, service providers were more willing to cooperate within clusters. It should be also emphasized that, in general terms, the enterprises that declare cooperation in implementation of innovations are not substantially involved in cluster initiative. The study showed that 18% of service providers and 13% of industrial enterprises were willing to connect these two aspects.

The relationships between cooperation within cluster initiative and cooperation within innovative activities were also examined in the regional context (Diagram 6).

![Diagram 6. Enterprises which cooperated within cluster initiative in percentage of enterprises which cooperated within innovative activities in 2010-2012](image)

Source: author's own elaboration based on: *Działalność innowacyjna przedsiębiorstw w latach 2010-2012* (in Polish: Innovation activity of enterprises in 2010-2012), Główny Urząd Statystyczny (the Central Statistical Office of Poland), Opracowania i informacje statystyczne (Statistical surveys and information), Warsaw 2013

With local approach, a noticeable relationship between cooperation within cluster initiative and cooperation in innovative activities can be indicated among the most of enterprises in the sector of services. In six voivodeships, the number of service providers that declared both forms of cooperation was at the level of at least 30%. Much fewer enterprises that were characterized by this type of relationships can be found in the enterprises from the industrial sector. The level of the structure discussed exceeded 15% only in five regions.
Next stage of the analysis concerned correlations of selected parameters of cluster initiatives and innovativeness of enterprises. The results of the analysis are presented in Table 1. The basic statistical variable was the number of clusters that were present in individual regions (voivodeships). Using the coefficient of linear correlation and coefficient of determination, this variable was compared to such variables as: GDP in a particular voivodeship, % of industrial enterprises innovatively active in a particular voivodeship, % of service providers innovatively active in a particular voivodeship, % of industrial enterprises innovatively active in a particular voivodeship, % of innovative service providers in a particular voivodeship, % of industrial enterprises that implemented organizational innovations in a particular voivodeship, % of service providers that implemented organizational innovations in a particular voivodeship, % of industrial enterprises that implemented marketing innovations in a particular voivodeship, % of service providers that implemented marketing innovations in a particular voivodeship, share of incomes on sales of new products or significantly improved products in incomes on sales in total according to voivodeships /industrial sector/, share of incomes on sales of new products or significantly improved products in incomes on sales in total according to voivodeships /sector of services/.

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<th>Table 1. Analysis of correlations between selected parameters of cluster initiative and innovativeness of enterprises</th>
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| Number of clusters vs. percentage of industrial enterprises that implemented marketing | -0.0905 | 0.0081 | t=-0.3400 < t\(0.05;14\)=2.145 No statistically significant correlation between the
Analysis of correlations demonstrated in the most of cases no statistically significant correlations between the variables studied. Statistically significant correlations between the variables studied were obtained only for three relationships concerning the number of clusters vs. selected parameters of innovativeness in service providers. These correlations concerned: the number of clusters in a particular voivodeship and % of innovatively active service providers in a particular voivodeship, number of clusters in a particular voivodeship and % of innovative service providers in a particular voivodeship, and number of clusters in a particular voivodeship and % of service providers which implemented marketing innovations in a particular voivodeship. Linear correlation coefficient in the above cases exceeded 0.5, which points to the relationship of medium character. Therefore, the coefficient of determination oscillated around 30%. Verification using the test of significance was carried out based on T-student statistics demonstrated a statistically significant correlation between the variables studied. Statistical analysis is consistent with previous results obtained in studies that have pointed to the relationship between cluster initiative and innovative activity of enterprises in the sector of services.

**Conclusion**

Enterprises, universities and scientific and research institutions represent a pillar for technological advances and economic growth in both regions they operate in and areas with broader macroeconomic context. It is knowledge, technologies used and specialized products and services that are becoming necessary resources used in these institutions in order to meet the demands of market competition. It should be emphasized that a vast majority of cluster initiatives in Poland focus on the activities that do not require substantial investment expenditures. Entities in the clusters are less frequently involved in the initiatives aimed at improving innovativeness and research and development activities of the enterprises included in these clusters.

Clusters are mainly equipped in training facilities and conference rooms. This suggests that they are mainly oriented at innovations of organizational and marketing character. Furthermore, the number of research centres in the clusters is insignificant. In general terms, there are 98 research centres present in 158 clusters in Poland, of which nearly a half are concentrated in two voivodeships. Therefore, it can be concluded that clusters in Poland are at the early stage of creation and do not have an entire infrastructure required for a comprehensive developing and implementation of product or process innovations. The study also demonstrated that industrial enterprises that cooperate in terms of innovative activities are not
involved in the most of cases in cooperation within cluster initiative. Large entities and entities from the service sector are more willing to integrate these two areas of activities.

It should be emphasized that fast transfer of technology and products at various stages of the value chain represents an essential factor in gaining the competitive advantage at both national and international market. The environment of cooperation formed within clusters can be stimulating. Therefore, it is essential to investigate the causes of low activity of cluster initiatives among the enterprises which cooperate within innovative activities. Furthermore, given more and more substantial pressure for searching for new competitive advantages in enterprises and reorientation of the public assistance towards innovative activity, it can be concluded that this area of activities in cluster initiative will become more and more important.

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