

POLISH CLUSTERS AND EUROPEAN CLUSTERS – DIFFERENCES IN THE MECHANISMS OF THEIR CREATION AND FUNCTIONING

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Abstract:

As the significance of clusters has been growing, it is important to focus on the issues related to the mechanisms of their creation and functioning. The purpose of the article is to present the specific character of Polish clusters by comparing them with European clusters on the basis of the literature study and the author's own research.

Keywords:

cluster, research on clusters, cluster profiles

INTRODUCTION

The issues related to the origination and development of technological clusters are highly interesting, however the research on them has been relatively limited, despite the dynamic development of management science. The limited knowledge of these issues significantly impedes the effective management of such organisations, often contributing to a failure of such undertaking. The concept of clusters still has not been thoroughly examined, and numerous problems arising therefrom require further research.

Clusters, understood as the geographical concentration of enterprises with a specific profile of economic activity, perform a significant role in the economy, particularly from the perspective of their influence on the advancement of innovation and competitiveness of respective regions. They are a characteristic feature of contemporary economies, especially in the developed countries, but in practice they occur on all continents. Since the significance of this specific group of organisations has been increas-

ing, it is purposeful to direct special attention on the issues related to the mechanisms of their creation and functioning.

The purpose of this article is to present, on the basis of the literature study and the author's own research [29], the specific character of Polish clusters, by comparing them with European clusters. In 2015, the author conducted research consisting in developing and analysing the case studies for twelve clusters – six Polish clusters and six clusters operating in the states of the 'old' European Union. On the basis of the case studies it was possible to prepare and compare the profiles of the Polish and European clusters, developed on the basis of the analysis of twenty variables, and to formulate initial hypotheses concerning the reasons for differences between these profiles.

1. DEFINITIONS OF A CLUSTER

One of the important shortcomings in the research on clusters is the lack of a clear definition of clusters, which makes it difficult to conduct comparative studies. Analysing the content of the definitions used by researchers working on clusters it can be observed that some attributes of clusters are mentioned by all of them, such as the concentration of interdependent entities on the specific area, the occurrence of interactions and interrelations between the participants of the cluster or the presence of social and cultural factors which determine the flow of information within the cluster. The characteristic features of clusters include their uniqueness, complexity and multi-dimensional diversity, giving rise to a wide range of various criteria, according to which they are differentiated and classified, with respect to the type of manufactured products or provided services, local dynamics, development phase, etc. In the literature on the subject the problem of cluster dynamics is also considerably diversified, however in this case researchers agree that among the factors conducive to the process of cluster origination and development the most important ones include: competition and cooperation between participants, the presence of educated workforce and the existence of a system for the spreading of knowledge. For the purpose of this article the definition of M. E. Porter has been adopted, according to which clusters are "geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (for example, universities, standards agencies, and trade associations) in particular fields that compete but also co-operate" [22].

2. RESEARCH ON CLUSTERS WORLDWIDE AND IN POLAND

European clusters, besides the American ones, have been researched and explored to the greatest extent. The states belonging to the old European Union, i.e. forming the European Union before its extension in 2004, have a particularly wide experience in this area. Clusters operating in these countries are at different stages of development and of different durations, as many of them originated in the second half of the 20th century and some concentrations having the characteristics of clusters date back even to the 19th century. In Europe numerous studies on clusters have been undertaken, including, among others, the European meta-study of clusters (conducted by a team of researchers from the Max Planck Institute of Economy in Jena) [3], the study of devel-

opment paths of German clusters (Justus-Liebig-Universität in Gießen) [19], the study of high-technology clusters in Germany (the Institute of Market Economy Research) [30], or the study of seaports acting as clusters (Erasmus Universiteit Rotterdam) [16].

In Poland the history of clusters is significantly shorter – just a dozen years or so. As a result the knowledge of the specifics of clusters is still very limited, despite the growing number of new research projects, including, among others, the study on clusters in Wielkopolska (Greater Poland) [6], the study on the automotive cluster in Wrocław [7], the study on clusters in Pomorze (Pomerania) [4], the study on clusters in Podkarpacie (Subcarpathia) [31], or the benchmarking of Polish clusters [2]. The above-mentioned studies have differed from each other with respect to their objectives, scale and research methods and, therefore, it is not easy to make direct comparisons between their results. However, some conclusions and observations have been recurrent in many studies. It has been found out, among others, that both clusters and respective enterprises participating in them are characterised by extraordinary competitiveness and innovation in comparison with the entities operating outside clusters. An important role is often performed here by participants' cooperation and competition, and not by the size of the cluster or its age. Furthermore, it has been observed that in Asian clusters cooperation between enterprises is far more important than their cooperation with the research and development sector, politicians or venture capital organisations. In Continental Europe a very strong influence on the cluster evolution is exerted by the companies initiating its formation and by the presence of regional traditions. In Anglo-Saxon countries innovation, the national policy and venture capital are of key importance for the formation of clusters.

The results of the studies conducted in Poland have also uncovered some of the truth about the landscape of Polish cluster initiatives – first of all the fact that there are only few model, developing and effective organisations having the characteristic features of clusters. Many clusters refused to take part in the research and the existence of some of them turned out to be purely fictitious, as discovered, among others, by the authors of the benchmarking of Polish clusters.

Studies conducted by various research centres over the recent decades not only have provided the data identifying clusters, but have also made it possible to investigate their impact on the economy. Researchers agree that clusters, through their influence on regional competitiveness and innovation, play an important role in the country's economy. Research has also shown that clusters are characterised by the high dynamics of employment growth and are conducive to the creation of new companies. Therefore, the support for clusters presents one of more important challenges for the developing countries.

Numerous clusters (for example American Silicon Valley, Hollywood, the German Multimedia Cluster in Munich or French Aerospace Valley) have originated naturally, without any deliberate state's intervention. Their evolution is related to the ability of the given location to attract enterprises and people specialising in a particular line of business. Consequently, specialised entities concentrate in this region, which leads to the natural development of clusters. In the regions without rich traditions or a long history

of operation of respective industries clusters are more frequently initiated and orientated by local or central authorities. The phenomenon of creating such structures has become more intense in connection with the funding made available for this purpose by the European Union and national budgets.

3. DIFFERENCES IN THE MECHANISMS OF CREATION AND FUNCTIONING OF POLISH AND EUROPEAN CLUSTERS

The author attempted to explore and describe the specific character of clusters in Poland and in the states of the old European Union on the basis of their comparison. Twelve clusters were singled out for the study and their choice was based mainly on the availability of source materials in the Polish, English, German and French languages, to ensure the fullest possible analysis of the selected characteristics. The organisations lacking the key distinguishing features of the cluster, specified in the definition of M. E. Porter, were rejected from the initially selected population – mainly the so-called cluster initiatives and clusters which had finished their operation or showed no activity. The following clusters were included in the study:

- Mazowiecki Klaster Optyczny (Mazowiecki Optical Cluster) (Poland) [11,27];
- Wielkopolski Klaster Teleinformatyczny (Wielkopolski ICT Cluster) (Poland) [14];
- Pomorski Klaster ICT (Pomorski ICT Cluster) (Poland) [13];
- Klaster “Zielona Chemia” (“Green Chemistry” Cluster) (Poland) [15];
- Klaster “Dolina Lotnicza” (“Aeronautic Valley” Cluster) (Poland) [12];
- “Life Science” Cluster (Poland) [10];
- Munich Multimedia Cluster (Germany) [8];
- Cologne Multimedia Cluster (Germany) [5, 18, 26];
- Aerospace Valley Cluster (France) [1, 9];
- Minalogic Cluster (France) [20, 24];
- Berlin Optical Cluster (Germany) [17, 28];
- ICTNorCOM Cluster (Denmark) [21].

Each of the clusters was described according to the following twenty criteria:

- a) Reason behind selecting the location (historical conditions, natural conditions – access to resources, etc.) [23];
- b) Origin – understood as the way of initiating the creation of the cluster (bottom-up and top-down initiatives);
- c) Duration (age of the cluster) – counted from the official date of the cluster formation. To ensure an equal representation of respective groups, three age ranges were set (up to 5 years; from 6 to 10 years; more than 10 years);
- d) Phase of life – phases of life adopted in accordance with the life cycle of clusters [25] (embryo, growth, maturity, decline);

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- e) Number of participants – a factor that indicates the significance of the cluster's 'critical mass'. To ensure an equal representation of respective groups, four ranges were set (up to 50 entities; 50-100 entities; 100-300 entities; more than 300 entities);
 - f) Geographical range of the cluster – depending on how distant (in the geographical sense) the entities, being partners in the cluster, are. The following types of clusters were distinguished: local clusters (partners in the cluster are located close to each other); regional clusters (partners from the same region, sharing specific industrial culture); national clusters (entities coming from one country, irrespective of the represented region of this country); supranational clusters (partners originating from different countries);
 - g) Structure of governing bodies – character of the coordinating entity – a body (institutional) appointed to coordinate the cluster's activity and to initiate and support the tasks taken up;
 - h) Cluster's width – a dimension depending on the number of horizontally interrelated sectors (wide or narrow clusters);
 - i) Dominant type of relations between the cluster participants – informal relations, customer – supplier relations, networks of relationships;
 - j) Strength of cooperation with other participants of the cluster – related to the number of entities taking part in joint projects (none, low, medium, high);
 - k) Strength of cooperation with the R&D (research and development) sector – research and development institutions, research and development units, higher education institutions, units providing services for science and conducting own research and development (Polish: *jednostka obsługi nauki*), etc. (none, low, medium, high);
 - l) Strength of cooperation with authorities – self-government, central authorities (none, low, medium, high);
 - m) Strength of cooperation with business environment institutions – entrepreneurship centres, innovation centres, financial institutions (none, low, medium, high);
 - n) Strength of cooperation with industry organisations – associations, chambers and other organisations gathering enterprises in respective industries (none, low, medium, high);
 - o) Degree of innovation – determines the extent to which the ideas developed in the innovative sectors reach the market (low, medium, high);
 - p) Export level – related to the number of entities involved in export activities and the share of export in the cluster's revenue (none, low, medium, high);

- q) Level of specialisation of the entities participating in the cluster – concentration on the activity in which the entities are highly effective (low, medium, high).
- r) Strategy for competitiveness – sources of competitive advantage (related to cost or quality, resulting from specialisation).
- s) Sources of financing of the cluster’s activity – public or own funds to support the cluster’s activity.
- t) Competitive position of the cluster – connected with the position of the cluster, its products or services on the broadly understood market. Depending on this position the following types of clusters can be distinguished: national or worldwide leaders (the highest competitive position), clusters with average competitiveness and those characterised by a weak competitive position.

The choice of variables for analysing clusters was dictated by the necessity of taking account of the most important aspects defining clusters and by the results of the analysis of secondary sources, in which the criteria differentiating clusters were mentioned. The applied criteria are based on the experience of the Polish and international systems for cluster assessment. On the basis of the obtained results and the specification of twenty diagnosed characteristics of Polish and European clusters the profile of the Polish cluster (Table 1) and the profile of the European cluster (Table 2) were developed. These profiles reflect the most frequent features that can be regarded as typical for clusters in the given area (Poland/the old European Union).

Table 1. Profile of the Polish cluster

No.	Characteristic of a cluster	
1.	Reason behind selecting the location	Access to resources
2.	Origin	Top-down
3.	Duration (age of the cluster)	Up to 5 years
		6-10 years
4.	Phase of life	Embryo
5.	Participants	100-300 entities
6.	Geographical range	Regional cluster
7.	Coordinating entity	Cluster participant
8.	Cluster’s width	Narrow
9.	Dominant type of relations	Customer – Supplier
10.	Cooperation with other participants	Low
11.	Cooperation with the R&D sector	Medium
		High
12.	Cooperation with authorities	Medium
13.	Cooperation with business environment institutions	Low
14.	Cooperation with industry organisations	None
15.	Degree of innovation	Low

No.	Characteristic of a cluster	
		Medium
		High
16.	Export	None
		High
17.	Level of specialisation	High
18.	Strategy for competitiveness	Benefits derived from specialisation
19.	Sources of financing	Public
20.	Competitive position	Average

Source: Own work

Table 2. Profile of the Polish cluster

No.	Characteristic of a cluster	
1.	Reason behind selecting the location	Historical conditions
2.	Origin	Bottom-up
3.	Duration (age of the cluster)	More than 10 years
4.	Phase of life	Growth
		Maturity
5.	Participants	100-300 entities
		More than 300 entities
6.	Geographical range	Regional cluster
7.	Coordinating entity	Association
8.	Cluster's width	Wide
9.	Dominant type of relations	Customer – Supplier
		Networks
10.	Cooperation with other participants	High
11.	Cooperation with the R&D sector	Medium
12.	Cooperation with authorities	High
13.	Cooperation with business environment institutions	High
14.	Cooperation with industry organisations	Present
15.	Degree of innovation	Medium
		High
16.	Export	High
17.	Level of specialisation	High
18.	Strategy for competitiveness	Benefits derived from specialisation
19.	Sources of financing	Own funds
20.	Competitive position	High

Source: Own work

A typical Polish cluster has been formed as a result of the top-down initiative of the public authorities and access to resources was the determinant of its location in the given region. It is a relatively young structure, formed in the last ten years, being in its initial, embryonal, stage of development. Its range coincides with the region, the number of its participants does not exceed 300 entities and it is coordinated by a company – being the cluster's participant. The cluster operates within one or several sectors. Participants, because of their limited confidence, are reluctant to start horizontal cooperation and the links occurring between enterprises are based on the customer – supplier relations. The cluster's cooperation with business environment institutions is equally weak. Cooperation with research and development units and representatives of the authorities is started more willingly, but there are no interactions with industry organisations. The Polish cluster has a significant potential in terms of the degree of innovation, which, however, relies (similarly to a pro-export orientation) mainly on the level of innovation of the industry in which it operates. Enterprises forming the cluster are characterised by a high level of specialisation and the strategy for competitiveness is founded on the benefits derived from specialisation. The cluster makes use mainly of the public sources of financing and its competitive position can be described as being at a medium level.

A model European cluster has been formed as a result of the bottom-up initiative of the enterprises operating in the given region and historical conditions were the determinant of its location. It is a structure in its growth or maturity phase, formed more than ten years ago and having a long-standing business tradition. Its range coincides with the region, however, the number of its participants exceeds 300 entities and it is coordinated by an association established specifically for this purpose. The cluster operates within numerous sectors and its participants willingly start horizontal cooperation, on the basis of the customer – supplier relations and networks, which makes it possible to generate a synergistic effect. The cluster's entities are equally eager to cooperate with business environment institutions, representatives of the authorities and industry organisations. Their cooperation with research and development units is at a medium level. The cluster is characterised by a high competitive position, a high pro-export orientation and a high degree of innovation, which, however, depends on the level of innovation of the industry in which it operates. Enterprises forming the cluster are characterised by a high level of specialisation and their strategy for competitiveness is founded on the benefits derived from specialisation. The cluster's activity is financed predominantly by its own funds, with the concurrent additional use of public support (by taking part in the European Union projects).

Analysing the results of the conducted research it should be stated that there are significant differences between the Polish clusters and the European ones. Out of the twenty criteria adopted for the description and analysis full convergence can be observed only in two cases, in six cases partial convergence occurs and there are significant differences with regard to the remaining twelve criteria. The greatest convergence of characteristics concerns the high level of specialisation and the strategy for competition based on specialisation. Partial convergence has been observed with regard to the following criteria:

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- Number of participants – both Polish and European clusters in the majority of cases consist of 100-300 entities, however, European clusters equally often involve more than 300 participants (in one half of the analysed cases the number of participating entities exceeds 1,000);
 - Geographical range – regional organisations prevail among the studied clusters, both the Polish and European ones, however in the case of European clusters also the supranational ones have been observed;
 - Dominant type of relations – in all Polish clusters the customer – supplier relations have been indicated, whereas in the European clusters also the network relationships occur equally often;
 - Cooperation with the R&D (research and development) sector – Polish clusters are characterised by medium and high levels of such cooperation, whereas in the European clusters a medium level of interaction can be noticed. However, another characteristic feature of European clusters is the occurrence of cooperation at a very high level, which is not observed in the Polish clusters;
 - Degree of innovation – in the case of Polish clusters equal numbers of clusters with a low, medium and high degrees of innovation have been observed, whereas European clusters, in their majority, are characterised by medium and high levels of innovation;
 - Export – in Polish clusters extreme values are recorded – the numbers of clusters without any export activity and with a high level of such activity are the same, while almost all European clusters export their products.

The main differences concerned the following criteria:

- Reasons behind selecting the location – the deployment of almost all Polish clusters (with one exception – Aeronautic Valley) took place on the basis of access to resources (raw materials, qualified workforce). In the case of all analysed European clusters the selection of their location was predominantly justified by historical conditions (their precursors had been operating long before the cluster was established) and only secondly by access to resources (the presence of qualified employees, which might result from the said historical conditions);
- Origin – almost all Polish clusters (with one exception – Aeronautic Valley – the same for which historical conditions were the reason behind selecting the location) have been established on the basis of the initiative of the authorities (top-down), whereas all European clusters have been initiated by enterprises, subsequently representing the core of the cluster (also in the case of French clusters, which, although their official formation by the central authorities took place in 2005, had shown the characteristic features of clusters much earlier);
- Age of the cluster – Polish clusters are relatively young structures, formed in the last ten years, gathering companies which often do not have a long tradi-

tion (with few exceptions, such as the Aeronautic Valley, which has over a century-long tradition of operating in the industry in the region, although the cluster was formally started up in 2003). European clusters were established more than ten years ago and have a long, often more than century-long, business tradition (it applies also to French clusters, which were officially established in 2005);

- Phase of life – the majority of Polish clusters, among others because of their short duration, are in their embryonal phase, whereas the structures of their European equivalents are in the growth or maturity phase;
- Coordinating entity – in the majority of cases both Polish and European clusters have their coordinating entities, however a significant difference consists in the fact that in Poland one of the cluster participants performs the role of its coordinator, whereas in the European clusters this function is fulfilled by an entity established specifically for this purpose (association);
- Cluster's width – narrow clusters, operating within one or several sectors are dominant in Poland, whereas in the European Union wide multisectoral clusters occur more often;
- Cooperation with other participants – the lack of sufficient horizontal relations, which could generate a synergistic effect, is characteristic for Polish clusters (Polish enterprises show little willingness to cooperate with other entities, which results from the lack of mutual confidence). In the European clusters cooperation between their participants is assessed as significant;
- Cooperation with authorities – Polish clusters are moderately interested in cooperation with representatives of the authorities, both local and central. Limited confidence is most often the reason behind such approach, like in the case of cooperation with other participants within the cluster. European clusters are definitely more willing to cooperate with public authorities;
- Cooperation with business environment institutions – Polish clusters show little interest in cooperation with business environment institutions and they are relatively most willing to cooperate with the banking and finance sector. European clusters are considerably more interested in such cooperation and, moreover, with a wider spectrum of institutions;
- Cooperation with industry organisations – in Poland in the majority of cases this cooperation is underestimated and ignored, whereas almost all European clusters seek such cooperation;
- Sources of financing – all Polish clusters function owing to public (national and obtained from the European Union) financial support, with only few financed from their own funds. In the case of European clusters the contrary trend is observed – they are all financed from own funds with additional public support (national and obtained from the European Union);

- Competitive position – Polish clusters are characterised by a medium level of competitiveness, whereas their European equivalents hold a strong competitive position.

During the analysis of the cluster descriptions the reasons for such substantial differences between Polish and European clusters were initially identified. It can be stated that these differences resulted to the greatest extent from the impact exerted by the modern history of Poland – the post-war years up to the 1980s were extremely difficult times for entrepreneurship. For many years the operation of private enterprises in Poland was thwarted by the centrally planned economy system. Private property did not fit with the then contemporary political system – private enterprises functioned only in the area of craft and, less frequently, in services and retail trade. The renaissance of this sector started only in the 1980s, however its rapid growth has been observed since 1990s, after the act on business activity was passed and the programme of privatisation of state-owned companies was implemented.

At present, Polish enterprises are capable of meeting the requirements of the contemporary global economy and competing with firms from other better developed countries. However, there are still some problems being the consequence of the above-mentioned historical conditions. These include first of all: a low level of innovation and entrepreneurs' reluctance to invest in research and development, insufficient funds, the lack of mutual confidence, the lack of cooperation, based on partnership, with the scientific environment and the lack of cooperation with regional business support institutions. Thence arises the characteristic of Polish clusters reluctance of its participants to start cooperation, both with each other and with their business environment or the research and development area. It probably results from the fact that these clusters are in the early stage of their development, in which the culture of competition prevails – other participants are perceived as potential competitors and not as partners. It hinders the growth of the cluster's potential and competitiveness. Therefore, it is important to take actions promoting such cooperation and improving the awareness of benefits that can be derived from it. Such actions should not, however, replace the market mechanisms, but they should only eliminate any obstacles to development.

A preliminary finding can be presented that the dissimilar conditions of the formation and operation of clusters, both organisational, legal and financial, and related to the cultural environment, are the main source of differences between Polish and European clusters, but this complex issue requires continued research. The question of the origin of these problem has to be further studied.

The research conducted by the author shows that in Poland only few concentrations of companies described in the literature can actually be characterised as clusters. Many of the clusters pronounced as existing do not actually operate, which suggests the tendency to create them exclusively for the purpose of using public funds (national and obtained from the European Union) designed to implement the policy of supporting clusters. Resources of the Polish entities, considerably limited in comparison with those available to their Western European equivalents, reduce their abilities to compete. It could be improved through more active cooperation and competition of the

entities within the cluster, making it possible, through the synergistic effect, to achieve the competitive position which is out of reach for a single company.

CONCLUSIONS

The results of the studies contained in this paper provide an affirmative answer to the question whether clusters in Poland are significantly different from clusters in the countries of the old European Union and give the initial description of determinants influencing the formation and development of Polish clusters. The presented conclusions, drawn from the research, justify the need and purposefulness of conducting further studies on the processes of formation and evolution of technological clusters. It seems to be of interest to conduct further more detailed studies and analyses aimed at:

- Working out a uniform and universal definition of clusters, providing the basis for unambiguous differentiation with respect to other concepts of regional development processes;
- Working out better ways and methods for cluster monitoring, analysis and assessment, leading to the development of the standard methodology for studying different types of clusters in various countries with the possibility of comparing them;
- Comparing the profiles of Polish and European clusters again at the further stage of their development to determine whether Polish clusters follow the pattern of clusters located in the other countries of the European Union;
- Analysing the determinants influencing the formation of cluster profiles. These studies would make it possible to explain the origin of differences in cluster profiles in different countries and to establish the success factors in their operation.

In conclusion, it should be noted that the growing significance of network relationships in the European economy, including cluster relationships, renders the clusters an important object of research for both science and economy.

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