The possibilities of creating cross-border clusters

Anna Wasiluk
Andrzej Daniluk

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Prof. dr. hab. Juozas LAKIS

Authors:
Anna WASILUK
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Anna Hlebowicz-Kozioł

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INTRODUCTION

The concept of clustering has gained great popularity as an attractive and effective measure to increase the competitiveness and innovation of local and regional economies. Many cities, regions and countries have developed their own policy based on supporting the development and promotion of clusters.

At the beginning of the XXI century M. Enright[1] stated that the decision-makers, in regard to direction of the development of the region and supporting specific clusters, find it difficult to resist the "fashionable" clusters in areas such as biotechnology, multimedia, etc., even when the analyzes leave no doubt as to the likelihood of success of such projects. This problem is constantly valid and has been the subject of various studies by A. Wasiluk related to cluster initiatives in Podlaskie province. It should be noted that clusters are models of success, but they do not give any guarantee of it. As experience shows, in certain circumstances, clusters can, but definitely do not have to, become a driving force for member companies and whole region development.

The Communication of the European Communities Commission to the Council, the European Parliament, the European Economic – Social Committee and the Committee of the Regions *Transferring knowledge to practice: A broad-based innovation strategy for the EU* states *"if Europe is to fully exploit the potential of clusters, they must reach a critical mass and strategic orientation through more and better transnational cooperation at the European level, across national borders".*[2] Currently, foreign solutions and efforts are focused not so much on the concept of cluster development in the regions, but on improving the competitiveness of enterprises and organizations. This is done mainly through creating inter-regional and especially cross-border clusters, not only within the European Union, but also with

[1] Enright M., *The Globalization of Competition and the Localization of Competitive Advantage: Policies toward Regional Clustering*, [in:] Hood N., Young S. (eds), *Globalization of Multinational Enterprise and Economic Development*, Macmillan, London 2000.

[2] Communication from the Commission to the Council, The European Parliament, The European Economic and Social Committee and The Committee of the Regions, *Putting knowledge into practice: A broad-based innovation strategy for the EU*, Brussels, 13.09.2006.

countries outside it. Therefore, taking into account the location of Podlasie region that provides favorable conditions for creation of cross-border structures with both Belarus and Lithuania, it seemed important to examine the actual willingness of entities on both sides of the border to create and operate within such clusters.

This book was written as a result of the research project "Possibilities of cross-border clusters creation", financed by the Ministry of Science and Higher Education (NN 114293938). Its main objective was to answer the question whether it is possible to create a cross-border cluster, or a few, in Podlaskie province. The answer to this question required above all: the identification of areas in which a cross-border cluster/clusters creation will be possible in the province of Podlasie and examining the willingness of entities on both sides of the border to work within such a structure.

The book consists of four main chapters and a summary with recommendations. The first chapter provides an overview of the theoretical aspects of clusters. The reasons for dedicating these issues the first part of the study derived from the fact that although the concept of clusters in recent years has gained immense popularity – especially as a key solution to innovation and competitiveness of firms and regions, despite the passage of time, we must still agree with R. Brown[3], that there is constantly much confusion around these issues. Although many attempts to develop a theory of cluster have failed, they resulted in a vast collection of different theories and ideas, aspiring to the logic of cluster.[4] This situation has led to negative and often harmful consequences, because some fundamental issues, including the definition of the relevant research methods, have been ignored by policy makers – politicians.[5] Important, therefore, according to the authors was to review the existing studies and to present their synthetic picture.

The second chapter is devoted to analysis of the regional policy instruments implementation effectiveness in the European Union and in Poland. The main assumptions and models of regional development and their impact on the formation of cluster structures were discussed. Reference was made to the provisions of the strategic documents developed in the Podlaskie Province in order to support cluster initiatives, including cross-border ones. The current effects of cluster policy implementation in the European Union in different

3 Brown R., *Cluster Dynamics In Theory and Practice with Application to Scotland*, "Regional and Industrial Policy Research Paper" 2000, Nr 28, s. 4.

4 Faser E., *Old and New Theories of Industry Clusters*, [in:] Steiner, M. (ed.) *Clusters and Regional Specialisation*, Pion Limited, London 1998.

5 Held J., *Clusters as an Economic Development Tool: Beyond the Pitfalls*, "Economic Development Quarterly" 1996, Vol. 10, pp. 249–261.

areas were indicated, taking into account the existing conditions and the preference areas of government intervention. Reference was also made to the model solutions used in Poland, in terms of the individual provinces approach to implementation of policies to support clusters and cluster initiatives. Particular attention was paid to the available support instruments used by local authorities of Podlaskie Province. When analyzing the provisions of recently generated and created strategic documents at national level, the prospects for the future implementation of cluster policy were highlighted.

The content presented in chapter three on one hand results from the need to show a multitude of approaches to cluster research methodology, but on the other hand, reflects the implementation of the provisions included in the research project. Cluster survey methodology is characterized by diverse and multi-faceted nature. In practice, there are many methods, techniques and tools available, that are both of a partial or comprehensive nature.In-depth analyzes were carried out of three sections, for clarity called sectors/industries of building, wood and furniture, and medical. It should be noted that the authors are fully aware of both the interpretation of these terms, as well as the lack of compatibility between them. Such a solution was accepted, taking into account the issues discussed in this study, which would be understandable not only for science entities dealing with these issues, but also for those of other areas, especially the business sector.

The fourth chapter is the presentation of research results. The analysis of responses of the survey respondents, with their in-depth interpretation and formulating recommendations, proved to provide very important information obtained during the interviews and numerous consultations. At this point the reader's attention should be to drawn to the fact that in this part of the study the authors use in Tables the name of Poland in regard only to respondents in the region of Podlasie (these were the project assumptions).

A cluster is not only a group of companies, institutions or research entities, but also a social group. The strength of this type of relationship is in large part the quality and intensity of personal contacts among representatives of organizations associated in the cluster. Therefore, trust, willingness to cooperate and openness to it, constitute an important factor for the success of these structures. With this in mind and fully sharing such a position, the authors of this book in their research focused on these issues. The book is addressed to a wide range of readers. It seems that first of all the people involved in creating solutions for the implementation of cluster policies may be interested in it. Undoubtedly, it may also be useful to representatives of businesses and business support institutions that are considering a cross-border cooperation with companies from Lithuania and Belarus.

Chapter I.
THEORETIC ASPECTS OF CLUSTERS

1.1. Genesis and the term of cluster

The term of cluster is not associated only to economics, but it is also functions in many other disciplines of science and art. For example:

- in chemistry – cluster is a super-molecular structure, in which there are two groups of molecules that form a common network of links;
- in music – cluster is a multi-tone sound created from the neighboring tones in the musical scale;
- in information technology – cluster is an indivisible unit of the division on the hard disk or floppy disk (there is also the concept of cluster computing (Web-based, servers), which is a group of interconnected computer units working concurrently as if they were a single computer).

In the economic literature information can be found that the oldest described example of a cluster dates probably for the period of 4000-3500 BC and originates from the area of present southern Iraq. It regarded the structure of the Sumerian cities, located along the valleys of the Tigris and Euphrates rivers, which had separate districts that specialized in a particular craft and formed a kind of mutual interdependence network.[6]

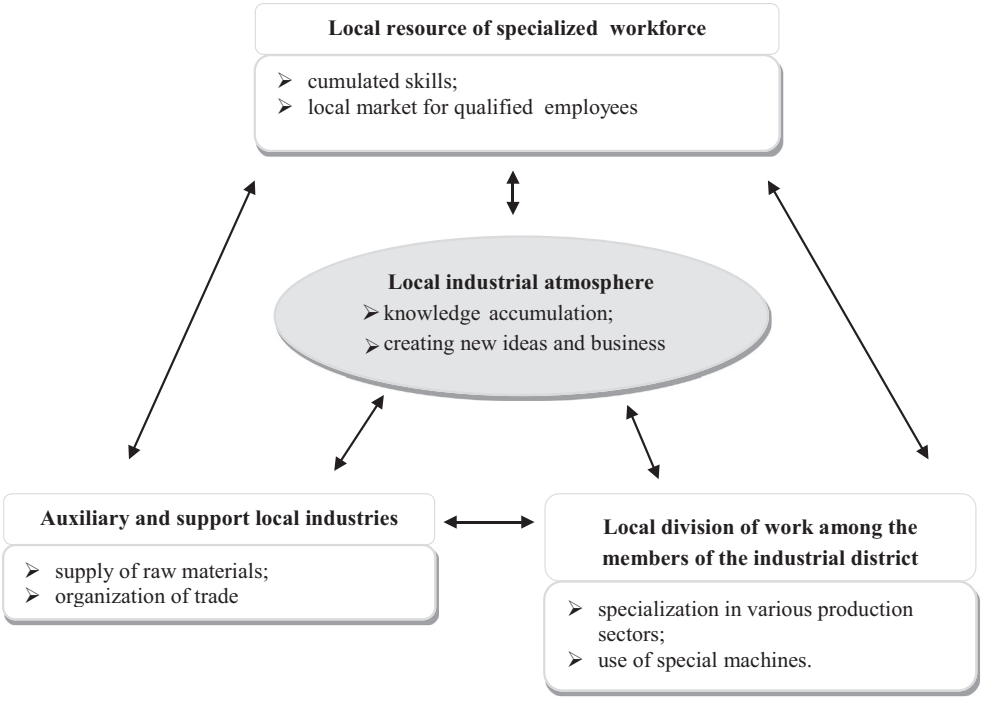
Nowadays, the grounds for clusters are included in the concept of A. Marshall's industrial district. This concept, popularized by AC Pigou, plays an important role through external effects[7] which as a rule contribute to the rapid growth of the region. Furthermore A. Marshall highlights the fact that in the industrial districts there is a specific industrial atmosphere, i.e. a set of formal and informal customs, traditions and practices, work ethos and entrepreneurship related to the industry (Picture 1.1).[8]

6 See for ex. *Inicjatywy klastrowe na gruncie ekonomii społecznej*, Project "Podlaska Sieć Partnerstw na rzecz Ekonomii Społecznej" No POKL.07.02.02-20-016/09, Białystok 2011, p. 2.

7 Creating concentrations of companies increases competitiveness by generating external benefits that lower producers' costs.

8 Skawińska E., Zalewski R.I., *Klastry biznesowe w rozwoju konkurencyjności i innowacyjności regionów. Świat – Europa – Polska,* PWE, Warszawa 2009, pp. 22–23.

Picture 1.1. A. Marshall's triad of external effects related to the industrial districts location



Source: Martin R., Sunley P., *Deconstructing Clusters: Chaotic Concept or Policy Panacea*?, "Journal of Economic Geography" 2003, Vol. 3, Issue 1, pp. 5-35; Skawińska E., Zalewski R.I., *Klastry biznesowe …,* op. cit., p. 22.

In the fifties of the twentieth century, F. Perroux highlighted the role of key sectors, which, because of their size, market power and innovativeness, have had a significant impact on the development of other sectors of the economy. The key sectors or individual companies are called growth poles that attract, focus and target other economic resources of the region[9]. In the seventies in Italy G. Becattini described the phenomenon of "Third Italy", in which he presented the cooperative associations of enterprises, located in the so-called Italian districts. They caused a significant development of the region in comparison to the rest of the country. M. Storper and R. Camagni completed the industrial district concept and assigned greater importance to organizational learning as

9 Kwietniewska-Sobstyl M., *Kapitał społeczny a funkcjonowanie klastrów w gospodarce opartej na* wiedzy, [in:] Arent A. (ed.), *Zarządzanie przedsiębiorstwem i regionem wobec wyzwań europejskich*, Politechnika Lubelska, Lublin 2010, p. 227.

Table 1.1. Example interpretations of the concept of cluster

Author	*Interpretation of the concept of cluster*
M.E. Porter	*„grapes (clusters) are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example universities, standards agencies, trade associations) in particular fields that compete, but also cooperate. Grapes, reaching a critical mass and enormously successful in competing in certain areas of activities, are a striking feature of virtually every national, regional, state, and even metropolitan economy, especially in developed countries."*
R. Rabelotti	*„geographic concentration of specialized firms operating in related sectors, linked by a network of public and private institutions that support their activities. There are market and non-market relationships between businesses resulting from the exchange of goods and information, and the behavior of individual firms are defined by a sense of relationship and fellowship with other companies in related sectors, operating in this location."*
P. Swann M. Prevezer	*„a group of firms based in one geographical area."*
T. Roelandt P. den Hertog	*„group of companies, their suppliers, customers and knowledge centers (universities, research institutes, consulting firms) that have complementary skills and participate in a chain of creating values (production process), aimed at improving the quality of processes and end products, that are able to create network connections to allow the diffusion of innovation and joint development of new technologies."*
M.P. van Dijk A. Sverrisson	*„dense network of companies and organizations which value chains are linked and those links do not always result from concluded transactions."*
S. Rosenfeld	*„a geographically bounded concentration of interdependent businesses acting in related sectors in the local labor market, providing each other complementary services, involving common infrastructure and specialized suppliers."*
P. Cookie	*„geographically proximate firms in vertical and horizontal relationships, involving a localized enterprise support infrastructure with a shared developmental vision for business growth, based on competition and co-operation in a specific market field ."*
OECD	*„concentration in the area related to each other (vertically and / or horizontally) companies operating in the same sector (industry or services), together with other related institutions."*

Table 1.1. continue

UNIDO	*"regional and territorial concentration of companies producing and selling similar products, or products of a complementary character. Functioning in such conditions requires them to overcome similar problems and challenges, which in turn can result in creation of specialized suppliers of raw materials and machinery, development of specialized skills and competencies and formation of specialized sectors and individualized services"*
European Union	*"The cluster is a mode of organization of the productive system, characterized by a geographical concentration of economic actors and other organizations, specialized in a common field of activity, developing inter-relations of a market and non-market nature, and contributing to the innovation and competitiveness of its members and the territory."*

Source: own study based on: Porter M. E., *Porter o konkurencyjności*, PWE, Warszawa 2001, p. 246; Stypułkowski W., *Brak kapitału społecznego jako bariera rozwoju struktur klastrowych w Polsce Wschodniej*, [in:] Błaszczuk D. J., Stefański M. (ed.), *Czynniki endogeniczne rozwoju Polski Wschodniej*, Innovation Press Wydawnictwo Naukowe Wyższej Szkoły Ekonomii i Innowacyjności, Lublin 2010, pp. 200 –201; Swann P., Prevezer M., *A comparison of the Dynamics of industrial clustering in computing and biotechnology,* "Research Policy" 1996, Vol 25, p. 1139; van Dijk M. P., Sverrisson Á., *Enterprise clusters in developing countries: mechanisms of transition and stagnation*, "Entrepreneurship & Regional Development" 2003, Vol. 15, Issue 3, pp. 183-206; Rosenfeld S., *Bringing business clusters into the mainstream of economic development*, "European Planning Studies" 1997, Vol 5; *Clusters in Transition Economies*, LEED Directing Committee, OECD, Paris 2002; Cooke P., *Knowledge Economics. Clusters. Learning and Cooperative Advantage*, Routledge, London 2002; UNIDO, *SME Luster and Network Development in Developing Countries, The experience of UNIDO*, Private Sector Development Branch, Working Paner 1999, No. 2; *European Trend Chart on Innovation. Thematic Report Cluster Policies,* European Commission Enterprise Directorate-General, March 2003, p. 4.

a stimulation for the formation of an innovative environment[10]. However, that was for an American economist ME Porter to contribute to the true prevalence of the term "cluster" in the nineties of the last century. The interest of European Commission Europe also influenced its popularity in Europe.

It should be noted that in the twenty-first century the previous considerations take on a new meaning. It is a period of civilization breakthrough from the period of industrial development into the era of information technology, the Internet communication and knowledge-based economy.[11] Shaping the new conditions

[10] Szultka S., Brodzicki T., Wojnicka E., *Klastry – trochę teorii*, [in:] Szultka S., Brodzicki T. (eds), *Klastry: innowacyjne wyzwania dla Polski*, Instytut Badań nad Gospodarką Rynkową, Gdańsk 2004, pp. 9–10.

[11] Skawińska E., Zalewski R. I., *Klastry biznesowe …*, op. cit., p. 167. D. Gelernter claims however, that the information era has already started in 1982, which was due to the Internet start-up and appearance of the first personal computers. – Gelernter D., *O czym ludzie są poinformowani w erze informacji,* [in:] Brockman J. (ed.), *Niebezpieczne idee we współczesnej nauce. Świat w oczach wybitnych myślicieli*, Published by Academica, Sopot-Warszawa 2008, p. 86. More on the subject also in: Brzozowski M., *Organizacja wirtualna*, PWE, Warszawa 2010, p. 17–23.

present other than so far existing opportunities to develop the relationships between the different actors.

Despite a great interest in cluster issues, or perhaps because of it, a commonly accepted definition of clusters has not been developed. Although many authors rely on the definition proposed by ME Porter, just as many try to create their own interpretations of the phenomenon (Table 1.1).

Polish legislation, for the use of bodies implementing policy instruments to support clusters, adopted the definition of clusters understood as *"Spatial and sector concentration of actors working on economic development or innovation, and at least ten enterprises, engaged in business activities in one or more neighboring regions, competing and co-operating in the same or related industries and interconnected by an extensive network of relations, of formal and informal nature, wherein at least half of the entities within the cluster are entrepreneurs."*[12]

It should be noted that the term of cluster is not finally scientifically examined, as under the influence of economic growth and development of cluster, the original definition is evolving. New elements are recognized in the cluster that determine its development. For example, Ch. Ketels emphasizes four characteristic features of clusters:[13]

- Proximity (companies must be located at such a distance, that would on one hand enable them to share resources and on the other hand, positive effects of spreading knowledge might appear[14]);
- Linkages (should serve the common goals);
- Interactions (they are essential to appearance of positive effects of cluster existence);
- Critical mass (there must be a sufficient number of participants in the cluster).

Proximity as a basic feature of the cluster, although discussed by many researchers, also raises some skepticism. For example M.P. van Dijk and Á. Sverrisson note that this is one of the possible types of reactions in which the actors from the cluster can exist, and the proximity does not automatically mean cooperation between them.[15] However, the geographical proximity is no doubt

12 Rozporządzenie Ministra Gospodarki z dnia 2 grudnia 2006 r. *w sprawie udzielania przez Polską Agencję Rozwoju Przedsiębiorczości pomocy finansowej niezwiązanej z programami operacyjnymi*, Dz. U. 226 poz. 1651, §13.2.

13 Ketels Ch., *European Clusters,* [in:] *Structural Change in Europe 3 – Innovative City and Business Regions*, Hagbarth Publication 2004, p. 1.

14 This effect is known as "spillover effect".

15 van Dijk M. P., Sverrisson Á., *Enterprise clusters …* , op. cit., pp. 183–206.

Table 1.2. The list of the cluster characteristics made by MP van Dijk and Á. Sverrisson

Cluster atributes		
	Observable	➢ Relative proximity of enterprises (Klapwijk 1997); ➢ Usually high density- intensity of business activity (Meyer-Stamer 2000); ➢ Presence of a number of companies engaged in the same, similar or substitute activity (Mc Cornik 1997).
	Continuing the cluster nature	➢ Relations between companies resulting from subcontracting (Rabellotti 1997; Sverisson 1997; Sandee, Rietveld 2000); ➢ Relations between companies based on different forms of cooperations (Sandee, Rietveld 2000); ➢ Defined level of specialisation (Halimana, Sverisson 2000; Sandee, Rietveld 2000).
	Deriving from theories related to cluster concept	➢ origins of the cluster related to historical determinants such as migration processes (Meyer-Stamer 2000); ➢ collective process of learning (Schmitz 1996; Visser 2000); ➢ social networks resulting from transactions between producers and traders (Sandee, Rietveld 2000); ➢ external effects arising from the linkages and networks (Sverisson 1993; Rabellotti 1997); ➢ the role of local institutions (Sandee, Rietveld 2000); ➢ the role of local authorities (Pedersen 1997; Meyer-Stamer 2000; Sverisson 2001); ➢ common cultural roots (Sverisson 2000); ➢ friendly, supportive institutional environment (Rabellotti 1997; Meyer-Stamer 2000; Pedersen 2000; Sverisson 2000); ➢ favorable conditions for building relations based on trust between business partners (Schmitz 1996); ➢ atmosphere of trust and lack of or limited opportunism (Pyke, Sengenberger 1992); ➢ similar level of technical sophistication / complexity (Sverisson 2000; Sandee, Rietveld 2000); ➢ widespread imitation products locally (Sverisson 1997; Visser 2000); ➢ joint workforce (Sandee, Rietveld 2000); ➢ common / shared technical expertise (Sverisson 1997, 2001; Visser 2000).

S o u r c e : own study based on van Dijk M.P., Sverrisson Á., *Enterprise clusters …*, op. cit., pp. 183–206.

very often the first indication that we might deal with the process leading to the formation of a cluster.[16] M.J. Waits also notes concentration[17] and mentions additionally, among other attributes of cluster, the interdependence of industries that form it (links are of competitive and partner nature), export orientation (large group of companies in the cluster sell products / services to entities outside the region and even the country), the rapid growth of companies in the cluster. [18]

Other authors list the following elements as the main features of the cluster[19]:

- concentration (spatial and/or sectorial) of companies;
- specialization in a specific area and use of common technologies and skills;
- interactivity in the areas of horizontal and vertical linkages;
- synergies with the creation of added value;
- common trajectory of development in the field of vision, mission, goals and objectives;
- com-operation – both competition and co-operation.

It should be emphasized firmly that any search for a "paradigmatic" cluster, to create a kind of model, would be highly misguided venture. This is confirmed with the list of the cluster characteristics made by MP van Dijk and Á. Sverrisson (Table 1.2). Certainly, however, it is worthwhile to attempt to organize its features, complement the existing typologies and develop new and existing theories, ideas and models.

Although the word cluster originated from the English word "cluster", which literally means: concentration, grape, bunch, group, bundle, a group of similar things growing together, a group of people or things that are close together, in the literature many concepts similar to these can be found. Though they are often equated with the cluster, and these concepts are used interchangeably, we should

16 Visser E. J., *Local Sources of Competitiveness: Spatial Clustering and Organizational Dynamics in Small-Scale Clothing in Lima, Peru*, PhD dissertation, Tinbergen Institute and University of Amsterdam, Amsterdam 1996 cit. after: van Dijk M.P., Sverrisson Á., *Enterprise clusters …* , op. cit., pp. 183–206.

17 Concentration of employment in the region is higher than the average level in the country.

18 Waits M.J., *The Added Value of the Industry Cluster Approach to Economic Analysis, Strategy Development, and Service Delivery*, "Economic Development Quarterly" 2000, Vol. 14, Issue 1, s. 35–50.

19 Comp. for ex: Janiec M., Szajna W., *Klastering w Polsce Wschodniej w kontekście krajowym i europejskim*, [in:] Hermaniuk J., Krupa J. (ed.), *Współczesne trendy funkcjonowania uzdrowisk – klastering*, Instytut Gospodarki Wyższej Szkoły Informatyki i Zarządzania, Rzeszów 2010, p. 58; Brodzicki T., Szultka S., Tomowicz P., *Polityka wspierania klastrów: najlepsze praktyki: rekomendacje dla Polski*, Instytut Badań nad Gospodarką Rynkową, Gdańsk 2004, p. 7; European Commission Enterprise Directorate-General, *Final report of the expert group on enterprise clusters and networks*, Brussels 2003, p. 9.

Table 1.3. Example concepts similar and complementary to cluster

Concept	*Interpretation of the concept*
Industrial district	Integrated spatial concentration of mutually interconnected companies in the same or similar sectors in which there is a beneficial effect of agglomeration based on three main sources: circulation of knowledge between companies, formation of specialized factors of production and services by supporting industries and emergence of district-oriented skilled labor adapted to the needs of the market.
Growth pole	Integration of the population, leading to the positive external effects, an increase based on the leading industry supported by other sectors of economy centered around it.
Growth zones	Correlations between companies and sectors improve the flow of knowledge.
Competence blocks	The coexistence of a number of different competences (customers who generate demand, innovators preparing new products, entrepreneurs identified with the potential novelties, venture capital funds), which together contribute to the dynamization and commercialization of certain products.
Industrial complex	Focus on the relationship between companies developing new technologies (in the form of components, machines, production systems) on the one hand, and the companies that use these methods on the other.
Resorce area	The area covers a vast range of products and services, which is relatively stable over time and has also a significant role in the economy. It consists of sectors that are inter-dependent due to the need to cooperate in the production of the final product or service. It may also include the public sector. Companies of the area have the same needs in terms of production situations.
Production chains	Based on the vertical relations in manufacturing processes, its center is constituted by neighboring businesses within the added value. Sometimes it also includes academic bodies, some business-related services and intermediary institutions.
Innovation environment	Area of high-tech industry accumulation characterized by the interaction of economic and institutional factors leading to the effective creation and diffusion of knowledge and efficient learning process.
Technological systems	Network or networks of actors interacting in the technology sector to produce, diffuse and apply technologies. It focuses on the flow of knowledge and competence more than on the circulation of goods and services.

Table 1.3 continue

Networks	The specific form of relationship between the actors based on mutual interdependencies, cooperation and trust (may or may not be integrated spatially). The term network means here *"a set of social relations between at least three actors. The network is informal as a rule, based primarily on cooperation and the actors are more or less equally powerful. In their interaction they follow a common goal. The network is part of a cluster, it can also extend beyond its frames".*

S o u r c e : own study based on Marshall A., *Principles of Economics. An Introductory volume*, Macmillan and Co, London 1920; Perroux F., *The Pole of Development's New Place in a General Theory of Economic Activity* [in:] Higgins, B., Savoie, D. J. (eds.*), Regional Economic Development: Essays in Honour of Francois Perroux*, Unwn Hyman, Boston 1988; Dahmén, E., *Development Blocks in Industrial Economics*, "Scandinavian Economic History Review" 1988, Vol. 36, pp. 3–14; Fridh A. Ch., *Institutions, technology and growth – a competence bloc approach*, Kungl Tekniska Hogskolan, Stockholm 2000; Drejer I., Skov Kristensen F., Laursen K., *Studies of Cluster as a Basis for Industrial and Technology Policy in the Danish Economy*, Danish Research Unit for Industrial Dynamics Working Paper No. 97–14, December 1997; *Kluster och Klusterpolitik*, Narings- Och Teknikutvecklingsver--Ket/Swedish Business Development Agency, Stockholm 1998; *Networks of enterprises and local development. Competing and Co-operating in Local Productive Systems*, OECD, Paris1996; *Cluster in der Wirtschaftsförderung*, Bericht des Bundesrates in Erfüllung des Postulats Rey (06.3333), Schweizerische Eidgenossenschaft, Bern 2010, pp. 7–8.

notice the fact that they are not as much equal concepts as complementary and related to one another (Table 1.3). These concepts, in search for new sources of competitive advantages, have extended the subjective scope of concentrations, including the different types of institutions and the organizations of local business environment. Therefore we can talk about a new, holistic and systemic approach to the concept of cluster.

Clusters are particularly often identified with the "network links" (networking) and "cluster initiatives" Therefore it appears desirable to discuss these issues in detail. At the very beginning it should be noted that in the literature, in both cases we are dealing with a large ambiguity of conceptual apparatus.

Among the stimulus of networks development the authors list:[20]

- quick and rapid technological change;
- shortened production cycles;

20 See for ex.: Hatch M. J., *Teoria Organizacji*, PWN, Warszawa 2002, p. 195; Chetty S. K., Wilson H. I. M., *Collaborating with competitors to acquire resources*, "International Business Review"2003, Vol. 12, Issue1; Wiatrak A. R., *Organizacje sieciowe – istota ich działania i zarządzanie*, "Współczesne Zarządzanie" 2003, nr 3; Najda-Janoszka M., *Organizacja wirtualna. Teoria i praktyka*, Difin, Warszawa 2010, p. 32.

- fragmented and specialized markets;
- high risk of activities;
- high market entrance barriers.

The comparison of sample network definitions (Table 1.4) shows that networks:[21]

- base on the relations of co-operation;
- are at most weakly hierarchical (or not at all);

Table 1.4. *Example definitions of networks*

Author	*Interpretation of the term*
K. Santarek, A. Kosieradzka, R. Rafalski (2005)	cooperation *"of many companies in the network in order to achieve certain benefits, including a competitive advantage. The cooperation takes place in the form of cooperative relations between economically and legally independent companies"*
T. Stryjakiewicz (1999)	*„A set of interconnected exchange relationships between actors (stakeholders) associated with a particular activity"*
M. Starnawska (2005)	Such *"structures, that consist of the environment in which the organizations exist forming a network of overlapping relationships."*
M. Rosińska (2005)	business network is a *"multidimensional relationship in frames of the "learning" structure intended to reach a common long-term (strategic) goal, which is the development, based on quality changes."*
M. Hopej (2003)	*"The network structure is generally speaking, a set of relations between the different units, sharing common interests."*
M. Gorynia (2007)	*"The network is a model or metamorphosis, that usually describe a large number of units which are interconnected by a system of different relationship."*
J. Brilman (2002)	*"The network is a set of measures and rules to allow entities that have access to them to make and implement joint projects."*
A. Jewtuchowicz (2001)	*"The network is a collection of selected relations with chosen partners to form market relations of the companies."*

Source: own study based on a set of definitions by Skawińska E., Zalewski R. I., *Klastry biznesowe …*, op. cit., p. 168.

[21] Skawińska E., Zalewski R. I., *Klastry biznesowe …* , op. cit., p. 169.

- affiliate, informal links prevail in them, but there is no competitive relationship;
- their feature is the flexibility of adjustment to changes in the environment.

The relations network can be also understood as:[22]

- relationships between entities of its composition, general and long-term relationships are distinguished;
- structure – companies in the network are more interdependent than independent; interdependence introduces restrictions on individual firms behaviour, which means building a structure in the broad sense;
- position – is a unit of mutually overlapping roles in the organization / company in relation to another organization / company;
- process – changes of relationships between companies, dominated by the distribution of power / strength and structure of interest.

Network of connections can be analyzed both in the narrow and in a wider sense. The first approach involves relationships between businesses: vertical relationships – within a particular value chain and horizontal relationships – with competitors. In the wider sense it includes additionally diagonal relationships with units supporting business activities (government, financial institutions, advertising agencies, etc.)[23] A.R Windmill also suggests considering network in the narrower and wider sense, although its very interpretation is quite different. He suggests to understand it in the first sense as *"a collection of several independent entities (companies) involved in the specific field of business and related by co-operation partners bonds"*, while in the second sense as *"a collection of scattered individual units belonging to one group – the economic organism."*[24]

Frequent equation of clusters and networks may result from some of the definitions of the first one, in which the network nature of the relationship between its participants is exposed. The interpretations of J. Schuler and C. DeBresson can be given as the examples. The first author defines cluster as *"spatially localized networks"*[25], the other one says that clusters are not *"a simple concentration of independent economic agents, but display at an inter-industrial*

22 Easton G., *Industrial Networks: a review*, [in:] Axelsson B., Easton G. (eds.), *Industrial Networks. A New View of Reality*, Routledge, London – New York 1992, pp. 3–25.

23 Axelsson B., Easton G. (eds.), *Industrial Networks. A New View of Reality*, Routledge, London – New York 1992.

24 Wiatrak A. R., *Organizacje sieciowe … ,* op. cit.

25 Schuler J., *Clustermanagement. Aufbau und Gestaltung regionaler Netzwerke*, Verlag Wissenschaft&Praxis, Sternenfels 2008, p. 17.

level, underlying networks of interrelated co-operating businesses."[26] Another reason is probably the fact that both cases refer to the relationships between the agents, which can lead to some simplification in thinking, especially among people from the business sector (but not only[27]), who are not involved into the theoretical research (according to the principle "since in both cases it is the same, so the two terms are synonymous"). The third reason is still poor knowledge about the clusters among people who do not deal with this issue. However, the differences between these two issues are worth noting (Table 1.5).

Table 1.5. Basic differences between clusters and networks

Clusters	*Networks*
➢ attract the required, specialized services to the region;	➢ facilitate companies access to specialized services at lower price;
➢ their membership is open;	➢ there are restrictions in membership;
➢ are based on social values that strengthen the trust;	➢ are based on agreements;
➢ generate demand for a number of companies in similar or related business	➢ facilitate companies operations in a complex business environment;
➢ companies simultaneously cooperate and compete	➢ companies solely co-operate with each other;
➢ companies have common goals.	➢ companies have similar goals.

Source: own study based on: Rosenfeld, S.A., *Bringing Business …*, op. cit., pp. 3–23.

The second concept equated with the concept of a cluster is "cluster initiatives". Although the literature on the subject presents a lot of different definitions of the term, it seems that its essence is well captured in the interpretation proposed by Ö. Sölvell, G. Lindqvist and Ch. Ketels, who state that cluster initiatives mean *"an organized effort to intensify growth and increase competitiveness of the cluster in the region, with the involvement of companies operating within the cluster,*

[26] DeBresson C., *Why innovative activities cluster*, [in:] DeBresson, C. (ed.), *Economic Interdependence and Innovative Activity. An Input–Output Analysis*, Cheltenham, Brookfield 1996, pp. 149–164.

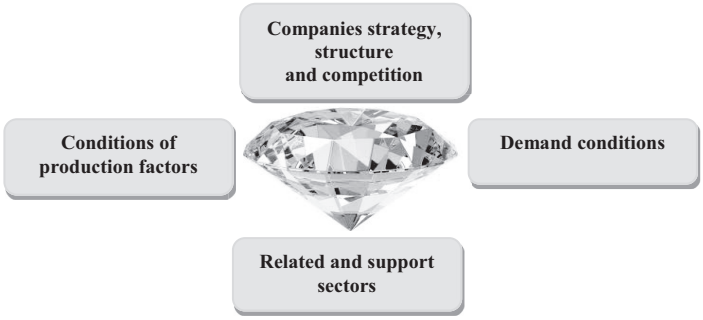
[27] Equation of clusters are present in both Polish and foreign works that constitute state and local government documents, ministry papers etc. Compare for ex.: Werner C., Welbich-Macek S., *Erfolgsgeschichte: 15 Jahre Clusterinitiativen in Österreich*, Bundesministerium für Wirtschaft und Arbeit, Wien 2007.

the government and / or the research environment"[28]. A similar position can be observed in other publications.[29] Some of the definitions emphasize additionally the fact that these actions are taken by many groups of agents[30], and they are usually business leaders, academic centres or government.[31]

The aims of cluster initiatives may include:

- implementation of actions aimed at the clusters formation (eg.: building social capital, encouraging cooperative behavior, coordinating actions of companies interested in network cooperation);[32]
- acceleration of the growth and competitiveness of the cluster already existing in the region (for example, by improving the operations and strategy of the group, improving the specific business environment, strengthening networking companies in order to obtain the economic benefits and the create spin-offs).

Figure 1.2. Diamond Model by M.E. Porter



Source: own study based on Porter M. E., *Porter o konkurencji …*, op. cit., p. 207.

Although most of today's cluster concepts are based on the concept of ME Porter, they supplement it and vary in its interpretation. The starting point for discussion is usually a reference to the model of the national competitive

28 Sölvell Ö., Lindqvist G., Ketels Ch., *Zielona Księga Inicjatyw Klastrowych; Inicjatywy klastrowe w gospodarkach rozwijających się i w fazie transformacji,* Polska Agencja Przedsiębiorczości, Warszawa 2006, p. 39.

29 Comp.ex.: Stawicki M., *Klastry i inicjatywy klastrowe – podstawowe definicje,* [in:] Stawicki M., Pander W. (eds.), *Metody ewaluacji polityki wspierania klastrów ze środków strukturalnych*, Warszawa, 2008, pp. 11–12; *Klastry. Polityka rozwoju gospodarczego oparta na klastrach*, Ministerstwo Gospodarki, Warszawa, p. 4.

30 Comp. ex: *Raport 2010, Klastry jako potencjał rozwoju – województwa podlaskiego*, Fundacja BFKK, Seria Wydawnicza RAPORTY, Białystok 2010, p. 10; Skawińska E., Zalewski R. J., *Klastry biznesowe …* , op. cit., p. 181.

31 Stawicki M., *Klastry i inicjatywy klastrowe …* , op. cit., pp. 11–12.

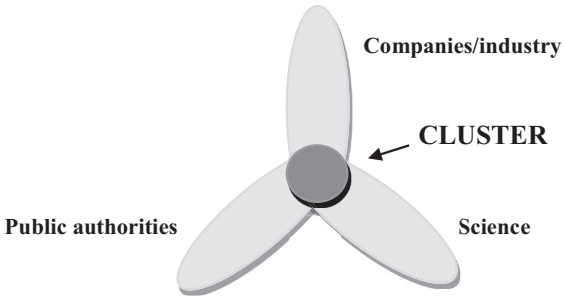
32 Ibidem.

advantage determinants, also known as "Porter's diamond" (Figure 1.2). Its manifestation in specific conditions is a cluster.

M. E. Porter, based his model on four groups of factors. These were:[33]

- factors related to competitiveness of companies in the area – competition should be characterized by a great diversity of products, high level of innovation and investment in technology and development, whereas the market should create conditions for human resource skills improvement and be open to trade and foreign investment;
- conditions related to the local factors of production – the wealth of the area in terms of natural resources, capital and human resources, as well as networks of information, knowledge and broad social and technical infrastructure;
- conditions related to local demand – this means that the needs of customers in the area are higher and more forward-looking than those of customers in other regions, and the quality of this demand requires companies to improve continuously, indicating the direction of clients needs development (influence on international demand);
- conditions in the related and support sectors – the region where formation of the cluster is planed should be rich with suppliers in terms of quality, quantity, price and time as well as with competing of related sectors at international level. A very important role is played by the network of institutions supporting entrepreneurship and innovativeness of regional organizations.

Figure 1.3. Triple helix



Source: European Commission, *Cluster Policies. Thematic Report*, European Trend Chart on Innovation EC, Enterprise Directorate General 2003.

33 Porter M.E., *Porter o konkurencji …*, op. cit., pp. 206–227; Cernavin O., Führ M., Kaltenbach M., Thieβen F. (eds.), *Cluster und Wettbewerbsfähigkeit von Regionen. Erfolgsfaktoren regionaler Wirtschaftsentwicklung*, Duncker&Humblot, Berlin 2011.

Clusters are an effective way to seek synergies arising from the cooperation between the different agents in the so called triple helix.

Cluster area is crossed by two elements: location and subject matter. Location determines the geographic concentration, which as should be emphasized, is not about the administrative division, but the density of links on a given area. The competitiveness of the cluster is determined by the accumulation of agents – companies and other organizations and institutions that are competitors, customers, expertise knowledge and other resources. The concentration in question defines the cluster's field of activity which serves attracting highly skilled workers who are professionals in the field. This allows for development of a high level synergy that strengthens the competitive position of the cluster.

1.2. Cluster life cycle

S. Klepper draws attention to the fact that the strong industrial growth is accompanied by an increase of companies concentration. In his opinion, clusters exist / arise when there is an increase in the certain industry.[34] Since the clusters are formed in almost all sectors of the economy, they have different level of technical advancement and innovation, and thus their strategies and prospects for development are different. The general layout of the cluster development stages is shown in Figure 1.4.

Each cluster has its own dynamics which is related to clusters life cycle[35]. This theory is based on the course of the cluster development in relation to the life cycle of its main product that is innovation.[36] The following stages can be observed[37]:

34 Klepper S., *Disagreements, Spinoffs, and the Evolution of Detroit as the Capital of the U.S. Automobile Industry*, "Management Science" 2007, Vol. 53, Issue 4, pp. 616–631.

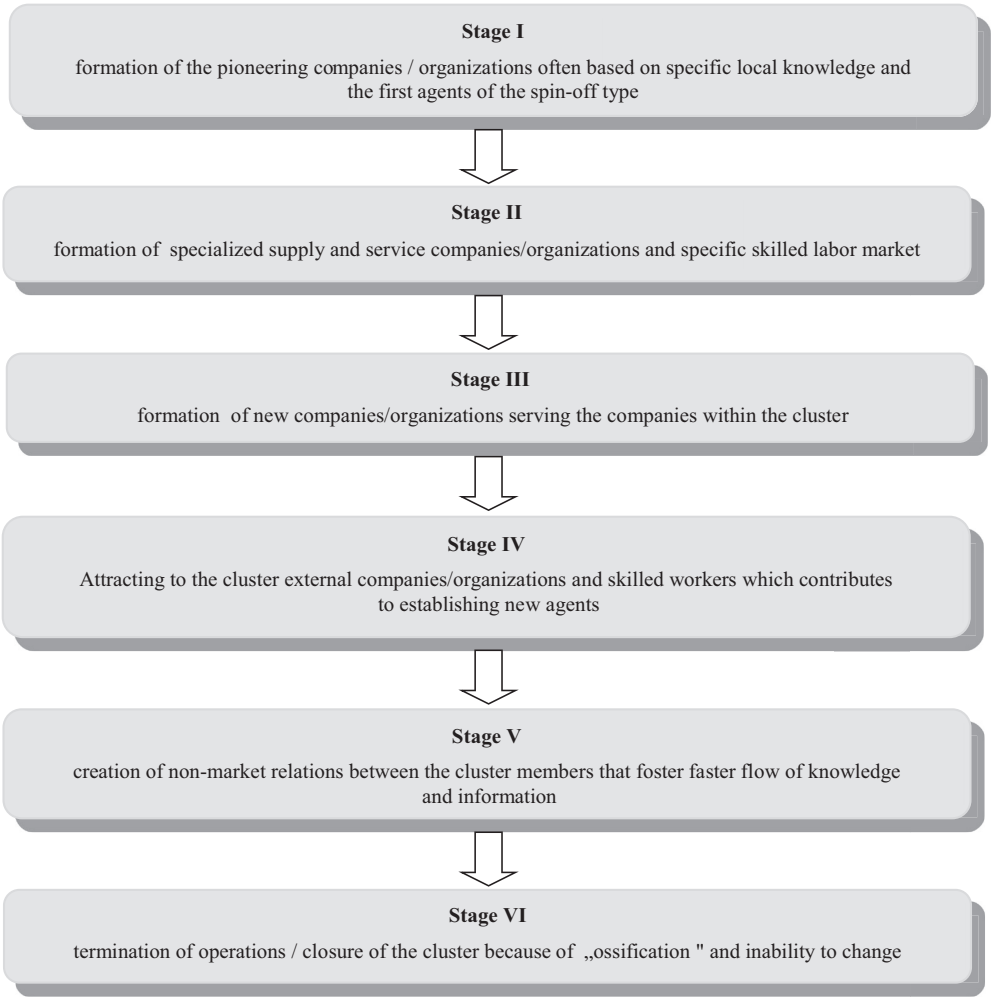
35 This model coincides with four-stage model of product life cycle by R. Vermon – more in: Vernon, R., International Investment and International Trade in the Product Cycle, "Quarterly Journal of Economics" 1966, Vol. 5.

36 Trippl M., *Innovative Cluster in alten Industriegebieten*, LIT Verlag, Wien 2004, p. 45.

37 Comp ex.: Menzel M.-P., Fornahl D., *Unternehmensgründungen und regionale Cluster. Ein Stufenmodell mit quantitativen, qualitative und systemischen Faktoren,* "Zeitschrift fur Wirtschaftsgeographie" 2005 No 49 (3–4), pp. 131–149; *A Practical Guide to Cluster Development*, A Report to the Department of Trade and Industry and the English RDA's by Ecotec Research & Consulting, England's Development Agencies, London 2004, p. 7; Trippl M., *Innovative Cluster …* , op. cit., pp. 45–47; Hermanns A., *Wirtschaftliche Cluster und Wirtschaftsförderung*, GRIN Verlag 2006, pp. 15–18; Skawińska E., Zalewski R., *Klastry biznesowe …* , op. cit., pp. 177–179; *A Practical Guide …* , op. cit., pp. 11–12.

- emergence (embryonic);
- growth (stabilization);
- sustainment;
- decline.

Figure 1.4. Stages of the formation and development of a model cluster



Source: own study based on Porter M.E., *Clusters and Competition: New Agendas for Companies, Governments, and Institutions* [in:] Porter M.E., *On Competition*, Harvard Business School Press, Boston 1997, pp. 197–288; *Regionale Cluster in Europa*, "Beobachtungsnetz der europäischen KMU" 2002, No.3, p. 16.

Emergence of the cluster is very difficult to be defined exactly because cluster that is being formed is actually not a cluster. Few companies that belong to it are "technologically scattered". Diversity of companies is relatively high due to their small number. It may hinder the exchange processes and thus make the cluster development impossible. At this point let's emphasize that we should avoid saying that the cluster was created, because it does not arise from day to day, with signing of the contract or any other document. The cluster does not arise, but forms as a result of a specific process. It goes through various stages of development, evolving from a small network to the ever-increasing one.

The condition for efficient formation and development of the cluster in the embryonic stage is a proposal made by the business representatives. It is important to have the human capital of certain abilities, experience and competence. At this stage design and projecting are important. Such an initiative may be demonstrated by some small companies or a large one. Their bilateral cooperation in networks of horizontal linkages and dissemination of their concealed knowledge due to the trust, are the foundations to create a competitive advantage that results from participation in the cluster and marks the transition to the next stage of its life cycle.

In the growth stage companies increasingly begin to implement expansionary policies, which contribute to the rapid development of the cluster. Additional impulses for growth are also provided by emerging companies (both new members of the cluster – entities from the service, manufacturing, commercial, institutional, etc. environment as well as these newly created in response to the demand[38]). A phenomenon typical for this phase is creation and strengthening of regional networks. In this phase all the benefits of clusters, that are mentioned in the literature, are apparent. They become the driving force behind the dynamic, mutually stimulating processes. Further development of clusters can generally be carried on the basis of two scenarios:

- cluster retains its diversification;
- cluster focuses on increasing specialization.

Especially in the second scenario the effects mentioned above are greatly highlighted. Specialization in a specific product and a narrow field of knowledge is especially likely when the cluster is particularly successful in the area. This way, however, leads to loosing the ability to adapt in the long term. Processes running within the cluster are not the only ones worth attention. It is also important that

38 In the subject literature there are cases of companies which creation resulted from an impulse of university or public authorities.

young clusters with high dynamics of growth begin to increase their regional scope, cause scarcity of production factors and thus step by step adversely affect the ability to compete other, unrelated, regional clusters. Therefore the likelihood of their "outflow" to other regions increases and the danger appears of the emergence of a mono structure region.

When the number of companies in the cluster stabilizes or decreases, it means that its development enters the stage of maturity, the length of which depends largely on the type of sector (it is shorter in IT and longer in the traditional industry). With increasing maturity and standardization of the product, which was originally the main source of the cluster growth, the priority is to achieve the scale of profit / result / income from mass production. At this stage two scenarios are basically possible:

- production is moved to other, cost advantageous places (internationalization of production);
- the degree of concentration in the cluster increases.

In conjunction with the second case – and that is the main aspect of G. Tichy's considerations – the cluster (and eventually the region) gradually loses its power of innovation. In particular it loses the ability to produce / generate radical innovations that could replace the matured products and thus initiate a new cycle. The gradual erosion of the innovation potential has many sources. First of all, it is important that the increase in concentration is inevitably associated with the effect of a fundamental transformation in the cluster internal relations. This means reducing and closing the regional networking. This in turn, leads to declining the availability of a variety of information, relevant to the innovation, which entails a sharp decrease in the probability that the cluster will generate innovation. Consequently, with the progressive aging of the cluster and its member companies, entrepreneurial strategies and abilities take a negative turn. G. Tichy states that it results in defensive pattern of behavior, hostile innovative organizational structures, problems in discovering the importance of new technologies. Companies in matured clusters become increasingly slow and take (in the best case) improvements to existing products, but they are almost unable to generate radical innovation, more and more necessary at this stage[39], which are the first line of young business domain[40]. Not only the ossification

39 Verification of the thesis, that the probability of generating innovation decreases with the aging of the company and the cluster, can be found in works by G. Tichy from 1987 and 1989.

40 Utterback J. M., Suárez F. F., *Innovation, competition, and industry structure*, "Research Policy" 1993, Vol. 22, Issue 1, s. 4; Christensen C.M., Rosenbloom R., *Explaining the attacker's advantage: technological paradigms, organisational dynamics and the value network*, "Research Policy" 1995, Vol. 24, Issue 2, pp. 233–257.

of companies is growing with the progressive aging of the cluster, but also the network links between its agents. Other regional actors and organizations such as labor, government and the trade unions also show increasing slowness, both individually and in their mutual relations.[41]

The cluster can enter the decline stage because of failing to adapt to changes such as: global trends, consumer preferences, technology or information gap on the sales market. The reason for this is, as mentioned earlier, the lack of entrepreneurship in regard to obtaining new skills and new knowledge, information absorption, the inability to obtain and transmit this information in networks of organizational units[42]. In this respect, the role of the intermediary should be assigned to specialized agencies. The cluster decline is always individual, but does not always have to mean stagnation or even complete termination. After the reforms of resources and production, innovation activities in the area of product, business model, etc. its renewed life cycle may occur.

It should be noted that not all of the clusters have to go through the life cycle described above. Whether the cluster is aged according to the scheme depends primarily on two issues: (previous) success of the cluster and its specialization. The more effective the cluster is and the larger is the size of its narrow specialization in traditional products, the higher is the likelihood that it will survive the described phases of aging. However, please note that the creation of a new cluster based on the foundation of the old structure should be regarded as an exception rather than a rule.[43]

In many previous studies the conclusion was drawn that companies in clusters grow faster, are more innovative and are characterized by a significant increase in the number of newly established enterprises.[44] However, some authors have pointed, and still do, that while in the growth stage companies

41 Tichy G., *Clusters: less dispensable and more risky than ever*, [in:] Steiner M. (ed.), *Clusters and Regional Specialization,* Pion Limited, London 1998, pp. 226–237.

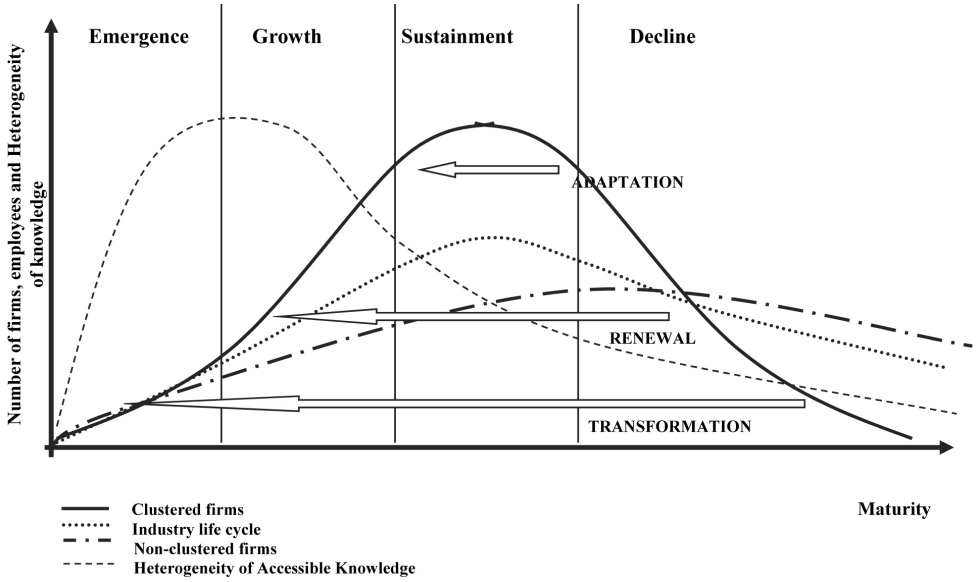
42 More on this subject also in: Wasiluk A., *Modne teorie w zarządzaniu a koncepcja klastrów (przykład z województwa podlaskiego)*, [in:] A. Adamik (ed.), *Zarządzanie relacjami międzyorganizacyjnymi: Doświadczenia i wyzwania*, Politechnika Łódzka, Łódź 2010; Wasiluk A., *Ocena przesłanek do rozwoju klastra w branży metalowej i maszynowej na Podlasiu*, "Współczesne Zarządzanie" 2012, nr 1.

43 Tichy G., *Regionale Kompetenzzyklen – zur Bedeutung von Produktlebenszyklus – und Clusteransätzen im regionalen Kontext,* "Zeitschrift für Wirtschaftsgeographie" 2001, Jg. 45, No. 3+4, pp. 181 –201.

44 Comp. ex.: Swann P., *Clusters in the US Computing Industry*, [in:] Swann P., Prevezer M., Stout D. (eds) *The Dynamics of Industrial Clustering: International Comparisons in Computing and Biotechnology*, Oxford University Press, Oxford 1998; Baptista R., *Clusters, Innovation and Growth*, [in:] Swann P., Prevezer M., Stout D. (eds) *The Dynamics of Industrial Clustering: International Comparisons in Computing and Biotechnology*, Oxford University Press, Oxford 1998; Baptista R., *Do innovations diffuse faster within geographical cluster?*, "International Journal of Industrial Organization" 2000, Vol. 18, Issue 3, pp. 515–535.

that are in the cluster indeed show greater innovation, at a later period, those outside the structure of cluster are more innovative.[45] This is because in the first phase of the cluster formation the diversity is high, as few existing businesses focus on a specific area of technology. With the cluster development the mutual technologic influence of companies increases. Over time, this technologic diversity decreases significantly and may even disappear.

Figure 1.5. Development of clustered and non-clustered firms



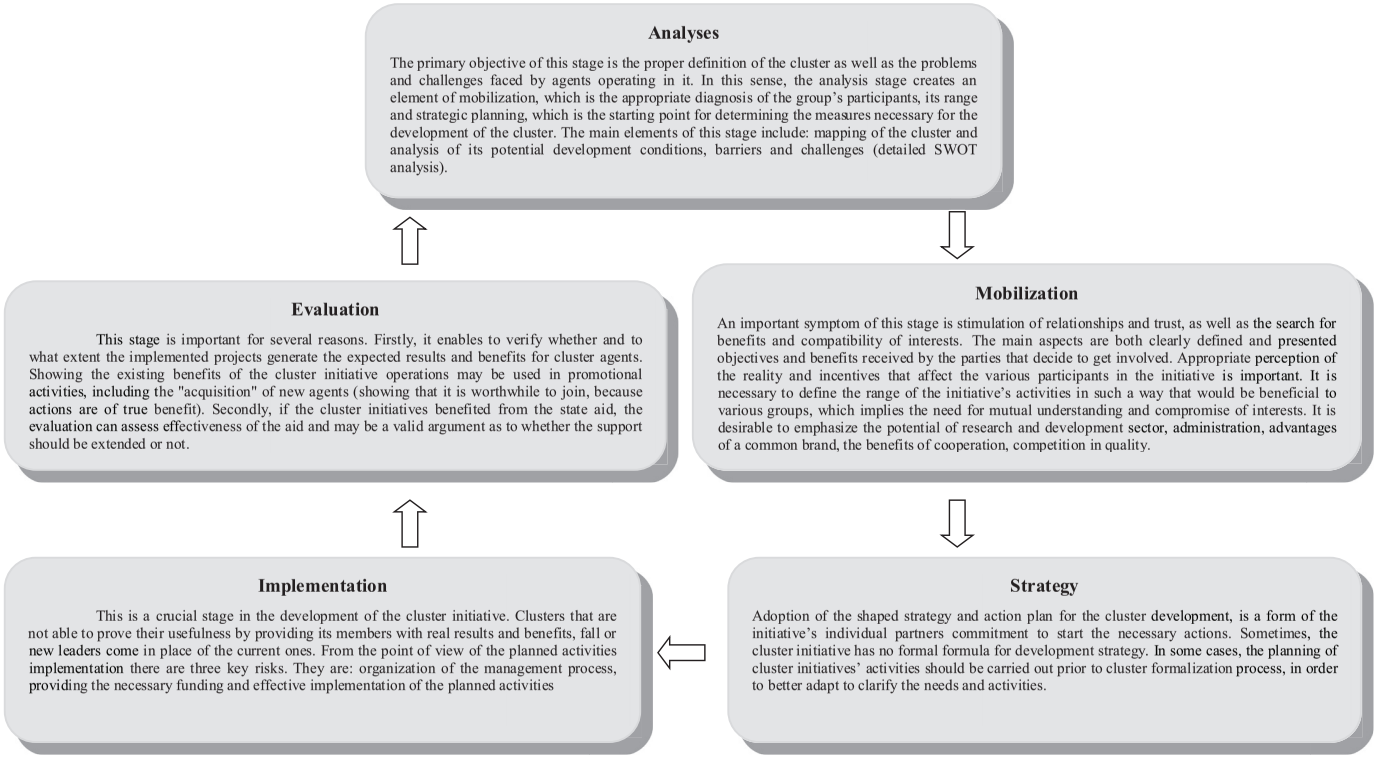
S o u r c e : own study based on: Menzel M.-P., Fornahl D., *Cluster life cycles: dimensions and rationales of cluster development …,* op. cit.; Menzel M.-P., Fornahl D., *Cluster life cycles – dimensions and rationales of cluster evolution …*, op. cit., pp. 205–238.

Similar reasoning can be noted also in the work of G. Tichy[46], who uses the term "cluster paradox". It is based on the fact that on one hand, the narrow specialization of cluster increases the efficiency of technology use by the cluster companies (synergy), on the other hand this strong similarity of companies increases the risk of adverse events occurrence and reduces the likelihood of generating more radical innovations, which would improve the capacity of the cluster to adapt to the environment changes, and thus ensure its steady

45 Comp ex.: Audretsch D. B., Feldman M. P., *R&D spillovers and the geography of innovation and production*, "American Economic Review" 1996, Vol. 86, Issue 3, pp. 630–640.

46 Tichy G., *Regionale Kompetenzzyklen …* , op. cit., pp. 181 –201.

Figure 1.6. Stages of cluster initiative development



S o u r c e : own study based on Borowicz A., Dzierżanowski M., Rybacka M., Szultka S., *Tworzenie i zarządzanie …*, op. cit., pp. 20 –52.

development. The cluster's decline can only be prevented by the proper timing of diversity. Thus, the basis for long-term development of the cluster is knowledge diversity.[47]

G. Tychy's work on the life cycles of clusters also include a discussion on the necessary intervention of different levels state authorities. He includes adaptive skills of regional clusters to the key recommendations. In other words the main role of the state is active counteracting clusters aging and early prevention of their ossification processes. Thus, at the stage of the cluster growth some actions should be taken to prevent too strong specialization and support constant flow of information (incl. the search for new applications of existing knowledge). In the clusters maturity stage national and regional policy makers have to intensify their efforts, especially in areas such as distribution of the information base, search for new clusters, acquiring new skills. However, clusters in the stage of decline constitute a particular challenge for the political-administrative system. Although unambiguous guidance for the activities of the state in dealing with aging clusters can not be formulated, it should be noted that important elements of the recovery strategy may be particularly relevant to the restructuring of companies and breaking of the blocked network links.

As the previous section highlights the cluster initiatives are often identified with the concept of cluster, it seems desirable to analyze also clusters' stages of development. Despite their high diversity several phases or components of the cluster initiative development process can be identified. They are:[48]

- analyses;
- mobilization;
- strategy formulation;
- implementation;
- evaluation.

The development of cluster initiative is a continuous process, which means that at the end of the stage, you can not go to the next stage and forget about the previous one. In practice, these stages are often parallel, and at the completion of each action, there may be the need to repeat it or complement the analysis. For example, while implementing a training project the training needs

47 Comp ex.: Menzel M.-P., Fornahl D., *Cluster life cycles: dimensions and rationales of cluster development*, "Jena Economic Research Papers" 2007 No. 2007-076; Menzel M.-P., Fornahl D., *Cluster life cycles – dimensions and rationales of cluster evolution*, "Industrial and Corporate Change" 2010, Vol. 19, Issue 1, pp. 205–238.

48 Borowicz A., Dzierżanowski M., Rybacka M., Szultka S., *Tworzenie i zarządzanie inicjatywą klastrową*, Instytut Badań nad Gospodarką Rynkową, Gdańsk 2009, p. 20.

of employers should be diagnosed, mobilization of additional partners, and commitment building may be necessary also at the stage of the various projects implementation.

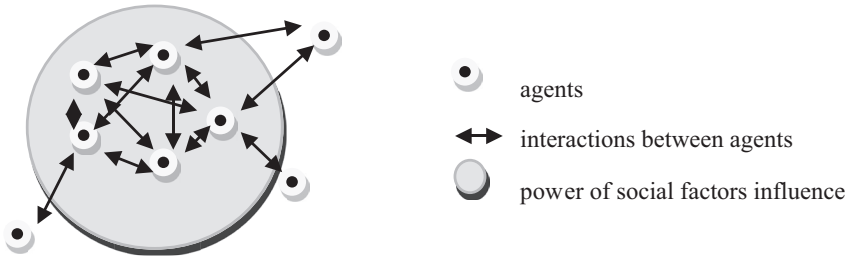
1.3. Typology of clusters

Both the unification of defining clusters and their typology encounter many difficulties. They result from the different locations of clusters, the variations in the segments in which they operate, the strategy used, the time of operation, etc. Due to their uniqueness and characteristics, resulting from the individual economic, geographic and social conditions, creating one correct and complete classification is unrealistic. It is also worth noting that in many studies cluster classifications to be found are based on the number of not always clearly separable criteria.

S. Rosenfeld, distinguishes three types of clusters with a clear focus on social capital:[49]

- working or "overachieving" clusters – they are identified clusters, their members have a sense of membership, they are interdependent and they cooperate in order to achieve higher benefits than they could achieve alone;

Figure 1.7. Scheme of working cluster

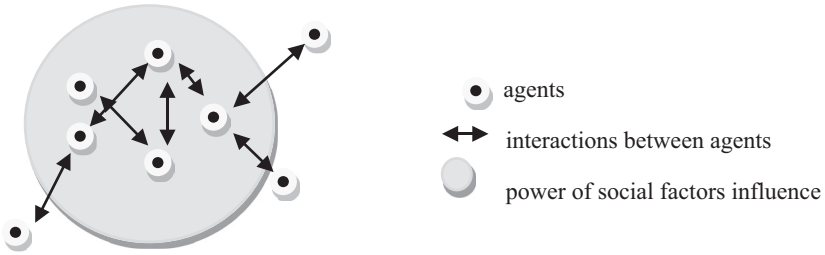


Source: own study based on Rosenfeld, S.A., *Bringing Business …*, op. cit., pp. 3–23.

- latent or 'underachieving clusters – although the potential to create a cluster exists, it is not used, there is no common vision of the future, players do not see themselves as participants in the cluster, there is no exchange of innovative ideas;

49 Rosenfeld, S. A., *Bringing Business …* , op. cit., pp. 3–23.

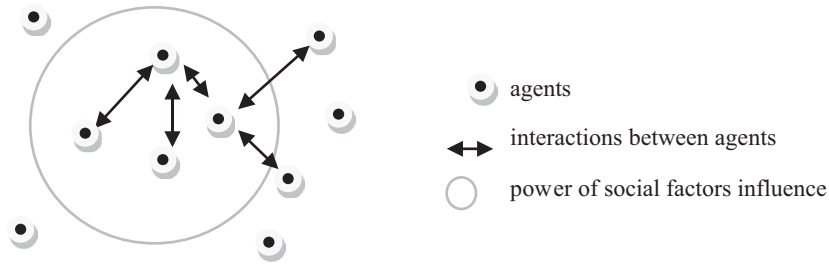
Figure 1.8. Scheme of latent cluster



Source: own study based on Rosenfeld, S. A., *Bringing Business ...,* op. cit., pp. 3–23.

- potential or wannabe clusters – there are conditions for their existence (e.g. technological resources, political support, etc.), but there are too many attributes to achieve the benefits of the cluster (for example, a critical mass, lack of or too weak interactions between agents).

Figure 1.9. Scheme of potential cluster

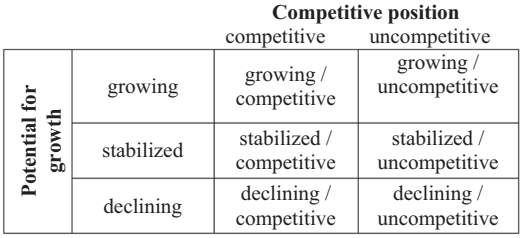


Source: own study based on Rosenfeld, S. A., *Bringing Business ...,* op. cit., pp. 3–23.

The classification proposed by S. Rosenfeld is a modification of the typology of MJ Enright, who took the stage of cluster development as a criterion for the division and development, perceived as a degree of cluster's self-awareness and self-sufficiency.[50] He distinguishes nine basic features of cluster (Table 1.6) to be used at the stage of their cognition and in the phase of describing their development opportunities. He believes that each of these features is a potential

50 Enright M. J., *The Globalization of Competition and the Localization of Competitive Advantage: Policies Toward Regional Clustering*, [in:] Hood N., Young S. (eds.), *The Globalization of Multinational Enterprise Activity and Economic Development*, Macmillan, London 1999.

Table 1.6. Typologies of clusters by M.J Eneight

Typological criteria	Kinds
Geographical coverage	➢ concentrated; ➢ spread
Density	➢ dense; ➢ scattered, dispersed;
Width (number of horizontally related sectors)	➢ wide; ➢ narrow;
Depth (the number of the production chain stages)	➢ deep (usually include all of the production chain stages); ➢ shallow – include one or only few stages of the production chain;
Complexity (technological advancement of activities carried out)	➢ high; ➢ low;
The potential for growth / Competitive position	
Ability to innovate	➢ highly innovative; ➢ poorly innovative;
Cluster organization / structure	➢ core with a coordinator company; ➢ core with leader company; ➢ no coordinator or leader;
Dominant mechanism for coordination and control of participants' behavior	➢ transactions ad hoc (spot markets); ➢ short-term co-relations; ➢ long-term relations; ➢ hierarchy.

Source: own study based on Peters E., Hood N., *Implementing the Cluster* Approach, "International Studies of Management and Organization" 2000, Vol. 30, Issue 2 cit. after: Gorynia M., Jankowska B., *Klastry a międzynarodowa …*, op. cit., p. 41.

typological criterion.[51] It is worth to highlight that the criteria in Table 6 also appear in the classifications by other authors[52].

Bearing in mind four stage life cycle of the cluster the following can be distinguished:[53]

- embryonic clusters, in the initial phase of growth;
- established clusters, which are seen as those with growth potential;
- mature clusters, stable or facing obstacles on the path to further growth;
- declining clusters, the peak of their development has already passed, and their potential is weakening.

Such an evolutionary approach, taking into account the different stages of cluster development, is also reflected in the classification proposed by MP van Dijk and A. Sverrisson (Table 1.7).[54] It is worth to point here to the fact that the

Table 1.7. Typology of clusters by M. P. van Dijk and A. Sverrisson

Type or phase	Observable factor	Main benefit	Action mechanism
Location clusters	Neighbouring companies	Information exchange	Imitation
Local market clusters	Many similar activities	Easy access/ competition	Product development
Local network clusters	Division of work	Specialization	Complementarity
Innovativeness (Innovative clusters)	Local novelties	Improvements ex. materials	Reverse Reenginering
Industrial district	Formal corporations increase	Collective interaction	Collective innovation

S o u r c e : own study based on van Dijk M.P., Sverrisson Á., *Enterprise clusters ...,* op. cit., pp. 183–206.

51 Gorynia M., Jankowska B., *Klastry a międzynarodowa konkurencja i internacjonalizacja przedsiębiorstw*, Difin, Warszawa 2008, pp. 41–42.

52 For example cluster size – its width and depth – make the basis for a division proposed by Dalum B., Ch. Pedersen Ch., Villumsen G., *Technological Life Cycles: Regional Clustering Facing Disruption*, Danish Research Unit for Industrial Dynamics DRUID, "Working Paper" 2002, No 10.

53 *A Practical Guide ...* , op. cit.; Owczarek K., *Klastry sposób na konkurencyjność regionu,* [in:] Owczarek K. (ed.), *Klastry w gospodarce regionu*, Wydawnictwo Politechniki Łódzkiej, Łódź 2010, p. 47.

54 van Dijk M.P., Sverrisson A., *Enterprise clusters ...* , op. cit., p. 188.

typology proposed by them is representative especially for developing countries (in Africa, in Asia) because the first three types of cluster dominate there. The last type pursued by less developed countries, occurs mainly in Western Europe (Germany, Sweden, Italy), but also in India.[55]

The concept of cluster life cycle also refers to the division proposed by E. Skawińska and R. I. Zalewski, who accepted their own criteria for cluster dynamics and identified:[56]

- initial clusters (newly formed, newly created);
- consequential clusters (renewed / with additional life cycle, revitalized).

In the subject literature, authors often refer to the typology proposed by the UK Department of Trade and Industry, based on divisions described in the work of D. Jacobs and M. de Jong[57] and D. Jacobs and A. de Man[58]. The division of clusters was made there according to:[59]

- vertical production chain – the core of the cluster is composed by companies neighbouring in the added value chain and the vertical links in the production processes are of key importance;
- aggregation of connected sectors – multiscale type of cluster defined by M. Porter that include four parts: final goods production segment, machines and equipment, specialized input and support service;
- regional cluster – refers to aggregation of related sectors concentrated within the region which determines its global appeal;
- industrial district – local concentration of small and medium companies that specialize in different stages of the production process, with strong links to the local environment, benefiting from high level of trust and co-operation ties;
- the network – specific kind of relations between economic agents that may, but do not have to be spatially concentrated, based on interrelations, trust and cooperation;
- the innovative milieu – this type of cluster refers to the local concentration of high-tech industry, where the co-ordination of economic and

55 Gorynia M., Jankowska B., *Klastry a międzynarodowa…* , op. cit., p. 43.

56 Skawińska E., Zalewski R.I., *Klastry biznesowe …* , op. cit., p. 180.

57 Jacobs D., de Jong M.W., *Industrial clusters and the competitiveness of the Netherlands: Empirical and conceptual issues*, "De Economist" 1992, Vol 140, No. 2, pp. 233–252.

58 Jacobs D., de Man A.P, *Clusters, industrial policy and firm Strategy: A menu approach*, "Technology Analysis and Strategic Management" 1996, Vol. 8, No. 4, pp. 425–437.

59 *Business Clusters In the UK – A First Assessment. Volume 3 Technical Annexes. A report for the Department of Trade and Industry by a consortium led by Trends Business Research*, February 2001, pp. 4–5.

institutional factors aim at the efficient creation and distribution of knowledge and effective learning.

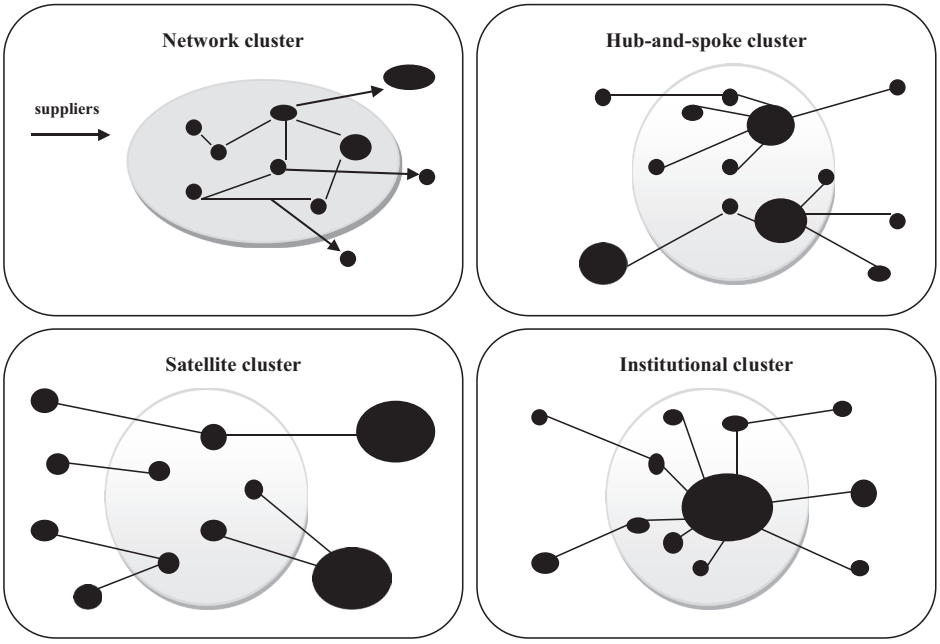
Typology proposed by A. Markusen[60] is very often quoted. It differentiates four kind of clusters on the basis of the agents size and ownership structure:[61]

- Network cluster (related to Italian industrial districts, marshall type) – characterized by domination of small and medium-sized enterprises, strong specialization, strong competition with each other, functioning network system is based primarily on trust. The occurrence of these circumstances allows for high productivity, flexible specialization and creates the potential for innovation. Thanks to the cluster local infrastructure supports specialized sales, service and a network of suppliers.
- hub-and-spoke type cluster (axis and spoke) – is characterized by the coexistence of large local companies, linked hierarchically, with an extensive group of SMEs. A cluster of this type is based largely on the strength of large local corporations and simultaneously outstands with flexibility as well as the use of cost advantages. Cooperation among competing small businesses is relatively small, the labor market is less flexible than in the network cluster and the level of regional development depends on the central company/companies.
- Satellite cluster – characterized by a predominant share of companies whose headquarters are located outside the cluster. The cooperation between the companies in the cluster is minimal because most relationships are chains of goods and services from external companies. The reasons for this type of cluster formation are the benefits of suitable location that enables lowering costs such as, for example, access to cheap labor.
- Institutional cluster – dominated by public and non-profit institutions that attract goods and services suppliers. First responsibility of small businesses is to meet the demand of awarding institutions, but in the

60 In Polish literature the authorship of this classification is often attributed to J. Meyer-Stamer, although he in his paper clearly refers to A. Markusen – See: Knorringa, P., Meyer-Stamer, J., *New dimensions in local enterprise cooperation and development: from clusters to industrial districts*, [in:] UNCTAD (ed.), *New Approaches to Science and Technology Cooperation and Capacity Building*, New York, Geneva: United Nations quoted after: Meyer-Stamer J., *Strategien lokaler/regionaler Entwicklung: Cluster, Standortpolitik und systemische Wettbewerbsfähigkeit*, http://www.meyer-stamer.de/1999/nsa.pdf as of 09.03.2013.

61 Markusen, A., *Sticky Places in Slippery Space: A Typology of Industrial Districts*, "Economic Geography" 1996, No 72, pp. 293–313.

Figure 1.10. Concepts of clusters by A. Markusen



Source: own study based on *Development of Industry Clusters*, Development Administration U.S. Department of Commerce, Carnegie Mellon Centre 2004, pp. 24–31.

course of the cluster development the superiority of large companies may be increasingly irrelevant, as companies become equal partners.

Some similarities to the division presented above can be seen in the considerations of A.M. Rugman and A. Verbeke[62], who used in their classification of clusters a combination of two criteria: geographical orientation of firms and the presence or absence of the dominant companies in the cluster (Table 1.8).

Similar to A. Markusen's approach to the types of clusters is also presented in regard to their classification by country of "origin", although it highlights the fact that these forms are also spread in other countries. This division allows for distinguishing an Italian, Danish and Dutch model of cluster. Although in the literature an "American cluster model" can be found, which is based on the cooperation of large enterprises related hierarchically to lots of small ones (Figure 1.11) this model is identical to the hub-and-spoke cluster.

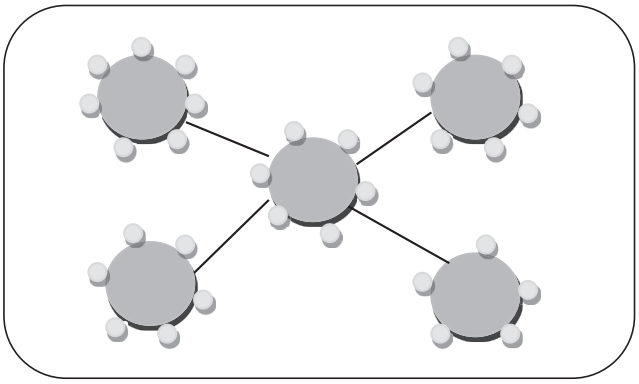
62 Rugman A.M., Verbeke A., *Multinational Enterprises and Clusters: An Organizing Framework*, "Management International Review" 2003, Vol. 43, Issue 3, pp. 151–169.

Table 1.8. Classification of clusters by A. M. Rugman and A. Verbeke

		Domination of cluster participants	
		symmetric	
Geographic orientation	national	➢ Model Porter's cluster; ➢ No dominant companies EXAMPLE: Italian ceramics industry districts	➢ One or more big companies dominate the other cluster members and constitute the basis of cluster operations. EXAMPLE: clusters in traditional industries
	Trans-border	➢ Important role of international factors; ➢ Companies have relations abroad for ex. export, co-operation.	➢ Important role of international factors; ➢ The key role of international links of one or more leading companies EXAMPLE: telecommunication

S o u r c e : own study based on Rugman A.M., Verbeke A., *Multinational Enterprises …,* op. cit., pp. 151–169.

Figure 1.11. American model of cluster



S o u r c e : own study based on Mikulec Ł., *Analiza przykładów organizacji klastrów i zarządzania nimi – baza dobrych praktyk*, Report prepared within the project "Innowacyjny śląski klaster czystych technologii węglowych". Report not published quoted after Staszewska J., *Klaster perspektywą dla przedsiębiorców na polskim rynku turystycznym*, Difin, Warszawa 2009, p. 69.

The Italian model, sometimes called "Third Italy" model is primarily based on unofficial links, it is characterized by lack of formal structure or a separate management structure and no capital relations. It should also be noted that there are strong family ties in companies and between firms and relations between companies are initiated by their owners. Moreover, in these clusters, there is a long tradition of strong guilds, high independence from the central government and a strong awareness of regional autonomy.[63] There is usually no network broker in Italian clusters, but if this happens, the role is often played by the public sector agency, business development agency, association or a commercial company.[64] The tasks of such a broker depend on the phase of the cluster life cycle (Figure 1.12).

Figure 1.12. Broker's tasks in different phases of the cluster life cycle

S o u r c e : own study based on Staszewska J., *Klaster perspektywą …*, op. cit., pp. 66–67.

The key role in the Danish model[65] is played by a network broker, whose task is to initiate contacts between partners and co-ordinate cluster activities. This model was introduced, in Hungary, among other countries, while its modified versions that included cultural and economic differences, were also introduced in Canada, the United States, Great Britain, Australia and New Zealand[66].

A modified version of the Danish model is a Dutch model, in which strong emphasis is usually placed on innovativeness and close cooperation of companies and R&D institutes, resulting in a significant reduction in the cost of

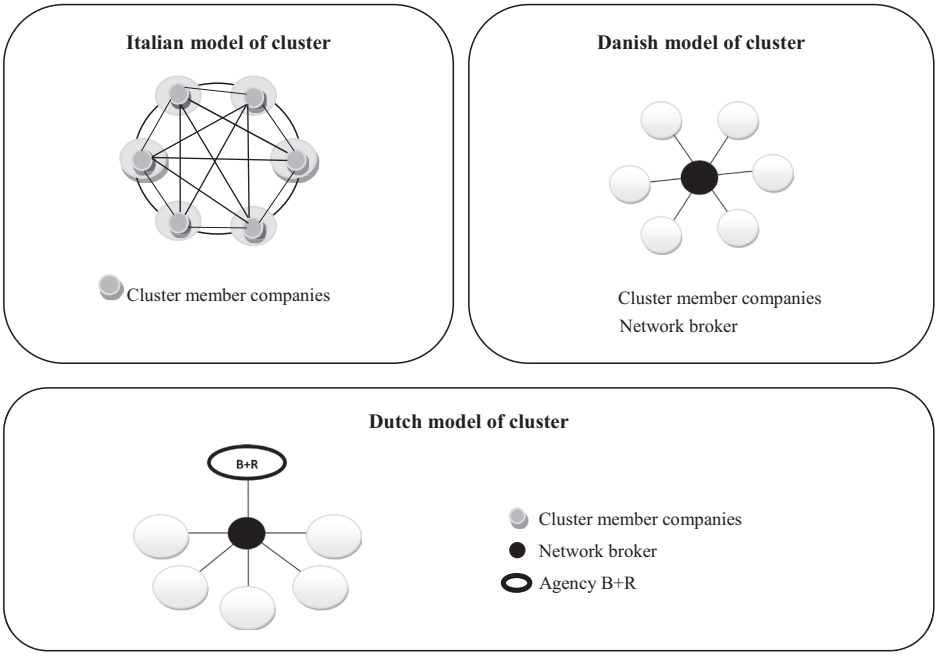
63 Bojar E., *Clusters – the Concept and Types. Examples Cluster's in Poland,* [in:] Bojar E., Olesiński Z. (eds.), *The emergence and development of clusters in Poland*, Difin, Warszawa 2007, p. 27.

64 Staszewska J., *Klaster perspektywą …* , op. cit., p. 66.

65 It was developed during the implementation of the network program which was aimed at co-operation, by the Danish government in 1988–1993.

66 Gorynia M., Jankowska B., *Klastry a międzynarodowa …* , op. cit., p. 46.

Figure 1.13. Italian, Danish and Dutch models of clusters



Source: own study based on: Karaś E., *Badania stanu wiedzy na temat klastrów i inicjatyw klastrowych w województwie opolskim. Desk Research,* [in:] Duczmal W., Potwora W. (eds.), *Klastry i inicjatywy klastrowe w województwie opolskim*, Wyższa Szkoła Zarządzania i Administracji w Opolu, Opole 2010, pp. 21–22.

deploying equipment and technology. The role of the network broker, mainly to stimulate clusters and provide them with information concerning the benefits of clustering and to share resources in the form of contacts, information and funds, is usually played by an appropriate authority (Figure 1.13).

T. Altenburg and J. Meyer-Stamer[67] draw attention to the fact that theoretical considerations about clusters are usually based on experience of developed countries, but in practice, these considerations do not fit the realities in developing countries[68]. Therefore, three types of clusters were defined for those areas:[69]

- Survival clusters –are clusters of small companies and their characteristic features are: low social capital, general lack of trust, destructive

67 Altenburg, T., Meyer-Stamer, J., *How to Promote Clusters: Policy Experiences from Latin America*, "World Development" 1999, Vol. 27, No. 9.

68 Certain exception is the classification by P. van Dijk and A. Sverrisson, mentioned above in this paper.

69 Meyer-Stamer J., *Strategien lokaler …* , op. cit.

competition and low innovation. The main weakness of this type of cluster is that all of the companies produce more or less the same, and product innovation of one of them, which is successful in the market, leads in the short term to its imitation by the others, which results again in production of the same product by all companies. Both technical and marketing competences are poorly developed (entrepreneurs are often illiterate). These clusters are of very limited development potential.

- Fordistische Clusters – this type of cluster corresponds to hub-and-spoke cluster. These clusters are usually of high potential for development and are often dominated by big companies. In these structures there are some desirable initial conditions to improve the competitive skills and adapt to new, more difficult operating conditions. However, at the same time, there are plenty of common reasons that are in opposition to the benefits offered by clusters. Businesses try, as much as possible, to reduce their dependence on other companies, in particular, from suppliers. Local management culture is formed, which is characterized by rare contacts between companies (often further intensified by the rivalry between families).
- Transnationale Clusters – is the type of cluster more and more present in the developing countries. They result from a changed strategy of international companies. In developing countries the clusters are formed not only by the final products manufacturers, but also the number of suppliers, that are transnational companies, increases in them. National companies are not included in these structures for two main reasons. Usually, there are no domestic companies that are able to meet the global demand. If, however, such domestic companies emerge, they are taken over by international companies operating globally. The role for small local businesses is the "second-class" suppliers, however, as such they encounter difficulties, because the supply system prefers to import from intermediates.

M.H. Best divides clusters into:[70]

- static – these are clusters that use the economics of operating locations, with limited innovation (most of the world industries operate according to this model).
- dynamic – these are clusters based on permanent improvement of processes, employees and services.

70 Best H.M., *The New Competitive Advantage. The Renewal of American Industry,* Oxford University Press, Oxford 2001, p. 69.

According to the European Organization for Cooperation and Development (OECD), the clusters can be divided into the following types:[71]

- knowledge based – these are clusters that use directly the results of research carried out in the research centers, both public and private. This type of cluster is composed of innovative companies that belong to high-tech sector, they are research intensive and interested in working closely with universities as well as R&D institutes conducting advanced research projects. These clusters are usually formed by strong research institutions from the public sector and are characterized by close co-operation with it. The clusters emerge especially in industries such as pharmaceutical, chemical, electronics and aviation.
- Based on economies of scale – firms within the clusters benefit from innovative solutions to a much lesser extent, instead they conduct their own research, on a small scale however; they are also related to technical institutes and universities. Implementation of innovations is planned in details and changes, due to the high costs of companies' reorganizations, are in most cases introduced on a permanent basis. The main external sources of technology are specialized suppliers of equipment and components. Their innovative effectiveness depends on their ability to import and create, their knowledge generated elsewhere, especially as regards to the improvement process. Companies developing in such clusters usually represent food industry, automotive and civil engineering.
- Dependent on the supplier – (forestry, agriculture and traditional processing industry i.e. furniture, textile, metal industry and services) activities in these clusters are aimed at technology import in the form of finished or semi-finished products. Companies operating in such clusters do not have specialized R&D units, they use the finished products and innovation processes generated by external companies. Innovation activities of these companies depend largely on their ability to cooperate with suppliers and agents providing after-sales services
- Specialized suppliers – these clusters concentrate different suppliers, buyers and users. Companies have a significant R&D intensity. They specialize in innovative products that are distributed directly to users, so their relationship with the final recipients are particularly important.

71 Hermaniuk J., Piotrowski M., *Formy organizacyjno-prawne i procedury funkcjonowania klastrów w kraju i za granicą: analiza porównawcza: studium typu desk research: raport,* Instytut Gospodarki Wyższej Szkoły Informacji i Zarządzania, Rzeszów 2010, p. 10; www.wsz-pou.edu.pl as on 09.03.2013.

Such companies produce elements of complex production systems, mainly in the form of machinery, components, instruments and software.

- Information intensive clusters – these are typically entities that provide services in the area of wholesale trade, finance, publishing and travel companies in which creating and managing systems of information processing are complex.

There are various other typologies in the subject literature due to different criteria applied, which are summarized in Table 1.9.

The Japanese clusters division seems worthy presentation due to the time of their creation. Many experts believe that a key advantage of Japan, classified

Table 1.9. Types of clusters

Criteria of division	Types of clusters
Ability to create workplace	➢ employment increase; ➢ stable employment; ➢ decreasing employment; ➢ stable; ➢ unstable;
Geographic scope of cluster	➢ local; ➢ regional; ➢ transnational; ➢ domestic/national; ➢ trans-border; ➢ international;
Cluster scale and character	➢ mega clusters; ➢ meso-clusters; ➢ micro clusters;
Competitive position	➢ worldwide; ➢ national; ➢ good; ➢ average; ➢ poor;
Size of companies that belong to the cluster	➢ big companies; ➢ small and medium; ➢ mixed;

Table 1.9 continue

Kind of the offered product/activity	➢ industrial; ➢ agricultural; ➢ service; ➢ financial; ➢ construction; ➢ IC;
Technological advancement level	➢ high-tech (highly innovative); ➢ middle technologies; ➢ low technologies (poorly innovative);
Main factor	➢ resource (raw materials, conditions); ➢ intellectual (human capital quality, environment quality) ➢ with foreign capital; --- ➢ cost; ➢ resource; ➢ innovative;
Connection of the main industry in cluster with its localization	➢ local industry (close localization of suppliers and customers); ➢ based on natural resources (localization close to natural resources); ➢ free choice of localisation.

S o u r c e : own work based on: Boekholt P., Thuriaux B., *Public policies to facilitate clusters: background, rationale and policy practices in international perspective*, [in:] *Boosting Innovation: The Cluster Approach*, OECD, Paris 1999, pp. 381– 412; Skawińska E., Zalewski R.I., *Klastry biznesowe …*, op. cit., p. 180; Ketels Ch., *European Clusters,* [in:] Menzel T. (ed.), *Innovative City and Business Regions*, "Structural Change in Europe" 2004, Vol. 3; Seeley E.L., *A New View on Management Decisions that Lead to Locating Facilities in Industrial Clusters,* "The Journal of Business Inquiry" 2011, Vol. 10, Issue 1, pp. 81–94.

as one of the leading industrial powers of the world, are strong and developed clusters. In Japan, there are four main types of clusters[72]:

- Jiba-sangy – industrial clusters including small and medium companies in close location
- Sangyo-shuseki – industrial agglomerations in the geographical area in which small and medium-sized companies operate as suppliers around large companies or research centers

72 http://pi.gov.pl, as of 15.09.2012. More on the subject of network and clusters in: Lincoln J.R., Masahiro S., *Business Networks In Postwar Japan: Wither the Keiretsu?*, The Oxford Handbook of Business Groups, Oxford 2010.

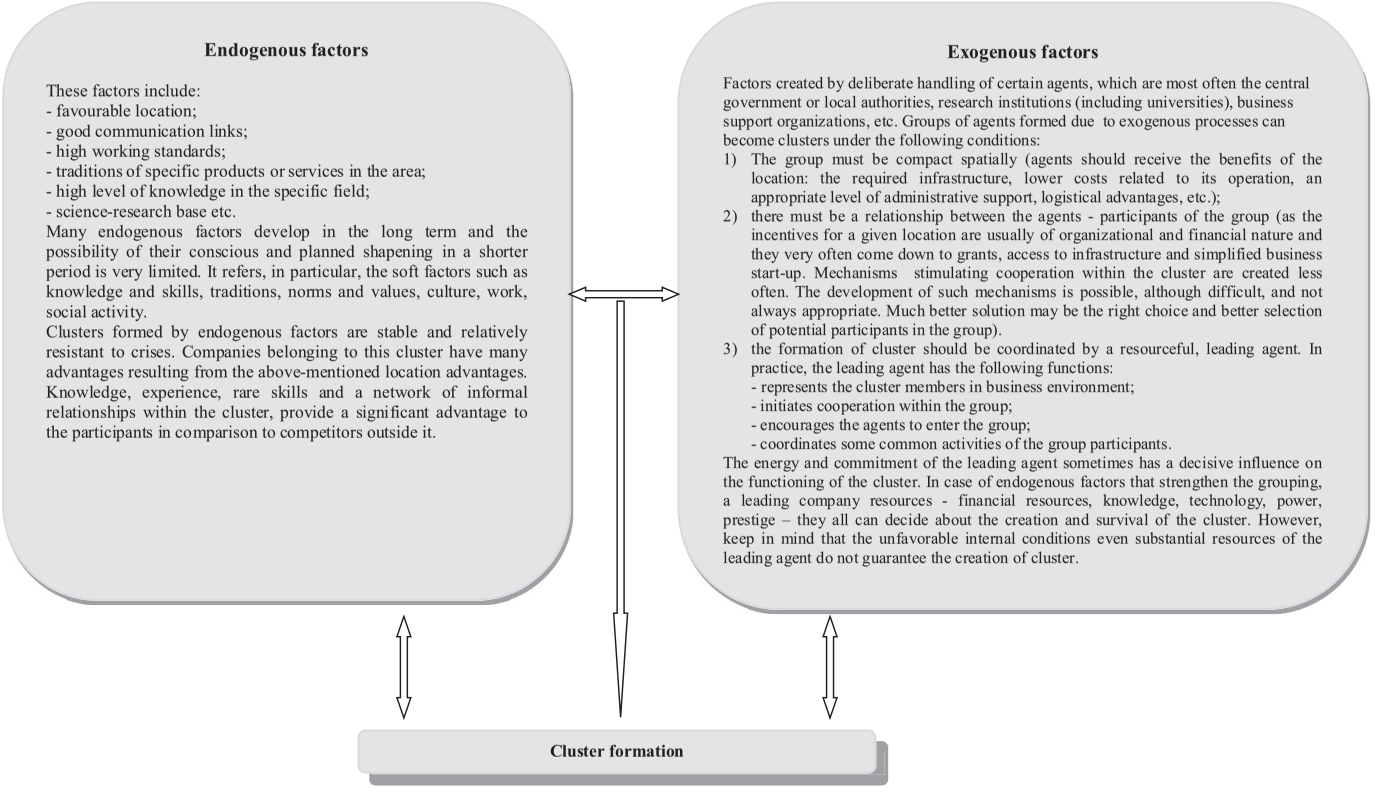
- Konbinato – created on the coasts, in order to benefit from the positive geographical locations, which greatly reduce the costs associated with importing raw materials and exporting products. Clusters of this type caused dynamic economic boom in Japan
- Just-in-time-delivery – these are clusters related to assembly of products; they are based on the outsourcing of services. More types of clusters can be further distinguished, such as clusters in the form of "towns" or clusters in the form of production regions.

Summing up considerations on the themes discussed in this chapter we should emphasize that the classification of clusters is extremely difficult due to their diversity and individual character. Each of them is formed in order to achieve various purposes, using the exceptional regional resources. Therefore, in the subject literature there are many different typologies that attempt to group them according to certain common features. However, we should always keep in mind the individual and unique nature of each cluster.

1.4. Determinants of cluster development

It seems that due to the complexity of the occurring developments, the possibility to control or manage the process of cluster formation is very limited. It is difficult to determine definitely whether endogenous (internal) or exogenous (external) factors are mainly important in the formation and development of clusters. One and the other theorem have some supporters, both among scholars and policy makers in the field of business and administration. It can be certainly concluded, that the formation and development of clusters result from positive feedback. The boundary between endogenous and exogenous factors of cluster formation, as it often happens, ceases to be sharp and the appearance of stimulators from one group is conditioned by the presence of the factors from the other group (Figure 1.14.). A situation when one of the agents initiates the cluster structure formation, e.g. by launching a significant investment which attracts the cooperating companies and other entities, can serve as an example. Success of the companies activates the mechanism of attracting different investors, businesses and institutions. This, in turn, promotes the creation of an appropriate technical and social infrastructure, which is an incentive for other agents.

Figure 1.14. *Endogenous and exogenous factors of cluster formation*



Source: own study based on: Pasieczny J., *Czynniki i uwarunkowania procesu tworzenia i rozwoju klastrów,* [in:] Bojar E. (ed.), *Klastry jako narzędzia lokalnego i regionalnego rozwoju gospodarczego*, Published by Politechnika Lubelska, Lublin 2006, pp. 90–93.

Some scholars criticize focusing on social and cultural factors influencing cluster development and operations. The importance of non-economic factors is the subject of major controversies in the interpretation of the origin of the regional clusters development, although many studies on regional production systems carried out after 1970 emphasized the close interaction between industrial organizations with their achievements, and historically and regionally conditioned socio – cultural factors.[73] Theoretical approaches commonly explain that the dynamics of cluster development begins with a discussion of economic motives, followed by socio – cultural ones. Compilation of approaches in example theories is presented in Table 1.10.

Table 1.10. Approaches to economic and socio-cultural factors of cluster development and some similar terms in example theories

Industrial districts	Californian school	Nordic school
Their development is based on numerous social and cultural factors that are typical for the discussed society. Mutual trust and "industrial atmosphere" are important features. These factors additionally stimulate development of innovations in local companies.	It dealt with the analysis of new industrial areas development, emphasizing the vertical disintegration of production chains, which should have lead to concentration of firms in order to reduce transaction costs and create a specific labor market. At the beginning the structural approach was accepted. It referred to some universal cause and effect mechanisms. Soon, however, attention was shifted to examine the role of culture and institutions in the development of new industrial areas. The region was considered a place where the norms and rules influence operations of agents under conditions of uncertaintv.	Innovation, which is the basis for achieving businesses, regions and nations competitiveness, is considered a complex and interactive learning process, in which cooperation and mutual trust is particularly important. They play a key role in acquiring knowledge in particular of an informal nature.

Source: own study based on: Asheim B. T., *Flexible specialization, industrial districts and small firms: a critical appraisal*, [in:] Ernste H., Meier V. (eds.), *Regional Development and Contemporary Industrial Response. Extending Flexible Specialization*, Belhaven Press, London, pp. 45–63; Scott A. J., *New Industrial Spaces*, Pion Ltd, London 1988; Scott A.J., *Flexible production systems and regional development: the rise of new industrial spaces in North America and western Europe*, "International Journal of Urban and Regional Research" 1988, Vol. 12, Issue 2, pp. 171–186, Lundvall B.Å., Johnson B., *The Learning Economy*, "Journal of Industry Studies" 1994, Vol. 1, No. 2; Greta M., Lewandowski K., *Euroregiony jako …*, op. cit., p. 99.

73 Stoper M., *Regional technology Policie In Europe: A reflection on TSER Research Project 1998 – 2000*, European Commission, Brussels 2000 cyt. za Greta M., Lewandowski K., *Euroregiony jako czynniki sprzyjające tworzeniu klastrów,* [in:] Bojar E. (ed.), *Klastry jako narzędzia lokalnego i regionalnego rozwoju gospodarczego*, Published by Politechnika Lubelska, Lublin 2006, p. 95.

Both hard and soft factors that support and hinder the clusters formation in Poland can also be identified among the endogenous and exogenous factors (Table 1.11).

Table 1.11. Hard and soft factors that support and hinder cluster formation in Polan

Factors		supporting	hindering
Endogenous	hard	➢ clear differentiation of technical infrastructure quality in selected locations; ➢ incentives for entrepreneurs; ➢ proximity of big markets; ➢ numerous business incubators; ➢ differentiation of local governments efficiency.	➢ Insufficient policy of business support ➢ bureaucracy; ➢ high costs of starting a company; ➢ no support for innovative activities.
	soft	➢ Manufacturing tradition in certain locations; ➢ regionally differentiated access to appropriately qualified staff.	➢ Low level of social trust; ➢ Research institutions preference for teaching activities; ➢ No interest from companies in cooperation with R&D sphere.
Egzogenous	hard	➢ Good technical infrastructure in selected locations; ➢ Proximity of absorbent national and international markets; ➢ Attractive real estate prices.	➢ Poor transport infrastructure; ➢ Unclear ownership structure of real estate; ➢ No spatial development plans in many locations; ➢ numerous bureaucratic obstacles.
	soft	➢ high activity of some local governments in attracting investors; ➢ high culture and great industrial tradition in selected locations.	➢ frequent distrust toward the outside (especially foreign) investors.

S o u r c e : own work based on: Pasieczny J., *Czynniki i uwarunkowania …*, op. cit., p. 95.

E. Bojar and J. Bis claim that the barriers to be overcome in the process of forming and subsequent operation of clusters can be seen on three levels:

1) companies area;
2) enterprises and support institutions area;
3) companies and the public sector area.

Table 1.12. Clustering process barriers

Area	Barriers
Companies area	➢ unwillingness to cooperate with competitors that may arise from adversity in the intentions and goals of individual companies, mutual distrust, bad experience with the existing cooperation; concerns regarding illegal imitation; ➢ lack of knowledge about the principles and benefits of the cluster operations; ➢ creation of spin-offs * (employers afraid of losing their skilled workers for the competitors or for the benefit of spin-offs); ➢ no leader in the industry, or the active involvement of companies acting as leaders in the process of cluster formation; ➢ the need to share the benefits resulting from cooperation (the problem may occur especially when the company not involved actively in the cluster work benefits from the joint efforts of others – the problem of "free-rider" that could lead to attempts of collusion cartel within the cluster).
Enterprises and support institutions area	➢ Problems with co-operation between schools and scientists; ➢ different goals of scientists and entrepreneurs (scientists tend to study the problem and publish their research results as soon as possible and as wide as possible. In contrast, entrepreneurs need quick solutions to problems and confidentiality of the research results); ➢ more interest in cooperation with research centers, chambers of commerce, business associations, etc. of large companies than small and medium-sized (therefore there is a danger that if the main initiators of the cluster are large, small and medium companies reluctance to participate can grow); ➢ Polish R&D units have a little understanding of business processes, financial problems and project rather than on process focus (especially the latter feature is not acceptable in clustering. Some argue that forming of a well-functioning cluster takes min. 10 years).
Companies and the public sector area	➢ limited trust of entrepreneurs to government initiatives; ➢ bad or inefficient initiatives of local and national authorities (for ex. each location of research and science centers, formation of clusters around obsolete industries and economy sectors, etc.); ➢ lack of support from public institutions (waiting for the effects of the cluster operations is much longer than the term of office, but the costs are now and problems need to be solved now. That can discourage the authorities to take such long-term initiatives.

* new entities selected from the parent company employees set up to commercialize the knowledge and skills of the research team working at a university or in industry.

Source: own study based on: Bojar E., Bis J., *Czynniki zagrażające klasteringowi – efektywnemu kreowaniu i funkcjonowaniu klastrów gospodarczych w Polsce*, [in:] Bojar E. (ed.), *Klastry jako narzędzia lokalnego i regionalnego rozwoju gospodarczego,* Published by Politechnika Lubelska, Lublin 2006, pp. 175 –178; Alm H., Mc Kelvey M., *When does Cooperation Positively or Negatively Affect Innovation? An Exploration into Turbulent Waters,* Discussion Paper no 39 at Center for Research on Innovation and Competition, University of Manchester, Manchester 2000; Mayer – Stamer J., *Obstracles to Cooperation …*, op. cit.

A different division of clusters was made by D. Smoleń, who divides them into:[74]

- Organizational – legal barriers:
  - Institutional – legal barriers (low quality of existing regulations, frequently changing regulations, excessive taxes);
  - Administrative barriers (too low quality of administration activities at both central and local levels, slowing business groups cooperation processes, slowness of the courts in civil cases, and especially in pursuing claims, excessively high legal fees);
  - Organizational barriers (narrow range of teaching in the field of clustering, limited access to good practice in clusters, no mechanisms of information and experience exchange among cluster participants);
- Historical – cultural barriers (mentality of Polish entrepreneurs – the culture of competition is dominant instead of a typical cooperative competition, no confidence in the competitors, the reluctance to participate in associations. The other barriers in this group include: limited awareness of regional authorities of the need to include clusters into regional innovation strategies, too little openness of the authorities to the exchange of information on clustering, no awareness of business environment institutions in terms of their role in improving cluster participants innovation, especially small and medium-sized companies; low regional public awareness of the innovation-oriented impact of clusters on the level of public life).
- Economic – financial barriers (high costs of doing business, taxes, additional charges and fees, insufficient inclusion of cluster model in shaping and implementation of local and regional development policies, lack of resources in the region to direct support to cluster initiatives, the central character of clustering support instruments within the Structural Funds).

The barrier to the clusters development can be also too high interference by the central government or local authorities in the functioning of cluster. The authorities can stimulate the development of the cluster in four areas:[75]

74 Smoleń D., *Bariery organizacyjno – prawne funkcjonowania klastrów w Polsce,* [in:] Bojar E. (ed.), *Klastry jako narzędzia lokalnego i regionalnego rozwoju gospodarczego,* Published by Politechnika Lubelska, Lublin 2006, pp. 190–191.

75 Komor A., Matras-Bolibok A., Żelazko B., *Klaster przemysłowy jako zjawisko przestrzenne w teorii i praktyce*, [in:] Bojar E. (ed.), *Klastry jako narzędzia lokalnego i regionalnego rozwoju gospodarczego*, Published by Politechnika Lubelska, Lublin 2006, p. 55.

- developing the infrastructure tailored to the specific requirements of the industry, which is the cluster basis, expanding the education and training offer to support research and development;
- organizing and co-organizing a meeting forum for cluster members, promoting and encouraging cooperation, creating institutionalized forms of support i.e technological or industrial parks;
- creating or pressing to create the regulations stimulating innovation in business, acting as a buyer of cluster products;
- eliminating competition barriers and promoting the cluster export capacity.

According to the cluster structure makers, the main issue in their development strategy is to identify the areas that would be the drive of development. An important factor are the people, *"who would believe that such a development is possible and would take the initiative to build relationships for the cluster development"*[76]. Social capital and human capital are also important for another reason. The idea is that clusters are based on formal and informal contacts, and it is the social factor that determines the efficient flow of information and knowledge and the quality of cooperation between participants. For the cluster to be effective, it is necessary to create the right atmosphere of mutual partnership between its participants, otherwise, it can lead to a loss of competitiveness of the structure[77]. The ability to form a group depends on, among others, the degree to which a community recognizes and shares a set of values and norms. It also depends on how the members of the community are able to sacrifice individual interests for the sake of group interests.[78]

Research on the importance of cluster formation conditions indicate that mutual relations, cooperation and partnership of activities are the primary factors affecting the formation of clusters in the initial period. Other very important initiatives, such as marketing and lobbying, finance and cluster initiatives, organization and management, strategic context, communication and interaction, training and experience become important later on in the course of joint work.[79]

76 Szultka S., Brodzicki T., *Klastry. Innowacyjne wyzwanie dla Polski*, Instytut Badań nad Gospodarką Rynkową, Gdańsk 2004, p. 30.

77 Lecznar M., *Koncepcja klastrów a podnoszenie konkurencyjności regionu Podkarpacia w dobie globalizacji*, p.100, e-document.

78 Fukuyama F., *Zaufanie. Kapitał społeczny a droga do dobrobytu*, PWN, Warszawa 1997, p. 20.

79 *Accelerating the establishment of luster and company networks*, Program Promotion of Innovation and Encouragement of SME Participation, UE 2004 quoted after: Knop E., *Potencjał relacyjny w procesie tworzenia*

Definitions of clusters[80] emphasize the importance of cooperation and exchange of knowledge in creating competitive advantage of regions. The impact of these factors on regional development is explained by the theory of social capital. It should be emphasized that the concept of social capital, because of its interdisciplinary nature, is defined differently by different researchers. Example definitions of social capital in the social sciences are presented in Table 1.13.

Table 1.13. Example definitions of social capital in the social science

Author	Interpretation
P. Bourdieu	Social capital is *"the sum of the actual and potential resources that belong to the individual or a group by virtue of a permanent, more or less institutionalized network of relationships, friendships, mutual recognition. That is, the sum of capital and power that such a network can mobilize."*
J. Coleman	Social capital is composed of "features of social life - networks, norms and trust - that facilitate coordination and cooperation for the common good of the people." It is a byproduct of individual actions related to the activities of interest groups.
R. Putnam	Social capital is composed of *"features of social organizations, such as networks, norms and social trust that facilitate coordination and cooperation to achieve mutual benefit*".
F. Fukuyama	Social capital is "the ability of interpersonal cooperation within groups and organizations to pursue common interests."

Source: own study based on Bourdieu P., Wacquant L.J.D., *Zaproszenie do socjologii refleksyjnej*, Oficyna Naukowa, Warszawa 2001, pp. 104–105; Coleman J.S., *Social Capital in the Creation of Human Capital*, "The American Journal of Sociology" Supplement: Organizations and Institutions: Sociological and Economic Approaches to the Analysis of Social Structure 1988, Vol. 94, pp. S95–S120; Putnam R., *Bowling alone: America's declining social capitals*, "Journal of Democracy" 1995, Vol. 6, Issue 1, pp. 65–78; Fukuyama F., *Zaufanie …*, op. cit., p. 20.

T.G. Grosse highlights that social capital has a significant impact on the nature of economy. Too strong network of social relations, based on strong trust of units to each other, but limited trust to the state, creating rich social capital resources, highly requiring and demanding loyalty, can become uncomfortable for entrepreneurship and can limit the large-scale industry development. On

klastrów, [in:] Bojar E. (ed.), *Klastry jako narzędzia lokalnego i regionalnego rozwoju gospodarczego*, Published by Politechnika Lubelska, Lublin 2006, pp. 163–164.

80 Although not only, for ex. also of regional innovation systems.

the other hand, loose social cooperation enabling access to education and information, can cause much greater flexibility and thus the possibility to adjust to the new situation and innovate. This is particularly important when the foundations of large industry are thought of.

A good example would be the northern and central Italy. Where the manufacturing process requires disciplined management and long-term financing the German works management system is introduced. It is particularly effective in technology and engineering sectors (such as: optical, chemical, automotive industry). However, in the U.S. economy, mainly because of the prevalence of high-risk funds and stock market, it is dominated by new and innovative industries (computer software, biotechnology).[81]

The essence of social capital is emphasized in works of sociologists, political scientists and regional economists. Researchers from the first and second groups indicate relations between the causes of rises and falls of certain social systems, and increasing or lowering the social potential[82], while scholars from the first and third groups combine certain regions development level with different economic potential of this capital[83]. It's noteworthy that researchers on modern organizations indicate high influence of social capital on their development. Even the most extensive, broad competence of individual members of the organization, if they are not transformed in the structure of social relations: in a relationship of cooperation and trust, can not bring the expected increase in value.

Characteristics of social capital such as: entrepreneurship, education, ability to work, mobility, ability to absorb, generate and distribute innovation are important for local and regional development and for the creation and

81 Grosse T.G., *Polityka regionalna Unii Europejskiej. Przykład Grecji. Włoch. Irlandii i Polski*, ISP, Warszawa 2004, p. 40.

82 Com. ex.: Bourdieu P., *La distinction: critique social du jugement*, Les Editions de Minuit, Paris 1979; Bourdieu P., *The Forms of Capital*, [in:] Richardson J.G. (ed.), *Handbook of theory and research for the sociology of education*, Greenwood Press, New York 1986, pp. 241–258; Coleman J.S., *Social Capital …*, op. cit., pp. S95–S120; Hamm B., *Kapitał społeczny z punktu widzenia socjologicznego*, [in:] Frąckiewicz L., Rączaszek A. (eds.), *Kapitał społeczny*, WAE, Katowice 2004, pp. 49–59. J.S. Coleman examines the concept of social capital in relation to human capital. In his opinion one of the basic functions of human capital is the ability to use social capital resources to achieve specific goals. Like J.S. Coleman also P. Bourdieu highlights the importance of interpersonal cooperation skills and his approach takes into account the individual and the collective nature of social capital.

83 Com. ex.: Putman R., *The Prosperous Community: Social Capital and Public Life*, "The American Prospect" 1993, No. 13, pp. 35–42; Fukuyama F., *Zaufanie …*, op. cit., Theories represented by J.S. Coleman served as basis for development of the approach presented by R. Putman, who analyzed the social capital in the region through the prism of the institutional system functioning.

development of clusters [84] Barriers within social capital that hinder the clusters creation and development will be therefore: dishonesty, closing to new trends and innovation, unwillingness to learn, no tradition and especially no willingness to cooperate and resistance to share information.

In the subject literature, it is emphasized that to make the activities of actors within cluster efficient and effective important is:

- effective decision making in the common interest;
- achieving a balance between the implementation of individual cluster members interests and the interests of the cluster as a whole;
- skillful management of conflicts;
- efficient exchange of information and constant communication between the cluster members;
- creating mutual trust between the cluster agents.

Cooperation in clusters, should be carried out in two dimensions:

- horizontal (in the sphere of industry analysis, industry sectors that produce complementary products and services, or use the same distribution channels);
- vertical (in the chain from the supplier to the final consumer of the initiative).

Cluster cooperation with the environment means taking action that could lead to raising competitiveness of its companies. Innovation is a key value for these structures, because it determines their international competitiveness. They can become the driving force of development of the country. They promote partnership activities, in which the key is cooperation not only within companies, but also between companies and the world of science and research. The cluster members, by far most commonly, cooperate on the area of the province, where the initiative is located. This is usually cooperation with universities and public research institutes, which started the implementation of at least one project within one year.

In general these are soft actions, such as: joint statement at trade fairs, organization of collective conferences, promotion of local events, sometimes focus on making innovation in the form of new or improved product or service of market nature[85].

84 Hertog P., Bergman E.M., Charles D., *Creating and Sustaining Innovative Clusters: Towards a Synthesis*, [in:] Hertog P., Bergman E.M., Charles, D. (eds.), *Innovative Clusters: Drivers of National Innovation Systems*, OECD, Paris 2001, p.11.

85 Hołub-Iwan J., Małachowska M., *Rozwój klastrów w Polsce. Raport z badań*, Szczecińska Fundacja Talent-Promocja-Postęp, Szczecin, 2008, pp. 56–56.

Based on the subject literature it can be concluded that the main motives of agents' cooperation are: [86]

- diversification of risk in the implementation of joint projects;
- access to complementary resources and skills;
- improvement of research efficiency;
- reduction of costs;
- improvement or increasing the scale of production;
- easier access to financing sources;
- overcoming common administrative and commercial barriers;
- internationalization;
- coping with demanding customers;
- revenue increase.

It seems that one of the main reasons hindering the cooperation of agents in Polish clusters is the lack of knowledge about the mutual needs. Communication is based on informal contacts and communication channels appear to be few. Important for communication, as poor as it is, are mental barriers causing businessmen's conviction that cooperation with other companies comes with more threats than benefits. Cluster, however, in its assumption should have an efficient communication which allows intense flow of information and knowledge. Communication is the more effective the smaller the gap is related to the amount and type of information given to and received. The specificity of communication between organizations in cluster depends on the needs of sourcing and aggregation of information shared, the purpose for which this information will be used, and internal, external and intentional environmental conditions.

J. Staszewska includes the following in the main cluster communication areas:[87]

1) co-operation between companies and between companies and institutions;
2) co-operation with R&D;
3) flow of personnel;
4) flow of knowledge and so called "hidden knowledge".

86 Fabrowska P., Halicki M., Kozdęba D., Piotrowski P., Szerenos A., *ABC jak założyć klaster? Przewodnik dla przedsiębiorcy,* ECORYS Polska, Warszawa 2008, pp.16–17; Doz Y.L., Hamel G., *Alianse strategiczne. Sztuka zdobywania korzyści poprzez współpracę,* Helion, Gliwice 2006.

87 Staszewska J., *Komunikacja w klastrach,* [in:] Bojar E. (ed.), *Klastry jako narzędzia lokalnego i regionalnego rozwoju gospodarczego*, Published by Politechnika Lubelska, Lublin 2006, s. 64.

Table 1.14. Areas of communication in clusters links

Communication area	description
Co-operation between companies and between companies and institutions	The cooperation includes links resulting from contacts, often a long-term relationship based on "spin-offs" contacts with the parent company.
Co-operation with R&D and flow of knowledge and so called „hidden knowledge	Cooperation and communication have different commitment levels of the companies involved in the research process. Polish companies are not interested in working with science institutions and science organizations show little interest in the needs of companies. Passive commissioning research and reporting demand for educated workers is dominant. A similar problem is seen in the EU. Europe, not so much lack clusters, but the problem is in unsatisfactory relationship between industry and R&D and insufficient cooperation within the EU, which means that the clusters in Europe do not always reach a critical mass and innovation capacity to meet the challenges of competition in the long-term and perform at the world level. Flow of knowledge and "hidden knowledge" is maintained through contacts with academic centers, consulting, also through flow of personnel and communications in the course of joint ventures, participation in training, trade fairs and conferences at the national and international level. On the other hand market transfer of technology includes communicating through acquisition of knowledge while purchasing machinery, equipment and licenses. Generally network organization promotes improvement of communication, and thus the spread of knowledge.
Flow of personnel	are realized on the basis of cooperation, and thus communication with the employment agencies or business development centers which through their vigorous activities create job mobility.

Source: own study based on: Staszewska J., *Komunikacja w klastrach …*, op. cit., pp. 64–65; Pasieczny J., *Czynniki i uwarunkowania …*, op. cit., p. 94; *Auf dem Weg zu Clustern von Weltrang in der Europäischen Union: Die Umsetzung der breit angelegten Innovationsstrategie,* Mitteilung der Kommission an das Europäische Parlament, den Rat, den Wirtschafts- und Sozialausschuss und den Ausschuss der Regionen*,* Kommission der Europäischen Gemeinschaften, Brüssel 5.11.2008.

Mutual trust between the cluster actors has a positive or negative impact on local and regional development. Confidence should therefore be seen as an important and measurable economic value.

Interest in the term trust started only in the second half of the twentieth century[88] however the concept itself is much older. Despite many attempts, to this day a commonly accepted, unambiguous definition has not been worked out[89], although everyone knows intuitively when the trust is there, and when it is missing. The problem with a clear definition of trust results, in part, from the fact that researchers dealing with the issue represent many disciplines and research areas including: general management, organizational behavior,

Table 1.15. Example interpretations of the term of trust

Author/authors	Interpretation
J.E. Rotter	Trust is in general some expectations that the word, promise, oral or written pledge of another individual or group is reliable.
A. Sankowska	Trust is the willingness to raise the awareness of other party activities based on assessment of credibility in a situation of interdependence and risk.
P. Sztompka	Confidence is a bet made about uncertain future actions of other people.
F. Fukuyama	Trust is the expectation of the environment regarding fair, reciprocal, repeated behavior, based on standards commonly accepted by some members of such an environment.
A. Lewicka-Strzałecka	To have confidence in someone or something means to be convinced that the other person shares our standards and values, and will work to the benefit of, or at least will not harm the trusting one.

Source: own study based on: Grudzewski W.M., Hejduk I.K., Sankowska A., Wańtuchowicz M., *Zarządzanie zaufaniem w organizacjach wirtualnych*, Difin, Warszawa 2007, p. 33; Sankowska A., *Wpływ zaufania …*, op. cit., p. 34; Sztompka P., *Zaufanie: fundament społeczeństwa*, Znak, Kraków 2007, p. 69; Fukuyama F., *Zaufanie …* op. cit., p. 38; Lewicka-Strzałecka A., *Zaufanie w relacji konsument-biznes*, "Prakseologia" 2003, No 143, p. 197.

88 Kuc B. R., Moczydłowska J. M., *Zachowania organizacyjne*, Difin, Warszawa 2009, p. 257.

89 This is not an isolated problem. Almost all of the terms in social science are difficult to define unambiguously. This may prove the diversity of the concept, but also the difficulty of defining the phenomena that are individual and fleeting. Comp. Bugdol M., *Wymiary i problemy Zarządzania organizacją opartą na zaufaniu,* Published by Uniwersytet Jagielloński, Kraków 2010, p. 15.

marketing, public relations, psychology, sociology, philosophy, information systems, etc.[90] Many definitions created by scientists proves multidisciplinary, multi-dimensionality and complexity of the term.[91] Example definitions are presented in Table 1.15.

Trust and confidence, like many other human qualities and states, are derivatives of the innate, inherited qualities.[92] E.H. Ericson introduced the concept of trust in the context of human psychosocial development. He argued that a sense of basic trust develops as early as in infancy and it is a natural step in the development of man and is one of his essential needs. Child, cared after by the mother, builds trust which results in the level of the general tendency to trust others.[93] Therefore, no doubt *"trust is the quality which everyone is familiar with. It is our elementary experience"*.[94]

Trust is a key factor of all transactions. It refers to the relationship, encourage reciprocity and can increase both the quality and quantity of social interaction, and as a result the relevant business transactions.[95] The actors of these relationships are customers who have the role of trusting and suppliers, vendors who are trusted (trustees).[96]

Confidence can be compared to the *"glue that holds together the most important economic activities and is located in the center of cooperation"*.[97] It is a good thing that has a real economic value of increasing operational efficiency, but at the same time it is not a property that can be traded on a free and open market.[98]

At the end of these considerations an important factor must be noted that social support for high technology and entrepreneurship in the region are very

90 Grudzewski W. M., Hejduk I.K., Sankowska A., Wańtuchowicz M., *Zarządzanie zaufaniem w przedsiębiorstwie: koncepcje, narzędzia, zastosowania*, a Wolters Kluwer, Kraków 2009, p. 13.

91 Sankowska A., *Wpływ zaufania na zarządzanie przedsiębiorstwem: perspektywa wewnątrzorganizacyjna*, Difin, Warszawa 2011, p. 28.

92 Wosińska W, Ratajczak Z., *Sprawiedliwość i zaufanie interpersonalne w świetle współczesnych teorii i badań*, Publisher by Uniwersytet Śląski, Katowice 1988, p. 28.

93 Grudzewski W. M., Hejduk I.K., Sankowska A., Wańtuchowicz M., *Zarządzanie zaufaniem w organizacjach…* , op. cit., p. 26.

94 Sprenger R. K., *Zaufanie#1. Zaufanie jest lekarstwem na chorobę, która opanuje świat biznesu*, MT Biznes, Warszawa 2009, p. 64.

95 Grudzewski W. M., Hejduk I.K., Sankowska A., Wańtuchowicz M., *Zarządzanie zaufaniem w organizacjach…* , op. cit., pp. 43–44.

96 Rudzewicz A., *Zaufanie – przegląd koncepcji,* [in:] Garbarski L., Tkaczyk J. (eds.), *Kontrowersje wokół marketingu w Polsce: niepewność i zaufanie a zachowania nabywców*, WAiP, Warszawa 2009, p. 422.

97 Harrison S., *Przyzwoitość w zarządzaniu: jak małe gesty budują wielkie firmy,* a Wolters Kluwer business, Kraków 2008, p. 83.

98 Zucker L. G., *Production of trust: institutional sources of economic structure,* "Research in Organizational Behaviour" 1986, vol. 8.

important in clusters development.[99] In a situation when the public appreciates the advantages of new technology and notices its positive impact on economic growth, there are more entrepreneurs willing to take the risk of operations in the areas of new technologies. It should be also noted that the success of other companies positively affects the decisions of creating businesses in their neighborhood.

1.5. Benefits of clustering

The approach to the effects of clustering, as to other aspects, is varied. Agents in clusters form a system of reciprocal and dynamic interactions and interdependences. They cause the synergies and contribute to the development of both companies as well as regional and national economies. Typically, the subject literature gives the general listing of their benefits, with no division in regard to any criteria. Thus, the researchers report that they help to improve the flow of information and knowledge, reduce transaction costs, facilitate access to specialized resources, increase efficiency, productivity and innovation, accelerate creation of new enterprises and thus create new jobs, improve infrastructure etc. The following arguments are often given to expand these assumptions[100]:

- Businessmen interact with other agents of clusters, with a huge advantage which is production costs reduction of individual units. This is achieved by extending the circle of cooperating companies, which increases the number of orders for the services and products. In turn, this supports specialization of manufacturers.
- Transaction costs are reduced related to implementation of the agreements concluded between companies that belong to the cluster. This is due to the fact that working together they improve their knowledge and generate consistent language of communication in business.
- Simultaneous competition and cooperation of enterprises in the cluster, and their geographical proximity means that competitive pressure

99 Miller R., Cóté M., *Growing the next Silicon Valley*, "Harvard Business Review" 1985, Vol. 63, Issue 4, pp. 114–123.

100 Wieczorek P., *Klastry a pozycja rynkowa przedsiębiorców,* "Ekonomika i Organizacja Przedsiębiorstw" 2008, nr 12; Penc-Pietrzak I., *Grona a analiza konkurencyjności*, "Ekonomia i Organizacja Przedsiębiorstw" 2004, nr 11.

is much stronger. The need for innovation and improvement grows in companies, as it would give them priority leading to continuous improvement and the search for ever new markets.

- By acting in the clusters of companies that know the customers, companies from similar sectors and the buyers themselves, the members of the group can notice the new needs of consumers and their services or products faster and better than others. In addition, they notice new technical or operational opportunities faster and also favor the implementation of their constant innovations and developments.
- Companies in the cluster, in result of cooperation, have easier access to new equipment, machinery and other items that are needed to implement innovation. Partners are usually involved in the development of investment, by offering their products or services. With reduced cost of "experiments", they are more likely to innovate because they do not take such risks, as is the case for example, of taking out a loan for investment.

Some researchers divide the advantages of clustering according to established criteria. M. E. Porter classifies the benefits of clustering around three dimensions:

- increase the productivity of companies in the cluster (for example, by reducing the costs of storage, transport, access to and use of specialized resources, marketing, etc.);
- increase the innovation potential (rapid generation and absorption of innovation, the links for the exchange of information and knowledge, etc.);
- stimulate the creation of new entrepreneurial and financial forms (better access to financial institutions, banks, capital including venture capital, public services, specialized programs, institutions with specific know-how, etc.).

An interesting approach is to consider the advantages of clustering at the level of:

- macro (national);
- meso (regional);
- micro (companies).

Summary of such approach is presented in Table 1.16.

Noteworthy is also the division that orders clustering benefits in regard to the following areas:

- business co-operation;

Table 1.16. Effects of clustering

Level	Effects
MACRO	➢ highly specialized areas of production costs reduction; ➢ reduction of social transfers for unemployed; ➢ reduction of unemployment level; ➢ since the number of clusters increases with economic development, they are seen as economic prosperity catalysts; ➢ stimulating innovation at the level of the whole economy; ➢ export activization; ➢ attracting foreign investment; ➢ enhancing competitiveness of the national market; ➢ infrastructure development at the national level; ➢ changes (positive) in legislation expanding production activities; ➢ social capital increase at the national level;
MESO	➢ regional authorities support to create highly specialized areas; ➢ employment growth; ➢ the region inhabitants' sense of security increase; ➢ inhabitants' pleasure and satisfaction of living in the region increase; ➢ social transfers for the unemployed decrease; ➢ creation of new jobs; ➢ mobility of human capital; ➢ increased use of IT solutions; ➢ communication improvement; ➢ development of business attitudes; ➢ changing the external invertors; ➢ investment increase (in terms of quantity and value); ➢ innovation increase at the regional level; ➢ strengthening the local patriotism; ➢ infrastructure development in the region; ➢ social capital increase in the region; ➢ promotion of the region;
MICRO	➢ faster and better development of companies; ➢ more flexible organization of work; ➢ specialized and cost effective production factors (incl. employees); ➢ faster and easier access to specialist services; ➢ increase bargaining power in the market; ➢ transaction costs reduction; ➢ access to the local network of suppliers and buyers, which results in lower transaction costs; ➢ higher productivity, effectiveness, efficiency, entrepreneurship; ➢ greater ability to innovate (improvements in the flow of information, knowledge and skills, through both formal and informal contacts of participants, experience exchange between research institutions and businesses); ➢ more effective impact on the regional authorities and public institutions; ➢ possibility of joint ventures, operating in networks, joint use of machinery; ➢ increased visibility (brand, image); ➢ „attracting" investment; ➢ favorable conditions to enter into long-term contracts; ➢ possibility to create joint sales offer; ➢ possibility of joint marketing activities; ➢ offer specialization; ➢ trust in other entities, organizations and institutions increase ➢ organizational culture increase.

Source: own study based on Staszewska J., *Klaster …*, op. cit., p. 46; W. Bojar, T. M. Gruszecki, *Grupa producentów a klaster* [in:] E. Bojar (ed.), *Klastry jako narzędzia lokalneg i regionalnego rozwoju gospodarczego,* Published by Politechnika Lubelska, Lublin 2006, p. 48; Szulika S., P. Tomanowicz, M. Mackiewicz, *Regionalne Systemy i Strategie Innowacji. Najlepsze praktyki . Rekomendacje dla Polski,* IBnGR, Gdańsk 2004, p. 31; www.cpp.bialystok.pl as on 10.03.2013; Skowera K., *Powstawanie i rozwój klastrów szansą dla wzmocnienia konkurencyjności regionu świętokrzyskiego*, "Miscellanea Oeconomicae" 2010, No 14, pp. 329–337; Scheer G., von Zallinger L., *Cluster – management*, GTZ, pp. 05–07.

- innovation and technology;
- policy of authorities;
- cluster expansion;
- research and networks creation;
- co-operation with institutions;
- education and training.

Table 1.17. Potential benefits of operating in clusters divided into seven areas

Scope of benefit	Kind of benefit
Business co-operation	➢ coordinating the purchase/ combines purchases; ➢ reducing competition in clustere; ➢ possibility of creating a joint venture with other regional companies; ➢ access to high-quality services; ➢ use of the partner's skills and experience; ➢ possibility of reducing the production costs; ➢ benefiting from specialization and/or increased production scale; ➢ strengthening position in relation to suppliers and therefore costs of supplies reduction; ➢ strengthening position in relation to customers;
Innovation and technology	➢ providing innovation, new technologies; ➢ technology diffusion within cluster; ➢ establishing common technical standards; ➢ analysis of trends in technology development; ➢ easier introduction of new technologies; ➢ combining investment funds;
Authorities policy	➢ better cooperation with local authorities; ➢ lobbing for infrastructure development; ➢ better regulations; ➢ lobbing for public subsidies; ➢ lobbing for the EU funds acquisition; ➢ lobbing the government for the funding of cluster initiatives;

Table 1.17 continue

Cluster expansion	➢ branding of the region; ➢ formation of partnerships in the clusters; ➢ possibility of joint promotion of cluster companies products; ➢ easier product launch into the national and international market; ➢ promote the export of cluster companies; ➢ promote the expansion of the cluster companies on domestic market; ➢ presentation of cluster companies in trade fairs and exhibitions; ➢ research the potential export markets; ➢ inflow of new co-operative businesses and professionals to the region; FDI inflows to the region;
Research and network creation	➢ interpersonal networks development; ➢ networks between firms development; ➢ raise awareness of firms participation in the cluster; ➢ submitting reports on the cluster; ➢ cluster research and analyses;
Co-operation with institutions	➢ access to research centers; ➢ better cooperation with consultants and experts; ➢ access to information on market developments; ➢ access to the services of technology centers ➢ providing support in running business; ➢ access to research centers; ➢ better cooperation with consultants and experts; ➢ access to information on market developments; ➢ access to the services of technology centers;
Education and training	➢ access to specialized training in the field of technology; ➢ access to management training; ➢ access to highly skilled personnel; ➢ adapting the education system to the needs of cluster companies;

Source: Plawgo B., Klimczuk M., *Przesłanki rozwoju klastrów w sektorach tradycyjnych,* [in:] Juchniewicz M. (ed.), *Czynniki i źródła przewagi konkurencyjnej,* Published by Uniwersytet Warmińsko-Mazurski, Olsztyn 2009, pp. 377–378.

The benefits of clusters are numerous, which can mobilize new companies, organizations and institutions to join the cluster structures. The most important include the implementation of joint projects and investments, which would not be possible to accomplish by the actors themselves, or those by which the joint execution minimizes the cost or risk. The interaction between companies, business institutions and research and development centres highly determine the innovativeness of companies. Cooperating actors may influence the

environment institutions more effectively, such as educational institutions, local and regional authorities, and their implemented policies.

Clusters compose an instrument that facilitates achieving common objectives of the scattered actors, giving them real benefits and supporting the development of synergies. To use it however, increased mutual trust and more effective civil society is neccessary. Unfortunately, there has always been a significant deficit in this area. A lot depends on the purpose and nature of cooperation. The cluster should provide access to knowledge and the experience of others, allow joint purchases, optimize access to specialized resources and the social and technical infrastructure. Wide openness and trust are particularly important. Cluster participants will gain more by working together than by working alone. The ability to define collectively the goals and identify instruments for their implementation is also important.

Chapter II.
CLUSTER POLICY IN THE EUROPEAN UNION AND IN POLAND

2.1. Regional policy and clusters in the development of the region

The European Union has an active regional policy in the long-term budget programming periods, the next will cover the years 2014–2020. Europe 2020 Strategy was adapted in 2010 as the basis of all policies in the decade of the twenties in the XXI century. The proposed priorities included: developing an economy based on knowledge and innovation, promotion of resource-efficient, green and competitive economy, promoting high employment economy that ensure high social and territorial cohesion. The importance of the Europe 2020 Strategy is underlined with the objective of European Cohesion Policy and other EU policies in the years 2014 to 2020, which will be the implementation of the Europe 2020 Strategy.

Effective use of the potential of Polish membership in the European Union necessitates a modern and efficient regional policy, which primary function is to reduce the occurrence of regional imbalances. Regional development specialists suggest that best developed are the areas where there are large cities, characterized by a relatively high number of inhabitants, a high level of foreign investment, relatively well equipped with technical and transport infrastructure, providing education at the tertiary level, and thus a highly skilled workforce[101].

Regional policy is defined as all activities of public authorities, both central and local governments, private entities, organizations and institutions in the region, aimed at increasing the competitiveness of regional economies, more dynamic development in the region and reduction of spatial disparities of development[102]. Traditional approach regarded regional policy as part of the State activities, aimed to encourage the development in problem regions,

[101] Hołub-Iwan J. (ed.), *Benchmarking klastrów w Polsce – edycja 2012. Raport z badań*, PARP 2012, p. 141.

[102] Filipiak B., Kogut M., Szewczuk A., Zioło M., *Rozwój lokalny i regionalny. Uwarunkowania, finanse, procedury,* Fundacja na rzecz Uniwersytetu Szczecińskiego, Szczecin 2005, p. 17.

and equalize the inter-regional development. In local government practice, a solution was adopted which required the use of the concept of region in relation to the province. This means that regional policy can be carried out by the State in relation to the regions – the provinces and by the provincial authorities, in relation to their territory[103].

Unsatisfactory results of the implemented policies that have not protected EU countries against the long-term effects of the economic crisis could be observed in recent years. In particular, failure to achieve strategic objectives in the sphere of the EU competitive position in relation to other economies could be seen. This required significant changes to the assumptions of the regional policy, both at the level of the European Union countries and the individual regions in regard to their territories.

A fundamental change of regional policy paradigm includes the following elements[104]:

- strong focus of public intervention on enhancing the competitiveness of the regions;
- release growth processes through more fully exploited competitive advantages and development potential;
- shift from the short-term, centrally distributed subsidies "for the least favoured areas" to the model of long-term, decentralized policies aimed at supporting the development of all regions;
- moving away from distributed intervention to more selective (focused) investments.

Determinants characterizing the existing and new paradigms of regional policy are presented in Table 2.1.

In the subject literature, examples are given of regional policy tools for both central and regional level, which firstly have a positive impact on regional development indicators and secondly, help to increase the growth potential of innovative companies in the region. New tools appear, complementary to the higher-level ones on one hand and most effective in terms of the actual needs of the mezzo level on the other, in the group of instruments suggested for use at the regional level. The most important ones are: systematic analysis of regional economies in the context of business relations development between companies and between the world of business and science sector. Additionally,

103 Filipiak B., Kogut M., Szewczuk A., Zioło M., *Rozwój lokalny…* op. cit., p. 17.

104 *Krajowa Strategia Rozwoju Regionalnego 2010–2020: Regiony, Miasta, Obszary Wiejskie (dokument przyjęty przez Radę Ministrów dnia 13 lipca 2010 r.)*, Ministerstwo Rozwoju Regionalnego, Warszawa 2010, p 16.

creation or co-creation of adequate infrastructure and technical information for closer cooperation between businesses and business institutions can be specified. This group of instruments may also include: awareness-raising activities involving companies and presenting the benefits of cooperation with

Table 2.1. Old and new paradigm of regional policy

	Old paradigm	**New paradigm**
Strategies	Sector approach	Integrated development projects
Goals	COMPETITIVENESS	
	Indicating many elements of the socio-economic structure as competitive factors, resulting in overlap of a variety of uncoordinated actions.	The strategic direction of regional policy (spread of growth) implemented in all regions, including the most competitive centres. Precisely defined factors of competitiveness and strategically selected its correct direction. Geographically targeted multi-sector approach.
	COMPENSATION	
	High emphasis on compensation, but the results counterproductive-widening disparities, scattering means.	Cohesion growth by increasing the absorption capacity (greater flow of capital, people, knowledge, innovation). Appropriate "compensatory" action tailored to the potential of individual regions, important for the country, focusing on selected areas to explore and exploit their potential, to achieve the "critical mass" necessary for further development.
Tools	Subsidies and public aid.	Integrated instruments "soft" and "hard", business environment, social capital, networking, better coordination.
Territorial dimension	Areas treated homogeneously, without regard to their internal and external diversity. The territorial dimension neglected the primacy of the sector approach, the so-called. "Poverty algorithm".	The territorial approach in all development activities (perception of diversity, strong coordination, multi-level management). Integrated programs dedicated to areas of strategic intervention while maintaining the spatial integration carried out in the framework of regional policy.
Territorial units	Administrative units. No account of urban-rural relationships in policy instruments, rural areas perceived equally across the country.	Functional units. Differentiated approach to different types of territories. Politics suited to local conditions, depending on the areas that generate growth, functionally related areas and remote areas.
Actors	Government and province authorities	All levels of government, social actors and business representatives.

S o u r c e : *Krajowa Strategia Rozwoju Regionalnego 2010-2020 …* op. cit., p. 15.

research and development units, creating or co-creating regional cluster support centres providing specialized services to the cluster structures, development and implementation of educational policy encouraging schools and universities to educate in accordance to the needs of local entrepreneurs, specialized, professional education and training systems related to the current and future needs of cluster actors, promotion of good practice in the field of cooperation between companies and business environment entities, in particular the educational and R&D units. The important role in the clusters development, of local authorities at the regional level working closely with the business environment institutions for the institutional and administrative support of clusters is also stressed. Added to this are such instruments as: taking actions of public-private partnership nature with cluster firms; strengthening partnership relations between entities belonging to the cluster and its potential participants; creating financial preferences for the cluster entities, supporting export expansion of clusters.[105]

Regional and local authorities should become important partners in emerging, specialized industrial centres, internally connected by networks of competition and cooperation. Identification of forming of business units' concentrations and institutions supporting them should be based on actual facts and not on hopes and dreams. Also, their instruments should become one of the elements of both individual provinces strategies and the strategy for the Eastern Poland.[106]

In the strategic documents created in Podlaskie was also clearly indicated that the cluster approach can contribute to the development of the region, based on the strongest and most active sectors of the economy in the region. Such a document is primarily Podlasie Region Development Strategy 2020. The current strategy was approved as an Annex to the Resolution of the Parliament of the Podlaskie Province of 30 January 2006. This document defines the region's development mission, set goals and priorities assigned to them. It states that by creating conditions that allow full exploitation of the regional potential, it will be possible to increase economic and social cohesion and competitiveness of the region. Podlasie Region Development Strategy identifies seven strategic objectives, adopting as the first of them to *"raise the investment attractiveness of the province"*, which is implemented through activities such as: development

105 Citkowski M., *Polityka rozwoju w oparciu o klastry a rozwój regionalny,* [in:] Błaszczuk D.J., Stefański M. (eds.), *Czynniki endogeniczne rozwoju Polski Wschodniej*, Innovation Press Wydawnictwo Naukowe Wyższej Szkoły Ekonomii i Innowacji, Lublin 2010, p. 25.

106 Gorzelak G., *Strategiczne kierunki rozwoju Polski Wschodniej*, Ministerstwo Rozwoju Regionalnego, Warszawa 2007, p. 7.

of road and technical infrastructure, development of ICT infrastructure, investment in R&D infrastructure, preparation and site development of investment areas, raising the level of public safety. The second objective adopted in the strategy is *"development of human resources to meet the needs of the labour market"*, realized, among other, through tasks such as: return to the professional activity of the disadvantaged and the unemployed, mitigating the effects of unemployment, activities promoting women and people setting businesses, retraining and supporting professional activity, encouraging active attitudes of civil society, creating new workplaces. The third objective is to *"improve the competitiveness of Podlasie companies on the national and international levels"*, which can be achieved through: promoting modern technology and innovation, developing an adequate training and education offer, credit and financial support, diversification and restructuring of the economic base of the province, stimulating innovation transfer and promotion. Another, fourth objective is to *"protect the environment" and* it can be achieved through: the development of roads, constant monitoring of environmentally hazardous facilities, etc. The fifth objective *„development of tourism with the use of natural and cultural heritage"* can be achieved by: comprehensive and innovative tourist development, the extension of the tourist season, stimulating the development of the institutions involved in culture and the arts, promotion of cultural content of the region, preservation of cultural heritage. Another important objective is *"the use of border close and cross-border location of the region"*; this objective can be realized through cooperation in the fields of economy, culture, science, technology, education and sport, in particular with the use of forms of the twin cities and Euro-regions. The final objective described as *"development of agriculture and creation of conditions for the multifunctional rural development"*, emphasises the following activities: conducting tourism activities, food processing by traditional methods, development of beef cattle breeding, supporting of forest management development, hotels and tourism in rural areas. The strategy includes the listed sectors and leading clusters in the region, such as food, wood, furniture and machinery industries and tourism. The areas of interprovincial, international and cross-border regional cooperation were described.[107]

Podlasie Innovation Strategy was also developed in the province of Podlasie in the framework of the Project "Podlasie Innovation Stratategy - implementation system development." This project as a continuation and expansion of the works

107 *Strategia Rozwoju Województwa Podlaskiego do 2020 roku,* Urząd Marszałkowski Województwa Podlaskiego, Białystok 2006.

on the Regional Innovation Strategy of Podlaskie Province was completed on June 15th 2012. Podlasie Innovation Strategy is one of the key program documents at the regional level, which determines the long-term policies and directions of the concept of building and supporting the regional innovation system development in Podlaskie Province. The strategy indicates the courses of actions and desirable trends of changes that should be encouraged, formulates the objectives and priorities. The strategy highlights *"improvement of the functioning of the regional innovation system functioning in Podlaskie province"* as the main objective. It can be achieved through the implementation of strategic objectives. The first presented in the strategy is *"strengthening the innovative potential of the region."* This objective can be achieved through forming an appropriate structure of education of people living in the province, with the emphasis on education in the fields of engineering and technical, and through promoting lifelong learning and continuous improvement of acquired skills. The second strategic objective is *"strengthening the institutional, organizational and social sphere of the innovation system."* Implementation of this objective is possible by considering it in three dimensions. First, in the institutional aspect that is by expanding the financial and material capacity of the network of innovation and entrepreneurship centres. It can guarantee an increase in performance of entities and match their service offerings to the regional needs in regard to the innovation development. Secondly, in the organization aspect, that is by supporting the innovative approach through activation of local governments, which would organize and coordinate meetings between science and business. Thirdly, in the social aspect, i.e. by fostering inhabitants' openness to change and improving their problem-solving skills. The third strategic objective is to *"create a supportive environment for innovation in the region,"* which will be implemented through converting the environment of innovation activities that create opportunities for development of companies with innovative technology base, by improving the economic and social infrastructure and promotion of the region by successful companies operating in it. The strategy sets out the priorities and actions attributed to them, highlighting seven priorities and sixteen measures. The first priority *"innovation processes in companies"* will be implemented through the following activities: development of physical capital, supporting the research – development activities of companies and promoting innovative initiatives. The second is *"potential of science and research sector"*. Activities under this priority include the growth of the research potential of universities located in Podlasie and improving innovation cooperation between

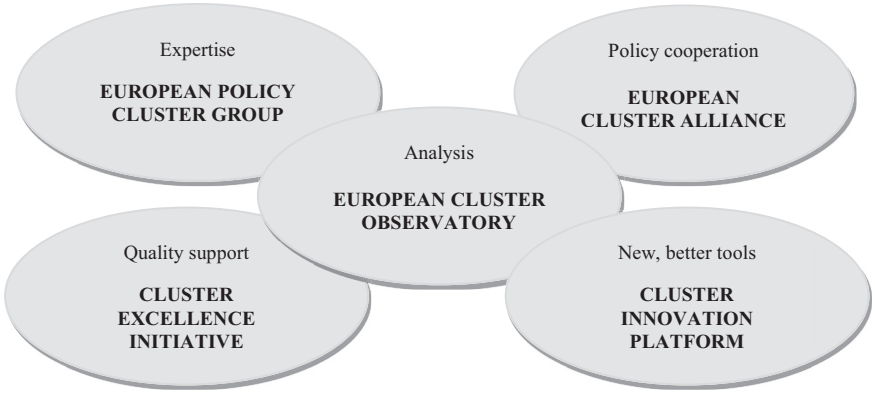
the science and business sectors. Another is the *"human capital for innovation,"* realized through creation of educated staff in innovative enterprises, as well as for innovative companies. Next is the *"institutional sphere of innovation system"*, implemented by supporting the operations of science- technology parks, technology incubators, strengthening venture capital, loans and loan guarantees, as well as providing assistance to qualified centres for technology and innovation transfer. One more priority is the *"organizational and social sphere of innovation system"*, described as stimulating the local governments activities for innovation and promoting innovative attitudes among the public. Second to last priority is *"the image of Podlasie as an innovative region"* implemented through promotion of Podlasie as the region of innovation and promotion of innovation leaders from the region. The last priority *"Podlaskie attractive for innovative investments"* is realized through increasing the investment attractiveness of the region as part of innovation and attracting Polish and foreign investors[108]. Podlasie Innovation Strategy shows the direction in which the regional authorities take steps to ensure that the region becomes competitive to other Polish regions, being mainly the area of innovation.

2.2. Clustering policy guidelines of the European Union

The objective of Lisbon Strategy, which has been implemented in the European Union since 2000, is to make Europe the most competitive and dynamically developing region of the world, actively implementing the foundation of the knowledge economy. Innovation increase has been recognized one of the main targets to achieve the objectives of this development. An important source of innovation growth was noticed in creation and development of cluster structures. This resulted in a dramatic increase of interest in the implementation of an economic policy based on the concept of clusters creation and development in most European Union countries. The European Commission, implementing the policies to support clusters, has led a number of informative initiatives. These efforts have developed the methodology for the study of clusters, using the best tools and methods. Considerable resources have been allocated for creation and development of clusters and recommendations for policies to support clusters. Key initiatives to promote the development of clusters are shown in Figure 2.1.

108 *Podlaska Strategia Innowacji*, Urząd Marszałkowski Województwa Podlaskiego, Białystok 2012.

Figure 2.1. Different kinds of cluster initiatives in the European Union supporting cluster development



Source: own study based on http://innova-ext.eurodyn.com as of 20.09.2012.

The main task of the European initiatives is to create a basis for international cooperation between clusters in order to improve their activities at all levels and to facilitate the emergence of more world-class clusters in the European Union. These initiatives are closely linked with other EU programs such as: the 7th Framework Programme, the European Territorial Policy, INTERREG Framework Programme for Research and Technological Development. Strengthening clusters in Europe was identified as one of the key strategic priorities to improve innovation and appropriate provisions in a number of EU documents were made. One of the key documents in this regard is the "Framework Programme for Competitiveness and Innovation 2007–2013". Many studies recognize significant positive effects resulting from the creation and development of cluster structures. For this reason, public authorities are taking an increasingly active role in facilitating the formation of projects of cluster nature, expecting also stimulation of innovation and increasing the competitiveness of the regions. This is particularly evident in the assumptions developed from scratch, and also in updated development strategies of individual provinces, which include creation of a favourable climate for the clusters development.

In the subject literature we can find many expressions indicating activities of administration at different levels aimed to develop clusters. One of the most frequently quoted definition is that developed by Ch. Ketels, who states that the concept of cluster policy should be understood as all efforts, the government strives borne both individually and in cooperation with companies, universities and other entities, directly aimed at the development of clusters and their

competitiveness[109]. According to the author, policy based on clusters should be considered including the basic conditions of inter-clusters policy impact on the creation and use of cluster structures as the process aimed at the increase of inter-cluster competitiveness[110]. Otherwise, the cluster-based policy is defined by the OECD, according to which this policy includes a set of activities undertaken by the public authorities, aimed at stimulating and supporting the relationships between companies in the manufacturing value chain, strengthening interconnections between the various components of the existing network and adding value to the actions taken[111]. Cluster policy in the European Union is seen as an active involvement of public authorities in activities that stimulate clustering process and help clusters to build and maintain a leading position in the sector. The purpose of these actions is mainly to influence the external conditions affecting positively the possibility of clusters formation and development. These activities include, in particular[112]:

- providing highly qualified and competent human capital;
- simplification of administrative procedures for establishment and development of clusters;
- creating mechanisms to facilitate the formation of information centres and integrated service centres;
- creating joint centres for specialized training in order to promote cooperation between educational institutions and clusters;
- enabling greater availability of financial instruments that meet the needs of clusters;
- ensuring good relations between the participants of cluster initiatives – businessmen, innovation centres, investors and funding sources;
- improving coordination channels within one cluster and with other clusters;
- improving the relations between clusters and public administration;
- promoting external opportunities for clusters development, promoting cluster activities on an international scale and encouraging trans-border networks;

109 Ketels Ch., *Clusters, Cluster Policy and Swedish Competitiveness in the Global Ecomomy*, Expert Report no. 30 to Sweden's Globalisation Council, Stockholm 2009, pp. 19–20.

110 This notion of cluster policy excludes actions of individual companies in the development of cluster initiatives it also does not include government policy, not addressed directly to the clusters or not focused on increasing competitiveness – even though it may largely be used to create a win-win initiatives for the region.

111 Boekholt P., Thuriaux B., *Public Policies …* op. cit., p. 381.

112 Opinion of the Regions Committee – Clusters and cluster policy (2008 / C 257/12), EU OJ October 9, 2008.

- helping to create a certain brand of the region and cluster brand;
- promoting research and development and innovation;
- Supporting and accelerating the development of private initiatives, including the European Union, national and regional levels in their mutual relations.

Therefore cluster policy can include multiple measures and instruments aimed at supporting the development of specific concentrations of companies and institutions. The purpose of this policy is to develop a cluster in normative terms, that is such concentration of companies and institutions which would be characterized by a high level of interaction and collaboration leading to the strengthening of existing competitive advantages and creation of new ones. Broadly we should speak of a development policy based on clusters, consisting of a variety of policies and instruments that in a coordinated way support the development of specific concentrations of clusters. Its important part is the impact of specific framework conditions relevant to the development of the cluster (for example, adequate infrastructure, specialized human resources, favourable legal and administrative regulations, etc). This policy provides for investment in a wide variety of areas important to the cluster development. In narrow terms, cluster policy includes supporting the so-called cluster initiatives and cluster coordinators. Their performance contributes to the development of the specific concentration of companies. The operation of these institutions should contribute to a more coordinated use of existing public policies and instruments – but this is an indirect effect, rather than the direct establishment of formulated this way cluster policy. The basic criteria for the use of cluster policy at various levels and their associated effects are presented in Table 2.2.

Table 2.2. Areas of cluster policy

Allocation criteria	Effect area	Implications
Aggregation level	➢ international level; ➢ national level (mega-level cluster policy); ➢ regional level (mezzo-level cluster policy); ➢ enterprise level (micro-level cluster policy).	The exact distinction of the policy application areas is difficult to implement, as the borders between them are often vague and blurred.This is due to the fact that on one hand cluster policy is aimed at making clusters more competitive by improving conditions for their functioning, on the other hand, as a policy based interconnection networks, it is aimed to stimulate cooperation between companies. This policy therefore to some extend takes place within each of the separated areas.

Table 2.2 continue

The scope of state policy applied to clusters	➢ no clearly defined cluster policy - limiting application of the general mechanisms influencing conditions for business environment shaping without any specific reference to clusters, ➢ mixed cluster policy - conclusion of cluster policy in general terms of industrial policy, regional policy or research and development policy, which influence the formation and development of clusters, is an important part of the overall cluster policy ➢ tight cluster policy - policy focus on clustering through stimulating their natural development opportunities, encouraging clusters to achieve the higher and higher stages of development.	The research shows that when government policy is aimed at strengthening the traditional clusters functioning, then the policy is close to the industrial and regional development, but if it is meant to stimulate the clusters formation in high-tech industries, it is more associated with the policy related to the sphere of science and technology. In frames of the mixed cluster policies the cluster initiatives are also implemented, i.e. organized efforts to accelerate the development and growth of clusters competitiveness in the region. These initiatives include companies operating within the cluster, the government and the science – research sphere. In general, they focus on areas with intensive development of technology, such as IT, medical equipment manufacturing, Bio pharmacy, production technology and the automotive industry.
The role of government in supporting clusters	➢ passive role - indirect stimulation, bottom-up type activities including encouraging and mobilizing the business community; ➢ active role - creating mechanisms and conditions for the clusters development as a result of direct government decisions.	For example, support for new emerging clusters in the area of advanced technology results more often from strategic decisions from above, while the clusters, formed as a result of the natural development process, are usually based on a bottom-up support
Methods used within the cluster policy	➢ direct methods - using the interference of the type of financial support or impact on the mechanisms of cluster management; ➢ indirect methods - including, for example, activities of promotional nature, monitoring and benchmarking of clusters, reports on development directions of clusters.	These methods complement each other. Institutions for regional development, using data from the indirect methods - for example, the monitoring of clusters, can include the results to introduce direct changes and shape actively the cluster policies.

Source: Pilarska C., *Polityka oparta na klastrach w wybranych krajach Unii Europejskiej*, Zeszyty Naukowe nr 8 PTE, Kraków 2010, p. 94-95; *Cluster Policies Thematic Report, European Trend Chart on Innovation*, European Commision, 2003, p. 10; *Innovation Clusters in Europe. A Statistical Analysis and Overview of Current Policy Support*, DG Enterprise and Industry Report, European Communities, 2007, p. 17.

Relations, cooperation and coordination within the cluster may be realized spontaneously. They can also be stimulated or enhanced by formal institutions – such as the cluster initiative or cluster coordinator. The presented definitions to varying degrees state that cluster policy includes mainly active and deliberate

Table 2.3. Conditions of the cluster based policy application

Conditions of the cluster-based policies application	The areas in which the public authorities act under the state policy oriented on cluster development	Instruments to implement policies based on clusters
No proper identification and diagnosis of cluster	identification of clusters	➢ record (mapping) and monitoring of existing clusters; ➢ promotion of clusters in the region; ➢ showing cluster members competence both inside and outside the cluster.
The rules, introduced by the government which hinder innovation and restrict growth of competitiveness	organization of special forums aimed at identifying bottlenecks occurring in the regulations and taking action to cancel them	➢ platforms (forums) for exchanging information and expertise within the cluster and between clusters; ➢ reform of the tax system; ➢ reforms in the regulation of the labour market, the business environment and financial markets.
Conditions of cluster-based policies application	the areas in which the public authorities act under the state policy oriented on cluster development	Instruments to implement policies based on clusters
Companies do not use the right opportunities arising from the cooperation with other companies	➢ encouraging and facilitating networking between companies; ➢ purchase of innovative products through collaboration; ➢ in submitting joint bids to producers.	➢ network programmes; ➢ training programmes.
Companies, especially small and medium-sized businesses can not access the knowledge of strategic importance	➢ assistance to clusters in accessing information; ➢ organizing debates regarding strategic issues of clusters.	➢ creation of specialized technology and information centres; ➢ creation of institutions for studying market opportunities and forecasting market developments.
Companies do not use the experience, skills and knowledge of their providers	undertake actions to increase cooperation with R&D units and facilitate access to these units	➢ establishment of specialized research and technology centres; ➢ subsidizing R&D and facilitating the transfer of technology.
No key elements (links) in the cluster	➢ attracting new businesses to the cluster and supporting their development; ➢ encouraging cooperation in clusters of significant research and development units.	➢ focus on direct foreign investment, ➢ support for business start-ups by new firms in clusters.

S o u r c e : Boekholt P., Thuriaux B., *Public Policies*... op. cit., p. 387.

inclusion of public authorities in the creation and development of clusters, with the intention of obtaining specific socio-economic benefits. Detailing this approach, the effectiveness of the public authorities' active involvement in the creation and development of clusters can be evaluated when viewed from different perspectives. Analyzing the presented records we can also note that in the formulation of cluster policies in the European Union, the key role was assigned to the regions.

On the bases of the above conditions and the use of appropriate instruments, the public authorities have the ability to actively influence formation and development of clusters. Virtually all EU countries carry out activities related

Table 2.4. Models of cluster policy in terms of the Netherlands Ministry of Economic Affairs

Model of cluster policy	Implementation objectives and scope
Policy aimed at creating a competitive advantage in certain sectors or value chains	Recognition of the clusters that are important or key clusters (in terms of number of firms, number of employees, historical factors) for the development of the country. The implementation of the model is to provide favourable conditions in a particular place and should lead to a continuation or development of competitive position.
Policy aimed at increasing the competitiveness of small and medium-sized companies	Inability of small businesses to innovate and learn together with other entities require action of public authorities, which will lead to an increase in the sector's interaction with external expertise centres, as well as with other companies. Network programs designed to achieve these goals are not necessarily based on cluster policies, if the networks do not refer to specific elements of the value chain.
Regional Development Policy	Increasing the attractiveness of regions and increasing their economics. The approach used by many development agencies, middlemen and government officials working at the regional level. Some regions, leading an active cluster policy, use a wide range of state policy instruments, such as stimulating the flow of investment, supply chain development, development of small and medium-sized enterprises and promotion of new technologies.
Policy focusing on measures including intensification of cooperation between industry and R&D	To strengthen the co-operation between industry and the R&D institutions, especially in the activation of the companies operating in the sectors for advanced technologies. To increase the degree of interaction between industry and research institutions, it is necessary to change the orientation in the direction of greater practical application of research results achieved. The approach used in regions concentrated geographically (e.g. urban areas) to launch economic potential, so that new technologies will arise. Directing the activities of public authorities to create a critical mass (sufficient number of firms) in emerging technological areas by attracting research units and finding big investors with R&D, as well as companies based on new technologies. Assuming that companies specializing in development of new technologies will grow faster if they will just share complementary resources with other companies and research centres.

S o u r c e : own study based on Pilarska C., *Polityka oparta ...* op. cit., pp. 102-103.

to the implementation of a policy based on clusters with the use of different models of objectives, methods and tools for this policy. Noteworthy is a model developed by the Dutch Ministry of Economic Affairs. It contains four types of policies to support the clusters development, which are synthetically presented in Table 2.4.

However, the European Commission proposed a classification of the cluster policy in regard to the type of entities and interactions in the cluster. According to this criterion the following models have been distinguished:

- policy model aimed at strengthening interaction in the triple helix;
- policy model focused on the relationship between industry and R&D sphere;
- policy model focused on stimulating all types of interactions (in vertical or horizontal systems) between firms within the cluster and its surroundings.

The presented classification shows that cluster policy can be considered totally as the base (frame) of these fields of policies, which are aimed on, for example, infrastructure and institutional conditions, essential for the functioning of clusters. In this perspective cluster policy can be defined in a very broad sense and it should incorporate all the policies that have any effects on the clusters. On the other hand, considering that most of the elements are linked in one way or another in the economic space, policy model defined this way becomes completely impractical. In addition, cluster policy is limited in a sense that, although it includes some of the general conditions of the economy, it includes also within its scope the activities that are undertaken with the sole intent to influence the process of clustering. No proper infrastructure, natural or legal, educational weakness or weak conditions conducive to long-term learning process, isolation of certain regions – are examples of areas that have a large impact on the clustering conditions. When choosing a model defining the enhanced framework for policies used it is important to determine how the system of government should be expanded for it to be able to co-ordinate the measures in the wide spectrum of adjacent cluster policy areas in order to shape more consistent and comprehensive conditions for dynamic cluster development.

At this stage of cluster policy implementation in the European Union it is difficult to assess its real impact on the development of clusters. Cluster initiatives taken by public authorities under this policy are still very young, and so we will have to wait for their results. So far, no comprehensive analyzes have

been conducted in this area. There are only preliminary results and individual case studies. In addition, measurement of outcomes achieved is hindered by the facts that in many countries actions of public authorities towards supporting cluster development are not strictly defined as cluster policy, but often occur at the boarder of other policies. Therefore, the governments of the European Union countries are facing another challenge, this time in the form of generating the most effective methods of monitoring and evaluating the results of action taken. Proper identification of the effects of the policy will enable more effective involvement of public authorities in the process of clustering in the future.

2.3. Implementation of cluster policy in Poland

Cluster policy in Poland is not a separate sphere of action, and there is no separate government document that corresponds directly to it. It is treated as part of the national innovation policy. Governmental organizations supporting cluster initiatives, among others, are the Ministry of Economy, Ministry of Regional Development, and Polish Agency for Enterprise Development and the Institute for Market Economy Research. Actions taken by the aforementioned organizations are mainly conducting conferences and seminars and maintaining a web site on the innovation portal. Cluster support is accomplished through the implementation of specific actions under the operational programs – targeted mainly to support directly the cluster coordinator 2 as well as the use in a coordinated way of various instruments that can stimulate the cluster development (such as joint projects of companies and R&D units, technology transfer projects, etc.).

Polish clusters and cluster initiatives can benefit from a number of programs to support the formation and development of clusters, such as:

- Innovative Economy Operational Programme 2007–2013, Priority 5 – Diffusion of innovation, Measure 5.1 – Support of cooperative relations of supra-regional scope;
- Sector Operational Programme Human Resources Development (SOP HRD), Priority 2 – Developing a knowledge-based society, Measure 2.3 – Development of modern economy, the pattern "b" – promoting systemic solutions in the field of adaptive capacity and knowledge-based economy;

- PRO INNO EUROPE project funded under the Sixth Framework Programme;
- INNET Project.

At the regional level, cluster initiatives are reflected in the Regional Innovation Strategies, Regional Operational Programmes and Regional Development Strategies.

In Poland, interest in the policy is based on clusters increased after the accession of Poland to the European Union in 2004. One of the institutions, which are actively investigating the development of clusters, is the Institute for Market Economy Research (IMER). According to the Institute, cluster policy includes a set of activities and instruments used by the authorities at various levels to improve the level of competitiveness of the economy by stimulating the development of existing clusters or creating new cluster systems primarily at the regional level[113].

The cluster support programs often point to three groups of instruments to support them[114]:

- reinforcement of the participants' commitment;
- access to common services;
- support of large scale research and development projects.

The first category of instruments related to engaging participants and conducting cross-linking activities is mostly supported by grants of up to € 100 000 per initiative a year. The support period is usually up to five years. The second category includes expenditures on programs that focus on providing support services for joint projects, including small R&D projects, in the amount of €100.000 to about €1 million a year per cluster within a few years. The third category of „large" R&D projects includes projects worth more than €1 million a year per cluster for a period of ten years. Generally, the level of funding for most of the support programs is rather modest, and it is rather used as a base to raise additional financing and not as a sole source.

A common feature of cluster policies in Europe and in the world is a strong program brand, which is an important communication factor for initiatives, particularly regional. For example, strong brands of Swedish and German programs have attracted new, interested participants from different business

113 Brodzicki T., Szultka S., Tomowicz P., *Polityka wspierania* … op. cit., p. 16.

114 *Wykorzystanie koncepcji klastrów dla kształtowania polityki innowacyjnej i technologicznej państwa. Rekomendacje dla polityki stymulowania rozwoju klastrów w Polsce,* Instytut Badań nad Gospodarką Rynkową, Gdańsk 2009, p. 15.

areas outside the existing group of 'traditionally' applying initiatives. The success of programs with a strong non-financial support indicates that relatively inexpensive financing can stimulate high additional involvement of regional partners and generate a high return on investment. The non-financial support to the initiatives that have not been winners of competitions, have allowed them to exist and develop on the basis of funding from other sources (experience of the VINNVÄXT and BioRegio).

The experiences of European programs also indicate that the initiatives which received support evolve gradually – they become important centres of innovation in their region or competence area. Examples of European solutions show the need for cluster policy of long-term horizon of action. The success of these activities depends, however, on whether institutions offering support work only as an evaluator or also as a partner supporting initiatives to achieve their goals, as it was in case of VINNOVA, the Swedish Agency

Previous activities related to supporting the development of clusters in Poland preceded with varying intensity in different periods. Before 2007 cluster support policy in Poland was carried out indirectly through the assumptions included in the Sector Operational Program Improvement of the Enterprises Competitiveness 2004–2006. They related in particular to reinforcing business support institutions and strengthening cooperation between the R&D sector and the economy. The Operational Programme Human Resources Development for the years 2004–2006 mainly supported projects showing businesses and local governments the opportunity to interact in the form of clusters. Priority was therefore assigned to actions on increasing awareness of clustering, defining areas of potential cooperation between enterprises, helping companies to make decisions on the possibility of cooperation in the form of a cluster and the implementation of joint projects important for the development of firms and regions. These initiatives allowed recognizing the potential of the network structure in the creation of regional development policy. Activities relating to cluster policy in Poland increased considerably during the programming period 2007–2013, when Poland acquired major funds from the European Union. Support for the establishment and development of clusters in Poland was detailed in the Strategy Paper named „Strategy for increasing the economy innovativeness for the years 2007–2013", adopted by the Government in September 2006. The document in one of the directions indicated the importance of promoting joint actions by entrepreneurs, with a focus on the implementation of innovative projects. In the financial perspective 2007–2013, cluster support programs were entered in both the general national

operational programs and regional operational programs of individual provinces. In the context of support for clustering at the national level, the most important is „Innovative Economy Operational Programme, 2007–2013" (IE OP). Interventions under IE OP include direct support for enterprises, business environment institutions and research units that provide companies with high quality services and system support to develop the institutional environment of innovative enterprises. IE OP does not refer directly to the support of clusters and cluster initiatives – the concept of a cluster is included in the definition of the so-called cooperative relations and science-industrial consortia. The most important measure to support the clusters development in the IE OP is Measure 5.1 – „Support for development of supra-regional co-operation." Its aim is to strengthen the competitive position of enterprises by supporting the development of links between companies and between enterprises and research institutions. Following the strategy under the Priority 5 of the IE OP, support is awarded for the development of trans-regional cooperation links, in particular for the joint venture investments and advisory activities that contribute to facilitate the transfer and diffusion of knowledge and innovation between the cooperating parties. Under Measure 5.2 innovation-oriented business environment institutions are supported, such as science and technology parks, technology incubators, technology transfer centres. Clustering support is also provided in the Operational Programme Human Capital, particularly in Measure 2.1 „Development of modern economy." The overall objective of this Priority is to improve the competitiveness of companies through increased investment in human capital of companies and improving the quality and availability of training and consulting services that support the development of entrepreneurship. For example, in the framework of the Human Capital Operational Programme 2011–2012, Polish Agency for Enterprise Development implemented a project for the promotion of clusters and clustering under the name „Polish clusters and cluster policy". Its main objective was to: strengthen Polish clusters, increase their competitiveness and innovative capacity through the development of human capital and through increasing the efficiency of cluster policy. Action was primarily directed to the coordinators, clusters animators, entities operating in clusters and collaborating with clusters, representatives of central and local government and all units interested in the development of clusters in Poland[115]. Clustering is also supported under the framework of the Development of Eastern Poland Operational Programme, which covered five provinces: Warmia

[115] Hołub-Iwan J. (ed.), *Benchmarking klastrów …* op. cit., p. 146.

and Mazury, Podlasie, Lublin, Swietokrzyskie and Podkarpackie. In frames of the above projects can be carried out that involve:

- conducting analytical studies, preparation of analyzes, studies and publications in the field of development policies based on clustering in the provinces of Eastern Poland;
- purchase of research results, analyzes, evaluations – promotion the clustering idea in Eastern Poland including: conferences and thematic meetings, creation and development of clusters, strategies and operational documents for cluster growth, purchase of consultancy / legal and marketing service, public relations, hiring area under the "cluster office", organization of conferences and thematic meetings for cluster members, organization of trade missions abroad, participation in thematic / sector conferences.

In addition to the options described above, cluster initiatives can apply for support from specialized programs, such as Eastern Poland Development OP and Central Europe Programme. Support of this kind is available only for clusters that meet specific conditions, such as for example – the headquarters of beneficiaries must be located in the provinces of eastern Poland. Support for local clusters, which do not meet the requirements to enter the competition at the national level, is available at the regional level. The main supporting entities are local authorities. Each regional program includes measures to support and develop local and regional linkages. Support is provided for, among others, transfer of technology and innovation, strengthening the potential of technology parks and research institutes, stimulation and development of networks and co-operation between enterprises and R&D institutions.

The ROP for individual provinces are programs and support instruments, which are available to regional clusters. We should note while analyzing the contents of the ROP 2007-13 in Poland, that the greatest possible support is awarded to projects related to the concept of cooperative relations focusing on:

- determining clusters;
- creation of an organizational structure and management of its marketing activities;
- efforts to attract new members, promoting best practices;
- creation of co-operation between its members for the purpose of technology transfer.

Analysis of the Regional Operational Programmes indicates main approaches of individual provinces regarding implementation of clusters and cluster initiatives support policies. They include, in particular:

- direct determination of the possibility of cluster support from the structural funds and separation for this purpose an individual measure (most often represented measure);
- combining measures to promote clusters with those of any other nature aimed at supporting entrepreneurship, business environment institutions or those aimed at building relationships between companies and R&D;
- no separate instrument dedicated to the clusters support, but at the same time giving adequate priority to actions implemented to favour the development of clusters by placing the appropriate entries in the selection criteria of projects funded under the program (e.g., ROP Podlaskie Province);
- ignoring the possibility of cluster initiatives support by regional programs, which force the potential beneficiaries to apply for national funding.

Due to the fact that each province alone determined its program, the programs differ from one another in terms of the offered support, as well as the conditions for their acquisition. We should pay special attention to the fact that only some of them use names directly indicating that it is a support for the development of clusters. In other cases, such support may be provided for activities related to investments in small and medium-sized companies or projects, consulting and training projects. These differences are reflected in the imbalance in the regional support. For example, two similar regional cluster initiatives could be supported in one province while they would not be eligible for support in another.

In case of Podlaskie possible directly defined support for clusters within the PP ROP is basically covered only in the Measure 1.2.2. – Economic Promotion of the Region. It includes support for participation in trade fairs and exhibitions at home and abroad, organizing and participating in trade missions at home and abroad, support the execution of advertising campaigns promoting the region in the country and abroad and support activities promoting cooperative relations brand/cluster initiatives. This is in a conflict with the declarations contained in the indicated at the beginning of the chapter strategic documents prepared by the authorities of Podlaskie.

Although a number of programs has been implemented so far at national and regional levels they have not been evaluated yet on their added value and impact on economic development. Preliminary analysis of support indicates that cluster policy actions should not be limited only to those aimed at the

creation and development of initiatives and cluster organizations, but should be also focused more on coordination and strengthening of other instruments related to investments in companies and investments in the field of research and development.

This should allow for a better allocation of structural funds available at different levels and focus that support on those concentrations of companies that have a chance of dynamic development, achievement of global competitiveness and becoming a driving force of economic development in Poland.

Following research on clusters in Poland, the need was determined to supplement cluster support instruments by the following elements:

- support for the development of cluster coordinators working procedures and relationship management in a cluster in order to reduce the risk of unfair distribution of benefits between members of the cluster;
- financing of fixed costs of cluster coordinator in order to ensure great stability of his/her activities;
- protection of intellectual property rights and supporting audit of training needs of clusters;
- support for the networking and partnerships with foreign clusters;
- organization of diagnosis workshops regarding cooperation between the cluster members, for example in the field of innovation and technology transfer.

To support clusters development in Poland professional and transparent process of clusters selection is important. It should be noted that in terms of Poland there is a need for evaluation and assessment of the intervention results. Evaluation of cluster policy should be conducted in terms of possible errors elimination. Changeable internal and external conditions should also be taken into account. Mechanisms of resigning from the creation or development of cluster, in the event of a significant risk of cluster purposes failure, need to be designed.

2.4. Perspectives of cluster policy development in Poland

In the document "National Strategy for Regional Development 2010–2020: Regions, Cities, Rural Areas" prepared by the Ministry of Regional Development, adopted by the Council of Ministers on July 13th, 2010 regional policy objectives

are indicated. Under Objective 1: "Supporting the competitiveness of the regions' it is stated that one of the activities stimulating the spread of development processes will be supporting economic development based on local and regional specialties, especially within cluster initiatives. Supporting the development of clusters was identified as a modern instrument of regional policy to support beneficial specializations, both regional and local. The support will be targeted specifically to clusters with the greatest competitive potential – currently showing international competitiveness, or giving a real chance to build such competitiveness in the future.

Regional policy, in the frames of cluster policy, will affect the competitive capacity strengthening and transforming concentrations of companies into dynamic clusters with high level of competition and cooperation, interaction and external effects.

Support intended for clusters will cover in particular:

- R&D activities;
- encouraging international expansion of companies;
- development of human capital quality in enterprises;
- stimulating collaboration in industries;
- establishing new businesses.

The objective of regional policy in this area will also be supporting cluster organizations or other legal entities involved in the cluster management, including development of the rules for participation and access to a shared infrastructure or operations. The establishment of a cluster organization or network of cooperation should be promoted by the authorities at the regional level through deepening economic cooperation between communities, government and science. Planned activities carried out from the regional level should be a part of the regional policy support for clusters. It is very important to maintain complementarities with national initiatives concerning: industrial policy, transport policy, attracting foreign investment and promoting education. The characteristics of the basic directions of cluster support policy are shown in Table 2.5.

The document *"Using the cluster concept for shaping the state policy of innovation and technology"* includes the concept of policies to stimulate clusters on the basis of the structural funds in the next programming period[116]. These include recommendations for clusters support to be directed to the clusters with the greatest competitive potential – showing the current international

[116] *Wykorzystanie koncepcji klastrów…* op. cit., p. 15.

Table 2.5. Characteristics of the directions of cluster support policy

	Description/characteristic	Determinants	Level of support
Technologic clusters	Cooperation network for the development and commercialization of technologies in the specific area.	➢ existing strong scientific potential in a particular area; ➢ meeting the economic interest in the development and implementation of technology.	national
Competitive clusters	Concentrations of activities in a particular industry located in one or several neighbouring provinces characterized by international competitiveness.	existing economic potential (export, sales, employment) concentrated in one or several neighbouring provinces, the existing research facilities interested in cooperating with the economy.	national/regional
Local/regional clusters	Clusters of regional potential characterized by the ability to compete in domestic and international markets.	great importance for the economy of the area (region, county).	regional/local

Source: *Wykorzystanie koncepcji klastrów dla kształtowania polityki innowacyjnej i technologicznej państwa. Rekomendacje dla polityki stymulowania rozwoju klastrów w Polsce,* Instytut Badań nad Gospodarką Rynkową, Gdańsk 2009, p. 15.

competitiveness, or giving a real chance to build such competitiveness in the future. The right choice based on clear and objective principles is also crucial to the effectiveness of stimulating the cluster development policy. Clusters should be selected through a competitive process based on three groups of criteria including the existing economic and scientific potential, development strategy for the future and partnership of entities[117]. It is necessary to prevent the dispersion of resources and their concentration on a limited number of clusters with the greatest potential in order to stimulate the development of clusters that have a real chance to achieve international competitiveness. Support for local and regional clusters should be available from the funding of regional operational programs i.e. at the level of province. Cluster development is a long term process. Cluster development support policy must take into account this factor and provide support for at least the medium term perspective – 5 years. Support for clusters should be directed to the areas that strengthen the potential future development of competitive clusters (enterprises operating in clusters) and not petrifying the current structure.

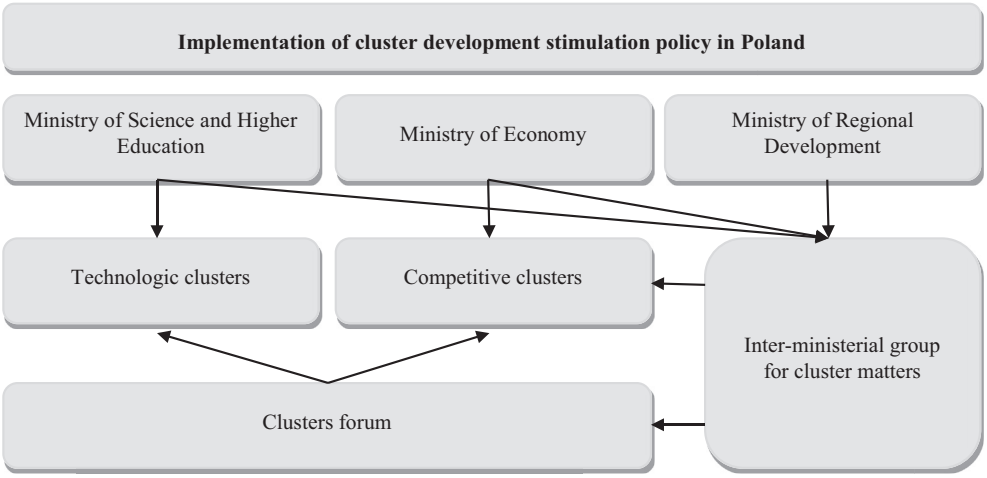
[117] Ibidem.

In particular, support should be used for the following kinds of activities[118]:

- R&D activities;
- encouraging international expansion of companies;
- development of human capital quality in enterprises;
- stimulating collaboration in industries;
- establishing new businesses.

The proposed scheme of technology and competitive clusters development policy implementation in Poland is shown in Figure 2.2.

Figure 2.2. Technology and competitive clusters development policy implementation in Poland



Source: *Wykorzystanie koncepcji klastrów* ... op. cit., p. 46.

In another document, *"Guidelines and principles of cluster policies in Poland until 2020"* recommendations were set out for future cluster policies. They are based on the assumptions accepted in government documents. In particular, reference was made to the following studies: *Poland 2030 Report Third wave of modernity, the National Regional Development Strategy and the National Reform Programme 2020*. These documents recognize the need to support the development poles in order to accelerate growth and enhance the competitiveness of Polish economy, and also the need to support economic development based on regional and local specialties, particularly in frames of the cluster initiatives.

In the documents mentioned above, it is assumed that the clusters support should be done in the following areas: research and development activities

[118] Ibidem.

(R&D), stimulating the international expansion of enterprises, development of human capital quality in enterprises, enhancing cooperation in industries, establishing new businesses. Support should be directed specifically to the clusters with the greatest competitive potential. The selection should therefore result in a concentration of public funds (including funds from the European Union). The proposed recommendations are in line with the EU 2020 Strategy and postulated by the European Commission concept of smart specialization. It assumes that each country and region should focus its efforts and resources on specific, small number of priorities or economic specialization of considerable innovative potential, which has real powers and resources and can achieve excellence and global competitiveness. Preparation of smart specialization strategies at national and regional levels will be the condition for granting EU funds for investments in research, development and innovation.

Developed recommendations assume that the main objective of the future cluster policy should be to strengthen innovation and competitiveness of Polish economy on the basis of intensifying collaboration, interaction and knowledge flows within clusters and supporting the development of strategic economic specialization (key clusters). Formulated trends and assumptions of cluster policy provide two lines of influence to achieve this objective.

The first one involves broad support to existing and forming clusters through funding (mostly at the regional level) cluster coordinators, including also cluster initiatives conducted by them. This ensures the functioning of institutions with a key role in the development of cooperation, interaction and knowledge flows within concentrations of economic activities, and thus improves their competitiveness and innovation. The second covers integration of public support available around the selected clusters of key importance and competitive potential for the state economy (central support) and individual regions (regional support), inscribed in the smart national and regional specialties. It is proposed to direct a part of the available support to co-funding a bundle of development projects agreed in the frames of key national clusters. These projects would be implemented by entities operating in clusters, i.e. companies, educational and research institutions, business environment institutions and other (including coordinators) or consortiums created by them (preferred). These would include, research and development activities, investments in joint educational and research infrastructure, human capital development, internationalization, etc. The expected result is an integrated and coordinated use of various policy instruments – innovative, science and technology, export-oriented, human capital development, etc.

The above courses of action are linked, because the strengthening of key cluster development also requires supporting their coordinators. Targeting support towards the cluster key actors directly will require the functioning of cluster initiatives and coordinators, i.e. the institutions which allow defining a common development strategy and action plan. Entities from all clusters will benefit from the available public support in general terms, and agreed projects of the key clusters actors, because of the importance of these clusters for economic development of the country or region, will benefit from the priority funding path (with additional points in the projects evaluation system). All projects of the key clusters will go through the standard procedure of formal and substantive evaluation, in which they will compete with other projects

In addition, it is recommended that the central administration in cooperation with the regional administration should develop a flexible program of support for cluster coordinators. It should then be notified to the European Commission in order to receive approval for allocating a higher support than *de minimis aid*, with varying levels of funding and without the need for a formal transfer of support given to entities that make up the cluster initiative. The main support for implementation of the basic functions of coordination within clusters would then run on a regional basis. At the national level additional funding would be available dedicated for coordinators of national key clusters and intended for internationalization – i.e. co-operation development and international expansion. At the same time, it is recommended that cluster coordinators should have the ability to raise financing for the implementation of specific, additional features and services, especially if the cluster lacks other institutions that could provide them efficiently.

For example, the coordinator should be able to apply for grants for activities in the field of technology transfer, innovation-oriented consultancy, professional training services and laboratory infrastructure provision, if there is no institutions specialized in this field within the cluster. Institutions forming various instruments of support available to the general business environment should take into account the cluster coordinators as potential project providers. It is proposed, however, to avoid making additional functions by the coordinator if they can be performed by other institutions that already exist in the cluster or its environment – that is, for example, university technology transfer centre, the institution of the National Innovation Network, science and technology park, special economic zone, or specialized private companies (including consultancy firms). Simultaneously various existing bodies and institutions should be allowed to act as co-ordination, subject to the necessary organizational separation of this

activity, employment of a particular person with particular competence for the position of the cluster manager.

The presented analysis show that cluster support policy is an important element of economic policy, which combines elements of different types of policies: innovation, regional, industrial, scientific-technological, educational, concerning SMEs, exports promotion and attracting foreign investment. Due to the fact that cluster support policy has not been carried out in Poland for a long time yet and it has largely related to stimulating cooperation between industry and the world of science, it has a particular significance in the light of innovation policy. Practice in Poland and around the world shows that cluster development initiatives are most often implemented at the regional level and are also parts of the regional development policy. It should be especially emphasized that the cluster policy in Poland, as well as at the EU level, in accordance with the Communication of the European Commission of 2008 presented above, is built on the basis of the so-called bottom-up approach according to which the most active participants in the process of building a cluster should be local companies. In this approach the activities of the state should play only a supporting role and focus on selective support programs and creation of appropriate institutional infrastructure in the cluster environment. Cluster development support provided by the public finance should in all cases be linked to the existence of real market imperfections. Simultaneously the role of public authorities in promoting a cluster should depend on the phase of the cluster development i.e., the scale and scope of support should be adapted to the development phase of the cluster according to the concept of its life cycle. Different actions of the public authorities are needed in the embryonic phase and growth phase and different in the mature or decline phases.

Clusters in the Podlasie RIS

The point Mission, strategic objectives and directions of development, Section 1 "Strengthening the competitiveness of the economy in Podlasie through innovation" provides that "*Local governments have unused resources in the form of investment areas and facilities with the necessary technical infrastructure that could constitute the basis for creation of industrial parks. Special features in this respect are found in the largest urban centres (Bialystok, Lomza, Suwalki), which are concentrated in the business environment institutions and specialized staff. Formation of industrial parks in these centres will favour the emergence of clusters in selected industries. Similar – to the developed but not used infrastructure – capabilities are observed in a number of local centres with sufficient potential to create*

a park." [119] In the part "Defining areas of intervention in the region and proposed pilot projects" section 3 "Clusters in Podlasie" states that clusters are innovative systems providing mainly knowledge transfer and based on the direct contacts of people. Geographical proximity is very important for this type of knowledge. Thus, compared to regional and national innovation systems, the intensity of knowledge diffusion through mobility is greatest in clusters.

The above review of cluster policies shows that within the European Union there are many different solutions to support the development of clusters and a universal model in this regard and have not been developed yet. Different countries often seek optimal solutions alone recognizing mutual benefits of cluster structures. Cluster support policy can be used at the national, regional and local levels as well as at the international level. In general it is fairly broad and horizontal policy. Its objective is most often to increase the economy competitiveness through stimulation of the development of existing clusters and creation of new ones. An important element of this policy is to promote interaction characteristic for clusters, including instruments such as: the networks of cooperation, excellence centres, science and technology parks, etc. However, a characteristic feature of cluster support policy is that it is often applied in a coordinated manner for specific cluster structures. A clear specific of cluster support policy is that there can be no single model of such a policy defined. In some countries and locations it is necessary to use different, individually tailored instruments. This is due to the fact that we are dealing with different types of clusters that are located at different stages of development. This is important for shaping the cluster support policy because it requires a process approach to define the optimal model, a set of tools for the specific conditions and the use of relatively flexible programs and supporting instruments.

Public authorities, joining the process of clustering, must remember that the purpose of the cluster policy is not to replace market mechanisms, but only act for their support. Thus, the use of the state intervention in this area should be conditioned by first of all evidence related to the existence of market failures and the existing barriers to the clusters development. Moreover, it should be noted that not the public authorities but the individual companies and organizations are the main actors in the process of clustering and cluster policy should be only a plane to establish specific conditions that lead to engaging people in joint activities and realization of mutual benefits. Understanding and positive attitude of the state policy makers is therefore of great importance in the context of the benefits that can be achieved through cluster initiatives.

[119] *Podlaska Strategia Innowacji* … op. cit., p. 47.

Chapter III.
METHODOLOGICAL ASPECTS OF CLUSTER RESEARCH

3.1. Identification of clusters and conditions for their formation

Cluster research methodology is of diverse and multidimensional character. In practice, there are many methods (their nature is partial or full). The inability to develop a widely accepted approach is conditioned in particular by:

- geographic level (national, regional, local, sector), at which the clusters are examined;
- the availability and nature of the data used (quantitative, qualitative).

Table 3.1. Summary of selected methods and techniques used in clusters research

Method	Description
Method of links penetration	It examines the relationship of one big company with a specific product specialization and actors cooperating with it horizontally (value chain) or vertically. This is the description method, which is based on the results of a survey about the strength of relationship between the agents, including the institution of the microenvironment in a given scale or flow of products and services. This method is regarded as one of the simplest methods suggested by M.E. Porter in cluster research.
Delphy Method (expert)	It is effective in the analyses of clusters formation and development, especially when some processes can not be quantified. It is an intuitive method of forecasting used alone or in conjunction with other methods and techniques applied in a situation when we want to get an overall assessment of more than one expert. It is based on interviews with a group of purposefully selected experts (e.g. representatives of local governments, regional authorities, managers, representatives of scientific institutions, authorities and experts in specific fields), who are normally selected by discretionary method according to criteria such as knowledge, experience, profession field, etc. Experts formulate assessments subjectively, then their assessments are objectified (verified) by the following approaches (stages) of interaction between individual experts (questions and information). Procedure most commonly used includes three or four rounds of getting information, since it is a convergence of views on the issue under examination, e.g. identification of development trends, projections of future conditions, the size and timing of events. It is assumed that the number of experts should be 10-15 people

The extensive range of research approaches used in these analyses on one hand imply difficulties in comparing factors that determine their viability and competitiveness, but on the other provide multi-criteria and variety of

Table 3.1 continue

Input/output method (I/O)	The essence of input / output method is identification and grouping of departments / sections of industry, agriculture or other actors along the value chain, related to the flow of goods and services, which may eventually tend to form clusters The four most important variables characterizing the strength of ties between sectors of the economy include: ➢ value of intermediate demand streams (input-output matrixes); ➢ coefficients of direct expenditures; ➢ coefficients of full circulation; ➢ coefficients breakdown structure. It is important that the obtained results of analyses used for identification of clusters, based on the data in the input-output tables were also complemented with the qualitative description of the existing relations of cooperation, diffusion of innovation, knowledge sharing, etc. on the basis of interviews and surveys made by experts (e.g., Delphi method). In practice the most commonly used methods of identifying clusters, based on input-output tables include: ➢ Maximization method, in which the procedure is as follows: 1) of the appropriate matrix elements located outside the main diagonal, choose the one which corresponds to the highest value 2) the coordinates of the maximum element identify the sectors to be connected (forming a cluster); 3) after the connection (the size of matrix is reduced by one), go back to step one and then go through the whole procedure again. Repeat this until the number of clusters established in advance by the researchers is reached. Disadvantages of this method include using only one matrix and preventing simultaneous use of others. Note also that the use of each matrix generates different results because of their different economic interpretation. Another disadvantage is the need to determine arbitrarily the number of clusters. ➢ Method of restricted maximization the essence of which is that not all the elements of the specified matrixes are taken into account, but only those that meet certain restrictions. Because the matrix elements schemes are not known, and they could be used for formal verification of their statistical significance, in practice a new matrix (A^r) is determined on the bases of the considered one (A), when matrix A^r is such that: $$a^r_{ij} = \begin{cases} a_{ij}, \text{ gdy } a_{ij} > \beta n^{-2} \sum_{i=0}^{n} \sum_{j=0}^{n} aij \\ 0, \text{ gdy } a_{ij} \leq \beta n^{-2} \sum_{i=0}^{n} \sum_{j=0}^{n} aij \end{cases}$$ where: β is a constant; n – number of matrix lines (columns) . Determination of the matrix restriction is usually the starting point for the next stage - the grouping of non-zero matrix elements in clusters, in which the method of maxima is used. Note however, that there is also a variant based solely on restriction matrix. Appropriately defined restrictions may refer to more than one matrix. In addition, this method does not require the arbitrary determination of the number of clusters. However, if there is a need for distinction of predetermined number of clusters it is achieved through an appropriate adjustment of the constant β.

approaches. Summary of selected methods and techniques for clusters research are summarized in Table 3.1.

Table 3.1 continue

Input/output method (I/O)	➢ Diagonalization method, wherein at the beginning the restriction matrix is determined for the selected matrix, such that: $z^{r}_{ij} = \begin{cases} z_{ij}, \text{ when } z_{ij} > q^{Z}_{1-\alpha} \wedge a_{ij} > q^{A}_{1-\alpha} \wedge b_{ij} > q^{B}_{1-\alpha} \\ 0, \text{ when } a_{ij} \leq q^{Z}_{1-\alpha} \vee a_{ij} \leq q^{A}_{1-\alpha} \vee b_{ij} \leq q^{B}_{1-\alpha} \end{cases}$ where: $q^{X}_{1-\alpha}$ – quartile row $1-\alpha$, calculated for all the elements of the matrix X. Subsequently, the restriction matrix comes down to a block-diagonal, where each distinguished block is a group of sectors strongly related to each other while unrelated, for a given significance level α, with other economy sectors (cluster). Note that the method is insensitive to the choice of the matrix to be analyzed. The value of the critical level, which is used when constructing the restriction matrix, is influenced by all the elements of the respective matrixes, including those located on the main diagonals. In case of economies in transition the use of the uniform level of significance α can lead to overestimation of the critical level. Note the fact that due to neglecting the value of one of the restriction matrix elements (assuming only that it is a value above zero) this method does not detect a relationship existing between two well-defined clusters. This disadvantage is a major limitation for the use of this method to analyze the process of innovation diffusion in the economy, based on the structure of cluster, where the link between well-defined clusters can not be ignored. ➢ Triangulisation method is particularly useful in the analysis of clusters role in the distribution of innovation in the economy, providing an image of cluster structure of the economy of higher transparency, compared with the conventionally used methods. In the initial stage, proceed in the same way as in case of the diagonalization method, that is based on the adopted level of significance α, determine the restriction matrix of restrictions Z^{r}. It is necessary to limit the set of elements for designation the corresponding quarter to those located outside the main diagonal. Then a new matrix is created $E = [e_{ij}]$, such that: $e_{ij} = \begin{cases} \max (z^{r}_{ij}, z^{r}_{ji}), & \forall_i > j \\ 0, & \forall_j > i \, . \end{cases}$ Subsequently, the matrix E is reduced to the form equal to a block-triangular form (in the absence of linkages between sectors forming distinct clusters or between sectors within clusters and outside clusters). Important links between different clusters (or between sectors that belong to clusters and non-clustered) represent the non-zero elements located outside the triangular blocks. The sector is included in the cluster, which has the strongest links.

Table 3.1 continue

Localisation/concentration index

The group of these factors include:

- LQ location factor, is used to identify the concentration of industry data and a preliminary analysis of potential clusters, but does not provide information about the clusters themselves and links between sectors. Analyses carried out with this method should therefore be deepen with the other methods, e.g by the expert method. It is calculated by the following formula:

$$LQ = \frac{\frac{E_{ij}}{E_j}}{\frac{E_{in}}{E_n}}$$

where:
E_{ij} – variable (economic categories such as employment, value added, income, number of companies can be used) in the section/test area j (e.g province);
E_j – variable in all sections of the test area j;
E_{in} – variable in section i reference area n (e.g country);
E_n – variable in all sections in the reference area n.

If LQ equals 1 it means that distribution of the analyzed variable in the researched area is similar to the distribution of this variable in the reference area (a standard deviation of +/- 0,15 is acceptable). LQ higher than 1 means that in the researched area there is higher concentration of the analyzed variable than the average in the reference area. However, if LQ is higher than 1.25 it is generally accepted that there is regional specialization in this sector.

- Simon Index (SI), is used to study the diversity of societies and economies in terms of the analyzed features. It allows to explore true diversification of the activities within the territorial unit, but it does not provide the possibility to compare the lower level unit to higher level one. This index is the numerical value from 0 to 1, where a value close to 0 indicates a large variation, while the one close to 1 - a small variation of the selected feature. It is calculated by the formula:

$$SI = \left(\frac{A_i^k}{A_i^k + B^k}\right)^2 + \left(\frac{B_i - A_i^k}{A_i^k + B^k}\right)^2$$

where A and B refer to the basic geographic or administrative unit (e.g. commune, district, province).

- Gini localization index (GC), characterizes the spatial concentration of certain industry sections to the entire industry in different territorial units (commune, district, province). The object of the study may be concentration of different economic measures, such as the number of enterprises, employment, exports value, depending on the analyzes needs and purpose. Determination of the index should be in accordance to the following stages:
  1) calculation of shares l_i^k number of companies A_i^k in lower row units k (where k = 1,2,...., k) in group i (i = 1, 2..., i) to the number of companies C_i, in group i (i = 1, 2..., i) in a unit of higher row A_i^k/C_i;

Table 3.1 continue

Localization/concentration index

2) calculation of shares L_i^k number of companies B^k in units of higher row k (where k = 1,2,...., k) in section against number of companies D in section against unit of higher row B^k/D;
3) ordering pairs of shares $l_i^k - L_i^k$ ascending the l_i^k;
4) calculation of cumulated values for both shares;
5) chart drawing, place on the abscissa axis (axis X) cumulated values L_i^k and on the ordinate axis cumulated values l_i^k, next join the points by a polyline;
6) points with coordinates (0,0) and (100, 100) should be joined by a straight line (diagonal of the square - equitable distribution line);
7) calculation of area of figure P limited by diagonal (equitable distribution line) and a polyline P, joining pairs $l_i^k - L_i^k$;
8) GC coefficient calculation by the formula:

$GC = \frac{P}{5000}$, where 5000 is half of the area of a square with sides 100%.

GC is a normalized value within the range of 0 < GC < 1 (where 0 is no concentration, while 1 is total concentration).

- Florence location index (F), which shows the overall spatial structure of companies locations in the communes of the county. The coefficient is calculated by the following formula:

$$F = 0{,}5 \sum_i \left(B_i - A_i^k\right) / 100$$

If the industrial companies (B_i) and food processing companies (A_i^k) in communes are of similar structure the coefficient F is close to zero and F > 0,5 shows high localization.

- Ellison and Glaeser aglomeration index (γ) determines the degree of geographical concentration of the industry. It is calculated by the formula:

$$\gamma_{EG}^i = G_{EG}^i - H^i l(1-H^i)$$

where:

H^i - Herfindahl index for section i (is calculated from the shares of various factories j in the industry results i – production, market share, the share of export etc.)

$H^i = \sum_{j=1}^{i} \left(L_k^i\right)^2$;

G_{EG}^i - „raw" measure of geographical concentration that compares the share of employment in industry in the region and throughout the industry

$$G_{EG}^i = \frac{\sum_{i=1}^{k} \left(\frac{A_i^k}{C_i} - \frac{w_i^k}{z_i}\right)^2}{1 - \sum_{i=1}^{k} \left(\frac{w_i^k}{z_i}\right)^2},$$

where $\frac{w_i^k}{z_i}$ - share of sub-region i in total employment.

When the aglomeration index γ is 0 ($\gamma = 0$) it means that companies are located at random. If they are concentrated the index γ is higher than zero ($\gamma > 0$).

- CI, Cluster Index is a maesure of localization density that takes into account:
  - relative intensity of industry (ID);
  - relative number of companies (IS);
  - relative size of companies (SB).

Table 3.1 continue

Localization/concentration index	These figures are calculated for different sectors of industrial activities (i) in various regions *(k)* and they include the number of employed (W_i^k), the number of companies (A_i^k), size of the region (R_k) and population of the region (Z_i).Simultaneous considering of the geographical dimension of European macro-scale (259 NUTS 2 regions), national (e.g. province, districts and communes in Poland) and industries, in the form of four-digit section codes, is possible with the use of formula: $$CI = ID_{ik} \cdot IS_{ik} \cdot \frac{1}{SB} = \frac{\frac{W_i^k}{\sum_{i=1}^{i} W_i^k}}{\frac{Z_t}{\sum_{i=1}^{i} Z_t}} \cdot \frac{\frac{A_i^k}{\sum_{i=1}^{i} A_i^k}}{\frac{R_i}{\sum_{k=1}^{k} R_k}}$$ Concentration of companies that belong to a particular section of industry is confirmed when CI > 1, but to talk about the conditions for forming a cluster in a particular activity, the cluster index should be higher - between 3 or even 4. The lower threshold value can not be specified in advance. It depends on the region, the degree of the industry aggregation, the number of potential clusters, social and behavioral aspects, etc. This is due to the fact that the potential clusters can penetrate the various industrial sectors or administrative divisions. Calculated indexes can be a starting point for further consideration aimed at identifying clusters.
Multi-sectoral qualitative analysis (MSQA)	It is used to assess regional development by identifying the competitive advantage of the region, economic potential analysis, assessment of market opportunities and economic risk assessment. The individual elements are assigned a certain weight (high, average, low) on the basis of input-output data, expert interviews and other information. It may also be helpful to supplement the data by the method of reviewing regional development characteristic, such as social capital, technical, social and economic infrastructure.
„Laeding" sectors analyse	It is used in the identification of clusters developed on the basis of sectors, providing competitive advantage of the region. Its application involves firstly identifying the most developed sections / departments in the region's economy and describing relationship between their suppliers, customers, competitors and local institutions. Next, it is necessary to measure the level of competitiveness of the sections / departments (using for this purpose indicators such as labor productivity, capital productivity, salary levels, degree of specialization, etc.) and make their benchmarking. This analysis is deepened with the study of linkages by input / output method.

Table 3.1 continue

Maping of cluster	It reflects graphically (charts, diagrams, etc.) flows of materials, products, knowledge and innovation within the cluster, between its actors. The purpose of mapping is to: define concentration of companies, define linkages and relationships, identify opportunities and benefits of synergies, identify gaps and weaknesses that reduce the competitive position of companies, determine the cluster strength, size and specialization. The mapping process should go through the following stages: 1) collection of the relevant economic data (e.g. number of employees, capital investment, R&D, cash input/output, export/import, etc.) for the area (region/ province/commune /county), using the official industry classification; 2) identification of geographic and administrative territorial units for analysis; 3) examining the degree of localization according to industry classifications by calculating e.g. the location factor; 4) separation of concentrated industry sections / departments from distributed ones by a single or several different location indicators; 5) identification of industrial sections/departments of high existing or potential clusters concentration and major industries in the analyzed area (this can be done by examining the number of occurrence of relationships and interactions between the types of industry; industry sections/departments with a large number of links to related sections/departments can be described as major or cluster centers, for their identification multivariate statistical analysis techniques are used); 6) assigning the other industry sections/departments to clusters on the basis of their relation to sections/departments included in the cluster centers; 7) omission in building the cluster map, the peripheral sections of industry defined on the basis of input / output. The many advantages of cluster mapping, are among others: determining the position of the cluster in relation to its competitors, recognition of its potential, its strengths and weaknesses of competitiveness, identification of gaps in the value chain and factors that limit the sustainable development of the cluster, more complete recognition of the industry, development of a wide and complete offer range, identification of opportunities to form consortia and alliances and initiation and implementation of joint projects, defining the degree of cluster development and identification of the growth areas (especially in the initial phase), promotion of the cluster activities and identification of cooperation areas for clusters. The results of the clusters mapping method are important for understanding the economic and geographical conditions for both economic activities and entrepreneurship in the cluster. Remember though that this is a complementary method, which uses the results of other research methods and techniques. Therefore, to explain in full the cluster economic performance effects, some factors conditioning its profile and effectiveness, growth opportunities and conclusions of mapping should be combined with other elements of knowledge. Note also that mapping is seen by some researchers as a specific solution, rather than as a method only.
Diagram cobwebby	Its preparation precedes a quantitative analysis of several economic indicators, grouped in four dimensions of the cluster: ➢ size (e.g. employment, number of companies, GDP share); ➢ potential (e.g. changes related to the data mentioned above); ➢ power (e.g. salary level, productivity, localization, concentration); ➢ growth dynamics (e.g. refers to indicators mentioned above). The values of the analyzed indicators are then marked on the clusters map in the form of cobwebby diagram.

Table 3.1 continue

Groundings-Enterprises-Markets (GEM) cluster method	It is based on an assessment of the innovative potential of the cluster. The subject of evaluation are the following determinants: ➢ supply: developed e.g. human capital, knowledge, technology; infrastructure – is evaluated by hard and soft indicators (education system, laboratories, quality of life, state policy etc.); ➢ structural (related industries, company structure and strategy); ➢ demand (local and external markets). Structural and supply determinants are evaluated by the use of an appropriate list of questions. The evaluation on a scale of 0 to 10 is carried out by expert method. The most efficient (competitive) is the cluster that maintains or increases its market share in comparison to the average or has a higher than average rate of return on investment in the basic products lines. $GEM = 2{,}5\ (\prod_{i=1,3}(D_{2i-1} + D_{2i}))^{2/3}$ where: D – determinats. The maximum number of this evaluation points is 1000 (GEM=2,5*[((10+10)* (10+10)* (10+10)]$^{2/3}$=2,5*400=1000). Getting 250 points means that the region has a weak cluster development opportunity(s).
National pattern	It involves grouping industries at the national level. This is done on the basis of information about the technical relationships between these sectors, regardless their geographic location.
Method of OECD interaction (cooperation networks analysis)	It is based on an analysis of existing interactions, diffusion of innovations and the transfer of so-called tacit knowledge in the cluster. It allows testing the main forms of cooperation between the various elements of the regional innovation system, which consists of: ➢ interactions involving direct R&D activities in the company, between similar companies and R&D (in terms of intensity, the effects of cooperation, investments, barriers and benefits); ➢ interactions involving indirect R&D activities in the company, the market diffusion of technology, transfer of knowledge by employees (ways to strengthen the innovation capacity of companies are tested, both tangible and intangible assets such as equipment, production technology, software, licenses, patents, trademarks, know-how and skills of employees. Analysis of data obtained from sources both primary and secondary, are the basis for assessing the innovation degree of the cluster in critical and prospective aspects.
Taxonomic method	It allows for extraction of similar areas (regions) according to a set of diagnostic features of all sizes. These characteristics may affect the results of production (value, volume, productivity), employment, exports, sales, etc. by industry/business section of manufacturing and services. Grouping territorial units and search for areas of high/low activity is done by one of the methods: ➢ Different ways of calculating the average, relative or absolute squared differences, similarities, and their use according to Czekanowski's algorithm.

Table 3.1 continue

Taxonomic method	➢ Non-hierarchical analysis of concentrations - based on a matrix of distances between objects (territorial units) in a multidimensional space of features, so that it is possible to extract the optimal number of homogeneous classes by implementing an iterative program. Then, for each class some parameters are calculated such as: the number of objects in the class, the coordinates of the class center and distance of objects from the center of the class. Note that the optimal solution, from a mathematical point of view, is often difficult or impossible to interpret from the general practice position. ➢ Dendritic – allowing for the linear and non-linear ordering of the objects in the multidimensional space by projection on a plane in such a way that the sum of the distances between the projections is minimized. An image of this ordering is an open graph, got on the basis of the distance matrix for pairs of objects. The distances between pairs of objects can be calculated by the average difference method. The most similar (close) objects are combined in pairs and joined to another, next objects until the last unit is joined. This way, the dendrite as a broken line, branched but not closed is received. Linkages of objects are diverse, which poses the problem of selecting the best solution. Optimal dendrite has the smallest total distance and ensures the highest similarity of neighboring objects. Taxonomic method allows to detect in the geographical space at the local level (commune, district) individuals that have a large or small business similarity. This way, the results can be used to identify the capacity needed to create or develop an existing cluster. Major limitations of this method are: ➢ difficulties in gaining access to the source data at the appropriate level; ➢ statistics do not include the cooperation between companies on the local level (within the subdivision) or larger (between neighboring territorial units) within the meaning of output / input method; ➢ companies are reluctant to reveal economic data even for science research Therefore, using other methods such as e.g. monographic or expert method is necessary for the results interpretation.
Advanced methods of multivariate statistics	Recently quantitative methods using multi-dimensional data gain in importance in the cluster identification process, in particular: ➢ PCA, (*Principal Component Analysis)* - each object (business, territorial unit, etc.) can be represented geometrically as a vector in a multidimensional space of *r* variables and each variable (economic parameters) as a vector in the space of *n* objects. The input data matrix *D* sized *n* and *r* is transformed into a square matrix of correlation or covariance between variables. The correlation matrix at its diagonal has the value of coefficients of correlation r = 1.000. These matrices allow for stating which of the used variables are correlated with each other and whether they can be replaced by another variable, which is their linear combination. Such a procedure leads to the creation of a new system of orthogonal variables called principal components that describe the percentage in explaining the variability of matrix D from the largest to the smallest. Then the main components or their loads can be interpreted mathematically or graphically.

Table 3.1 continue

Advanced methods of multivariate statistics	➢ Classification analysis - calculated matrix of loads for the various sections / sectors can be a starting point to carry out statistical classification analysis by the nearest neighbors classification method (dendrogram method) or around the centers of classes, especially when dimensions of the data matrix are large. Each method may be carried out by the hierarchical or non-hierarchical, ascending or descending way. In addition, distances between objects can be expressed as the Euclidean measure, squared Euclidean measure, metric streets, Pearson's r, Chebychew percentage of compliance measure. There are also different ways of aggregation of classified objects possible – single joining, combined joining, Ward's method and averages or medians. ➢ Discriminative analysis, made according to different algorithms - it allows the verification of intuitive knowledge of experts (and other observers of the economy) about the clusters in the area. Its execution requires the collection of data in the form of matrixes (such as in principal components analysis or classification) and assignation of each object to the projected clusters, which requires the addition of one variable to the data matrix (discriminatory variable). The algorithm allows to find out whether the collected data entitle to a positive verification of the hypothesis adopted a priori about objects that belong to different clusters by generating discrimination lines or planes, mathematical equations, and flat or spatial image classifications. Discriminative analysis is a kind of "reverse" classification analysis.

S o u r c e : own study based on: Hoen A. R., *Identifying Linkages with a Cluster-based Methodology*, "Economic Systems Research" 2002, Vol 14, No. 2, pp. 131–145; Eding G. J., Oosterhaven J., Stelder D., *Clusters, Linkages and Regional Spillovers: Methodology and Policy Implications for the two Dutch Mainports and the Rural North*, "Regional Studies" 2001, Vol. 35, Issue 9, pp. 809–822; Gurgul H., Majdosz P., *Identyfikacja klastrów w oparciu o strukturę nakładów i wyników*, www.wne.sggw.pl/czasopisma/pdf/ EIOGZ_2006_No 60_p.103. pdf as of 11.04.2013; Czamański S., Ablas L.A., *Identyfication of industrial clusters and complexes: a comparison of methods and findings*, "Urban Studies" 1979, Vol. 16, pp. 61–80; DeBresson C. (ed.), *Economic Interdependence and Innovative Activity: An Input/Output Analysis*, Edward Elgar Publishing, Cheltenham 1996; Roberts B., Stimson R.J., *Multi-sectoral qualitative analysis: A tool for assessing the competitiveness of regions and formulating strategies for economic development*, "Annals of Regional Science" 1998, No 32; Santarek K., Szerenos A., *Ocena funkcjonowania klastrów przemysłowych*, "Ekonomika i Organizacja Przedsiębiorstwa" 2006, No 12; Skawińska E., Zalewski R. I., *Klastry biznesowe …*, *op. cit.*, p. 190–205; Hill E.W., Brennan J., *A methodology for identifying the drivers of industrial clusters: The foundation of regional competitive advantage*, "Economic Development Quarterly" 2000, Vol. 14, No. 1, pp. 65–96; Padmore T., Gibson H., *Modelling systems of innovation:: II. A framework for industrial cluster analysis in regions*, "Research Policy" 1998, Vol. 26, Issue 6, pp. 625–641; Stough R. R., Kulkarni R., *Technology and industrial cluster analysis: some new methods*, [in:] Higano Y., Nijkamp P., Poot J., van Wyk K. (eds), *The Region in the New Economy*, Ashgate, Burlington 2002, s. 155–178, Stimson R., Stough R. R., *Regional Economic Development Methods and Analysis: Linking Theory to Practice*, [in:] Rowe J.E.(ed.), *Theories of Local Economic Development: Linking Theory to Practice*, Ashgate, Burlington 2009, pp. 169–192; Feser E. J., Bergman E. M., *National industry cluster templates: a framework for applied regional cluster analysis*, "Regional Studies" 2000, Vol. 34, Issue 1, pp. 1–19; *National Innovation Systems*, OECD, Paris 1997; O'Donoghue, Gleave B., *A Note on Methods for Measuring Industrial Agglomeration*, "Regional Studies" 2004, Vol. 38, Issue 4, pp. 419–427.

Keep in mind that inference based on the results of statistical summaries only can lead to erroneous conclusions. As E. Peters and N. Hood highlight that it can lead to omission of certain industries or too broad outlining of cluster boundaries.[120] It is therefore recommended to use a broader approach e.g using both quantitative and qualitative methods. Using for this purpose the solution proposed by C. Steinle and H. Schiele[121] may also be helpful. They made a statement of the necessary and indispensable conditions for cluster formation. They included divisibility of the process and the ability to transport the final product into the necessary conditions, and into the sufficient conditions – long chain of value, variety of complementary competencies, innovation network to drive the agglomeration, the changeability of the market – to reward flexible adaptation (Figure 3.1). Note that these conditions do not clearly indicate where the cluster is to be formed, but only suggest that industries are more susceptible to form one.

Clusters can also be identified by examining the path of economic and cooperative relations of the most significant company or group of companies in the sector. G. Gierszewska and M. Romanowska indicate the steps of cluster recognition components:[122]

- indicate a large company or concentration of similar companies and then "search" their vertical value chain;
- examine the level of the value chain in order to identify the sectors benefiting from the common distribution channels or producing complementary products or services;
- find the sectors benefiting from similar specialized inputs, technologies or other supply links;
- identify the defined (in the first three stages) cluster providers of specialized skills, information, capital and infrastructure.

S.A. Rosenfeld asks 12 groups of questions which are important from the point of view of both existence and strength of the cluster:[123]

1) R&D capacity: Is the access to specialized public or private research centres or expert individual researchers available, as they can help the cluster agents to solve pressing problems and carry out innovation research?

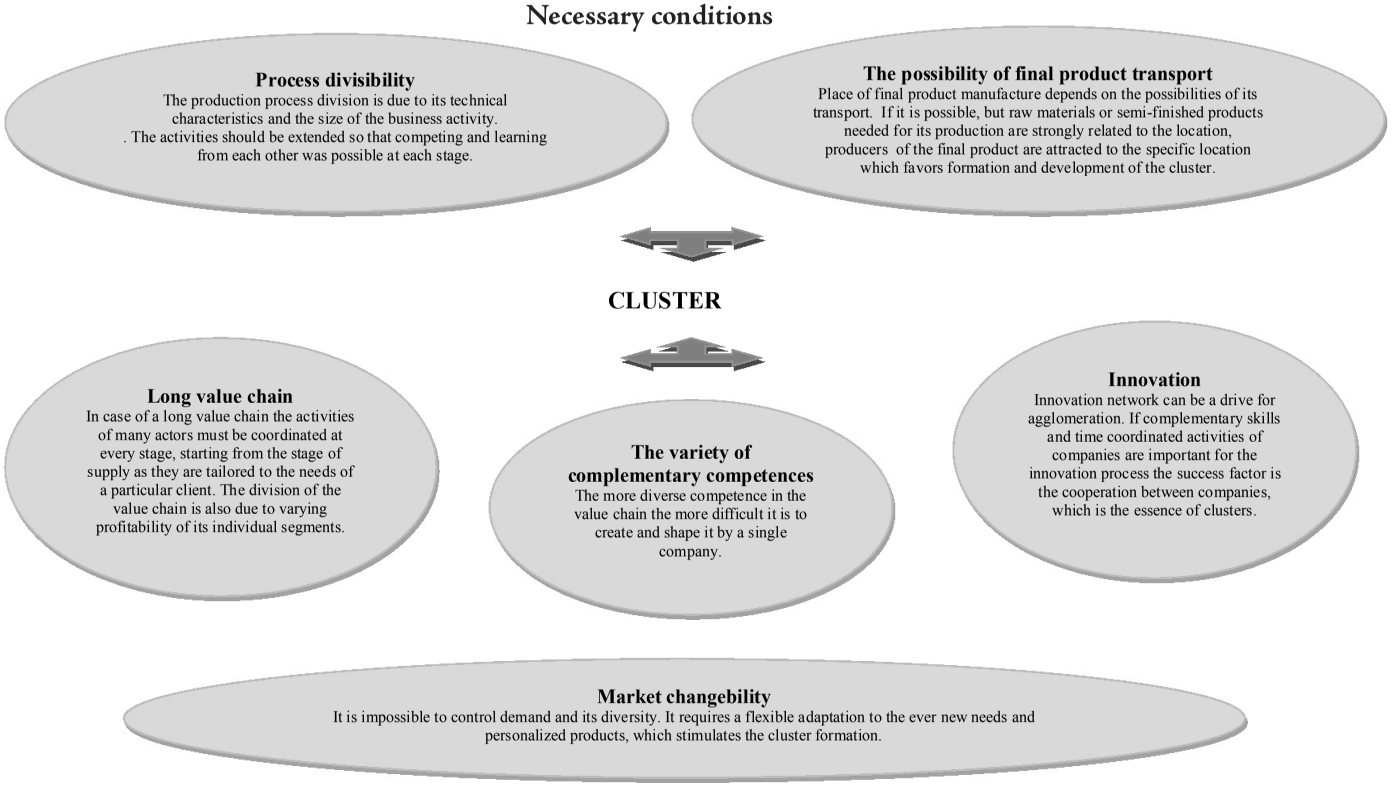
120 Peters E., Hood N., *Implementing …* , op. cit., pp. 210–220.

121 Steinle C., Schiele H., *When do industries cluster? A proposal on how to assess an industry's propensity to concentrate at a single region or nation,* "Research Policy" 2002, Vol. 31, Issue 6, pp. 849–958.

122 G. Gierszewska, M. Romanowska, *Analiza strategiczna przedsiębiorstwa,* PWE, Warszawa 2003, p. 138.

123 Rosenfeld S.A., *Bringing Business …* , op. cit., pp. 3–24.

Figure 3.1. *Necessary and satisfactory conditions for cluster formation by C. Steinle and H. Schiele*

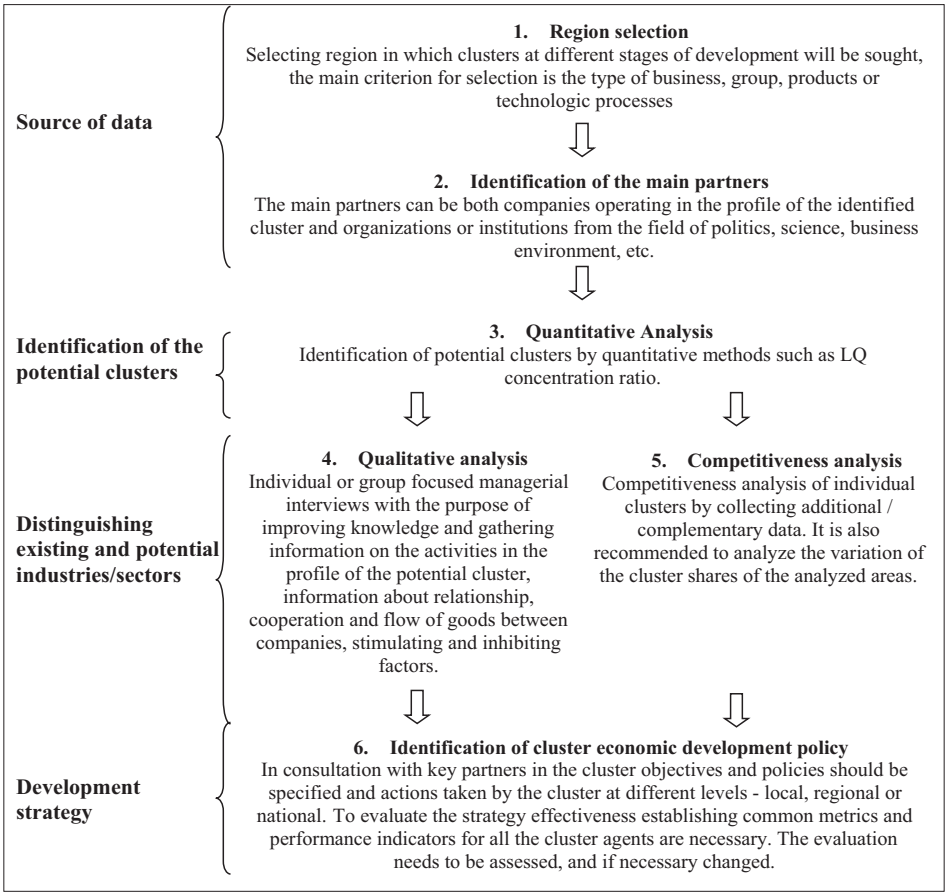


Source: own study based on: Steinle C., Schiele H., *When do industries cluster? …*, op. cit., pp. 849-958.

2) Knowledge and skills: Do the skills of the labor force, which include not just technical skills and competences, but also general knowledge of the industry and entrepreneurial skills, fit the needs of the cluster?
3) Human resource development: Are there opportunities of formal training in the cluster's major occupations? Does the cluster provide training to prepare for and adapt to technological and organizational change?
4) Proximity of suppliers: Are sources of raw materials and key suppliers nearby? What is the contact with the clients? What are the interactions with suppliers?
5) Capital availability: Do banks understand the needs of companies? How well is the capital accessible to exploit new opportunities?
6) Access to specialized services: Are there specialized public sector institutions available such as technology centres, small business centres that support assistance for export development? Are there specialized private sector services available, such as those provided by designers, consultants, accountants and lawyers?
7) Machine and tools builders: Are there companies designing and building machines, tools and software used by the cluster members nearby? Are there good working relations between the machine builders and the cluster's companies that foster improvements?
8) Intensity of networking: Do firms in the cluster cooperate? How often and to what extend? Do they share information and resources? Do they solve problems together and have common assignments? How often and to what extend?
9) Social infrastructure: How many institutions and civic associations are there in the region? How big are they? How active are their members? How often do they cooperate? Are there informal networks of contacts?
10) Entrepreneurial energy: Are new companies started up in the cluster by both workers and managers? How successfully does the cluster attract new firms from outside?
11) Innovation: How quickly are new and enhanced technologies developed and adopted? How quickly do products and services based on these technologies appear?
12) Shared vision and leadership: Do companies become a „system"? Do they have a common vision for the future, share goals and plans? Do they have leaders who are able to improve their competitiveness and keep them together?

The Competitive Institute[124] recommends procedure for identifying clusters as a sequence of six-step procedure leading to the identification of data sources and knowledge about clusters or cluster initiatives and strategies for their development (Figure 3.2).

Figure 3.2. Procedure for identifying clusters by The Competitive Institute



Source: study based on: Cortright J., *Industry Clusters: Theory, Practice and Definitions*, www.slideshare.net/Annie05/cortright-cwg-presentation as of 15.03.2013; Skawińska E., Zalewski R.I., *Klastry biznesowe* ..., op. cit., pp. 188-190; Montana J.P., Nenide B., *The Evolution of Regional Industry Clusters and Their Implications for Sustainable Economic Development*, "Economic Development Quarterly" 2008, Vol. 22, Nr. 4, pp. 290-302.

[124] It is a worldwide organization of scientists and practitioners dealing with clusters.

The variety of methodological approaches makes it considerably difficult to compare the performance and competitiveness of individual cluster structures. Each of the presented approaches has both advantages and disadvantages. Quantitative methods (e.g input/output method, LQ location indicator, shift-share analysis) are based on statistical data and their main minus is the inability to make a full analysis of the relationships between the elements of the cluster, as well as the high cost, or even impossibility of obtaining the necessary data. Qualitative methods (e.g. Delphi method, multi-sectoral qualitative analysis MSQA, the cluster map) are characterized by subjectivity and hence there are problems with the comparability of results. In practice the above methods are supplemented or mixed methods are used (e.g. the leading sectors analysis, GEM cluster method, cobweb diagram, national pattern, OECD interactions method) adapting them to the special characteristics of the area. The other approaches presented in this chapter can also be helpful.

3.2. Research methodology

The main objective of the project was to answer the question whether there is a possibility to create a cross-border cluster, or a few, in Podlasie province. The answer to this question required in particular:

- identification of the areas in which it would be possible to form the cluster/cross-border cluster in Podlaskie province;
- examination of the actors' readiness to cooperate in such cross-border cluster on both sides of the border.

It also seemed important to determine the demands for future actors, which would help both initiation and development of future cross-border cluster structures in Podlasie province.

R.A. Podgórski writes: *„selection of appropriate method or research methods is not simple, primarily due to the lack of a comprehensive and yet final classification. This results from yet unsatisfactory degree of the methodology development and because of too big differences in the development of testing methods."*[125]

Considering the nature of information sources, the researches are divided into primary (direct, in the field, field research) and secondary (indirect, desk research). Their characteristics are shown in Table 3.2.

[125] Podgórski R.A., *Metodologia badań socjologicznych*, Oficyna Wydawnicza Branta, Bydgoszcz-Olsztyn 2007, p. 179.

Table 3.2. Characteristics of primary and secondary research

Primary research	Secondary research
➢ involves gathering information from primary sources (direct); ➢ person who conducts the survey identifies accurately the type of information required to solve a given problem and ways of obtaining it; ➢ information obtained this way corresponds precisely with the specific research problem.	➢ involves collecting, analysis and interpreting information from secondary sources, both internal and external, domestic or foreign; ➢ forms the basis for more extensive research projects, using direct methods; ➢ problems with carrying out such research may include searching for relevant sources of information and their critical assessment, and in particular their availability, actuality or reliability; ➢ are particularly useful at the stage of "taming" the problem and generating ideas that can help in formulation and defining research hypotheses and designing field studies.

Source: study based on: Kędzior Z. (ed.), *Badania rynku – metody, zastosowania,* PWE, Warszawa 2005, p. 24.

Table 3.3. Characteristics of qualitative and quantitative methods

Qualitative methods	Quantitative methods
➢ are based on the assumption that the study of some problems are better for in-depth analysis of a smaller number of cases than the superficial analysis of a big number of them; ➢ are aimed at understanding the phenomena and processes, answering the question: why?, how is this possible?, what way?; ➢ do not allow for any generalizations, but provide some insight into the phenomena and processes, rather than their numerical description; ➢ attention is focused on the importance and value of the results and their reliability; ➢ attempt to reproduce the subjective reality; ➢ take in their attempts to reproduce the subjective reality; ➢ frequent tendency to use more than one interpretive practice in the study; ➢ are studies of identificative nature (exploratory).	➢ serve primarily to measure, identify the facts, generate new knowledge slightly; ➢ respond mainly such questions as: What?, How much?, How often?, What part?, How strongly?; ➢ attention is focused on coherence and repeatability of the obtained results; ➢ attempt to reach the objective truth; ➢ are studies of explanatory nature.

Source: study based on: Podgórski R. A., *Metodologia badań …*, op. cit., pp. 177-178; Z. Kędzior, K. Karcz, *Badania marketingowe w praktyce*, PWE, Warszawa 2007, pp. 43-44; Kędzior Z. (ed.), *Badania rynku – metody, zastosowania,* PWE, Warszawa 2005, p. 25; Flick U., *Projektowanie badania jakościowego*, PWN, Warszawa 2010, pp.22-23; Denzin N. K., Lincoln Y. S. (eds.), *Metody badań jakościowych. Tom 1*, PWN, Warszawa 2009, p. 23.

The researches are of both primary and secondary nature. The authors carried out analyzes using statistical data when calculating LQ index and characterizing different economic values. To gather the primary information they decided to use personal interviews and three survey techniques: hand outs, mail and the Internet.

From the perspective of the obtained information nature the applied research methods can be classified into qualitative and quantitative methods (Table 3.3).

The carried out research were of quantitative – qualitative nature. In the literature, it is emphasized that both methods are not competitive, but they are complementary to each other.

The research were of single nature[126], although the authors do not exclude the advisability of repeating them at intervals, preferably every few years, to determine trends at least in the level of trust between companies, the level of cooperation and willingness to strengthen it in the future. These elements are necessary in cluster structures formation.

The following statistical measures were used in the study:

1) structure indicators;
2) measures of central tendency:
   - dominant, that is the most common value in the data set;
   - medium, which determines the average level;
   - median;
3) measures of dispersion:
   - standard deviation, which determines the average difference between the recorded values and their average value. It is determined through the square root of the variance, which is the arithmetic mean of the differences between the observed values and their mean, squared:

$$S(X) = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(X_i - \overline{X})^2}$$

where: x_i – value characterizing *i* –this unit in the data set.
variation coefficient, which is defined by the formula:

$$V(X) = \frac{S(X)}{\overline{x}}$$

where: x_i – value characterizing *i* –this unit in the data set.

126 Rószkiewicz M., *Metody ilościowe w badaniach marketingowych,* PWN, Warszawa 2002, p. 33.

U Mann-Whitney test, which is one of the most popular alternative to t-Student test for independent samples, was used to identify differences in assessing the value of individual variables. The main advantage of this test is low requirements. The primary condition for the application of this test is measurability of the variable dependent on at least ordinal scale (this may also be measured at the quantitative scale). This test can be used also when the variable is measured on the dichotomous scale (or 0-1), because it is the case of nominal variable, which is also the ordinal variable. Application of Mann-Whitney U test does not require equi-numerous groups, normal distribution or homogeneous variance. This gives the possibility of its wide use.

U Mann-Whitney test involves ranking of the dependent variable results (from smallest to largest) in the researched groups, which are then compared with each other. Test formula has the form presented below:

$$U = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R$$

where: R – sum of the ranks; n_1, n_2 – quantity in the researched groups.

Then, for a sample larger than 20, a different formula is used with the assumption that the distribution of the U is approximately normal:

$$Z = \frac{U - \frac{n_1 n_2}{2}}{\sqrt{\frac{n_1 n_2 [n_1 + (n_2+1)]}{12}}}$$

Methods of multi-dimensional graphical presentation were used to present the research results.

Although the subject literature distinguishes a variety of methods that can be used to study clusters, the research authors used the location indicator LQ to identify potential areas (sectors) for clusters formation of cross-border character in Podlaskie province. The authors are aware of the fact that this indicator shows only the relative density of certain activities in the area compared to the area of reference. However, it does not answer the question whether the cluster can function or develop in a particular location. Therefore, a preliminary analysis of potential clusters was deepened by other methods. It should be noted, however, that many authors studying clusters indicate the critical concentration of companies as one of the main factors of clusters functioning.

Therefore, the starting points in determining the study sample were LQ ratio analysis. The number of companies was used as a variable. The study area was Podlaskie province and reference area – the area of Poland.

Analysis of LQ index at the level of sub-groups, analysis of other economic values and literature sources, led to identification of these areas (sectors) that were ultimately classified for research. They were:

- building, wood and furniture industry in the perspective of potential clusters with Belarus;
- medical sector, extended for rehabilitation and wellness, in the perspective of potential clusters with Lithuania.

Every company in Podlaskie province, which reported its core business activities to be classified into subclasses with LQ ≥ 1 (in the sectors selected for testing), was classified to be surveyed. Address database was collected in the Statistical Office in Białystok. Finally, a questionnaire was sent to a total of 974 companies from the region of Podlasie. However, only around 30% of them were filled in and returned. Research in Belarus and Lithuania were carried out by a hired company that had the possibility of conducting the research in selected areas. The structure of respondents is summarized in Table 3.4.

The questionnaire was addressed to the top management of the company. It could have been the owner, board member, CEO or one of his deputies.

Table 3.4. Structure of respondents

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Employees (people)	≤9	34	46,57	32	35,17	87	56,13	3	7,50	8	16,67	18	56,25
	10-49	23	31,51	28	30,77	49	31,61	19	47,50	22	45,83	11	34,38
	50-249	15	20,55	26	28,57	10	6,45	15	37,50	14	29,17	3	9,37
	>250	1	1,37	5	5,49	9	5,81	3	7,50	4	8,33	-	-

Table 3.4 continue

History of operation on the market (years)	**<1**	–	–	3	3,30	3	1,93	1	2,50	2	4,17	1	3,12
	1-3	1	1,37	4	4,40	21	13,55	10	25,00	11	22,92	3	9,38
	>3-5	1	1,37	8	8,79	20	12,90	10	25,00	11	22,92	3	9,38
	>5-10	18	24,66	21	23,08	42	27,10	12	30,00	15	31,25	12	37,50
	>10	53	72,60	55	60,43	69	44,52	7	17,50	9	18,75	13	40,62
Area of operation	**L**	30	41,10	70	76,92	138	89,03	8	20,00	21	43,75	25	78,13
	K	28	38,35	19	20,88	17	10,97	22	55,00	21	43,75	4	12,50
	M	15	20,55	2	2,20	-	-	10	25,00	6	12,50	3	9,37

L – local market only;
K – national coverage;
M – international coverage.
S o u r c e : own study based on conducted research.

On the occasion of the study it appeared that companies address database of Podlaskie contains several indexes of companies that do not exist, often for several years, or that were registered, but have never started their operations. This confirmed in a way different press releases, reports of institutions, publications, books, etc., which state that the actual number of companies in Poland does not amount to nearly 4 million as it is given in the official publications of the Central Statistical Office, but a little more than 1.8 million.[127] The problem is not new because already in 1996 A. Balicki i M. Szreder[128] studying the opinions of the largest marketing companies said that their assessment of the completeness and validity of REGON (company statistical number) focus between 50–90%. What is interesting, in regard to the data completeness the assessment were even below 50%, which means that the completeness of the assessment of some respondents reached only 50%, yet the completeness is one of the basic features of a good sampling frame. M. Szreder wrote that in recent years the quality of REGON registry has significantly improved, but still, the researchers conducting research on the population of entrepreneurs have to deal with outdated data obtained

127 See ex. Śmigiel S., *Ile w Polsce mamy firm?*, www.gazeta.pl as of 07.04.2011.

128 Balicki A., Szreder M., *Użyteczność rejestrów urzędowych jako operatorów losowania. Wyniki badania firm marketingowych* [in:] J. Paradysz (ed.), *Statystyka regionalna. Sondaż i integracja baz danych,* Materiały konferencyjne 25-27.09.1996, Akademia Ekonomiczna w Poznaniu.

from this register.[129] Such significant differences, according to the authors, may be due to the fact that the person who gives up business activities is not legally obligated to unregister in the Regional Statistical Offices. Therefore, it should be assumed that the return rate received by the authors of the study was actually higher, but due to the fact that some of the questionnaires were sent by e-mail and by traditional post, it is difficult to say exactly how high it was in fact.

It should be noted that the sample was not a representative sample because it would have to be a "miniature" of the test population that met certain criteria. S. Nowak says that:[130]

1) all values of the studied variable/variables would have to occur – the typological representativeness
2) distributions of the variables in the sample would have to reflect distribution of these variables in the community – representativeness due to the distribution of certain variables;
3) dependencies between variables would have to exist that correspond to the same dependencies in the general population

Selection of the test units can be done in various ways depending e.g on the results representativeness. S Mynarski states that the sampling methods can be divided into two broad groups: the method of random selection and non-random selection. The first is based on the well-known and specified probability of getting each individual unit in the sample, the structure of the analyzed sample is formed as if it was spontaneous. Whereas the second is to determine in advance some certain characteristics to be met by each unit in the sample, the structure of the analyzed sample is formed in an arbitrary way.[131] The degree of representativeness can be determined for random selection methods, while for non-random selection methods that can not be done.[132] In the subject literature other nomenclature of these two methods can be met. The random selection methods[133] are also called probabilistic, while the non-random methods are also called non-probabilistic.[134]

The study conducted by the authors in Poland, Belarus and Lithuania were not representative (it should be noted that this was not the aim of the project).

129 Szreder M., *Metody i techniki sondażowych badań opinii,* PWE, Warszawa 2010, p. 50.

130 Nowak S., *Metodologia badań społecznych*, PWN, Warsaw 1985, pp. 300–301.

131 Mynarski S., *Praktyczne metody analizy danych rynkowych i marketingowych,* Zakamycze, Kraków 2000, p. 22.

132 Gorynia M., Jankowska B., *Klastry a międzynarodowa …* , op. cit., pp. 119–120.

133 Some authors say they are techniques – comp. e.g. Szreder M., *Metody i techniki sondażowych badań opinii,* PWE, Warszawa 2010, pp. 50–51.

134 Szreder M., *Metody i techniki …* , op. cit., pp. 50–51.

Table 3.5. Random and non-random selection methods

Random selection methods	Non-random selection methods
➢ simple random selection: • independent (with replacement); • dependent (without replacement); ➢ systematic random selection; ➢ layer random selection: • proportional; • disproportional; • optimal; ➢ group random selection: • with equal probabilities of selection; • with different probabilities of selection; ➢ multistage random selection: • with equal probabilities of selection; • with different probabilities of selection; ➢ multiphase random selection.	➢ Selection by amount; ➢ selection of typical units; ➢ selection by elimination; ➢ purposeful selection; ➢ random selection; ➢ selection by competent judges; ➢ convenient selection; ➢ network selection; ➢ snowball; ➢ „interception on the way".

S o u r c e : study based on: Mynarski S., *Praktyczne metody …*, op. cit., p. 23.

In view of the information about incorrect data available in Polish Statistical Offices (Central Statistical Office in Warsaw, Province Statistical Offices) in regard to the number, and hence the structure of companies, creation of a reliable "miniature" of all the companies in Podlaskie province is not possible. It should also be noted at this point that the authors did not have the possibility to reach the database of institutions with most reliable data, that were the Social Security Office and Tax offices. Therefore they were forced to use only the address data obtained at the Statistical Office in Białystok. Foreign studies were based on the database and the contact details received from professional institutions and research centers. The authors are aware that in terms of the conducted studies their results can not be generalized to the entire population, including among others, all of the companies in certain sectors in Poland, Belarus and Lithuania or all of the companies which may form clusters in the specified areas.

Selection of the sample was non-random. Purposeful selection was used. The authors deliberately limited their studies to specific agents recognizing that their opinion is most desirable.

The primary data collection included surveys and also individual interviews were used, also known as "face to face" or personal interviews. They are a form of

communication with the respondent, which allows direct measurement of the respondents' opinions in different places. During the interview some additional methods of collecting information can be applied e.g. through observation of the respondent's behavior.[135]

Individual in-depth interview is aimed at getting the information that is under study and deepening knowledge about a particular area. The basic method of obtaining the information is to ask questions and encourage respondents to express themselves freely. During the interview the researcher uses some interview dispositions or an interview scenario. The interview has relatively free structure, which means that not the order of the questions is important, but the set of information the investigator wants to get. It is run on the basis of so-called a set of thematic threads.[136]

The essence of interview results in the direct meeting of the interviewer and the respondent. In addition to the many advantages of this fact there are also some disadvantages, which will definitely include the reluctance of some people to share their opinions. W.G. Zikmund argued that respondents are not anonymous, and therefore may be reluctant to give another person – the researcher – information of a confidential or private nature.[137]

The nature of interviews can be:[138]

- overt (the interviewed person is informed and agrees to provide certain information, he/she is targeted during the conversation or in advance in order to prepare for it);
- concealed (the interviewed person is not informed about the aim of the conversation and does not realize that he/she is participating in the research);
- informal overt (the interviewed person is aware of participation in the research, but is not aware of its proper objective).

The pilot interviews were overt ones. It turned out however, that the vast majority of respondents disapproved the proposal for recording the interviews. Furthermore, the authors noted that during the official research the respondents expressed not so much honest opinions as they gave "politically correct" feedback. The authors obtained really valuable information when the official part of the interview was ending, and the unofficial part was starting. Repeatedly,

135 Kędzior Z., Karcz K., *Badania marketingowe …* , op. cit., p. 112.

136 Kędzior Z. (ed.), *Badania rynku …* , op. cit., p. 98.

137 Zikmund W.G., *Business Research Methods*, The Dryden Press, New York 1997, p. 235.

138 Podgórski R.A., *Metodologia badań …* , op. cit., p. 195.

respondents said "I'll say unofficially ...". These findings prompted the authors to conclude that in order to obtain, in the course of the research, relevant reliable, valuable opinions and information the hidden interviews should be used. The interviews focused on the most important issues and the results were written down immediately after leaving the respondent. Recording the interviews was opted out because this type of behavior was assessed unethical by the authors[139].

Interviews, in both the pilot and main research were individual interviews, that is they were conducted with individual respondents. There was no need for collective interviews.

3.3. Analyses of the location index in selected test areas

3.3.1. Analysis of companies concentration in medical services sector, extended for rehabilitation and wellness, in Podlaskie province

The analyses carried out in the course of the research showed that the core of the potential cluster of medical services could be formed by the agents whose activities include hospital services, medical practice, dental (general and specialized), nurses and midwives, physiotherapeutic, psychological and psychotherapeutic practices as well as activities not elsewhere classified[140].

The calculations of the concentration index LQ indicate that only physiotherapeutic practice, out of the analyzed subclasses, does not meet the minimum concentration conditions. In case of hospital services, medical and dental practices we can even speak about specialization of Podlaskie province. It is worth noticing that these index values are the highest in Poland.

Analyzed subclasses are dominated by micro-enterprises (nearly 98%). Large companies, employing more than 250 people, represent only a small percentage of these entities (0.30%). They are found only among hospitals and medical practice entities, with the first of these two groups account for 90% of the agents.

139 More on ethics in interviews e.g in: Fontana A., Frey J. H., *Wywiad. Od neutralności do politycznego zaangażowania* [in:] Denzin N. K., Lincoln Y.S. (eds.), *Metody badań jakościowych.* Tom 2, PWN, Warszawa 2009, pp. 81–127.

140 This includes, among others, diagnostic services provided by independent medical laboratories and health prevention and promotion activities run by e.g. dieticians and health promotion specialists.

Table 3.6. LQ index for agents that might form the core of the potential cluster of medical services in Podlaskie province

Type of activities \ Province	dolnośląskie	kujawsko-pomorskie	lubelskie	lubuskie	łódzkie	małopolskie	mazowieckie	opolskie	podkarpackie	podlaskie	pomorskie	śląskie	świętokrzyskie	warmińsko – mazurskie	wielkopolskie	zachodnio-pomorskie
hospital services	1,01	1,17	1,22	1,12	0,98	1,15	0,74	1,08	1,14	**1,28**	0,59	1,26	1,01	1,24	0,81	1,10
medical practice	0,95	1,12	1,23	0,84	1,10	1,05	0,84	0,88	1,14	**1,39**	0,84	1,09	1,12	1,14	0,96	0,93
dental practice	1,01	0,80	1,34	0,90	1,13	1,01	0,96	0,93	1,20	**1,43**	1,01	0,93	1,02	0,97	0,92	0,91
physiotherapeutic service	0,95	1,26	0,61	0,77	0,77	0,95	1,03	0,96	0,85	**0,67**	0,81	0,82	0,74	0,86	1,11	2,33
nurses and midwives services	0,42	2,46	0,79	1,70	0,34	0,86	0,50	0,62	0,82	**1,06**	1,19	0,40	0,34	2,69	1,49	2,71
psychological and psychotherapeutic practice	1,12	0,96	0,81	0,76	0,96	1,00	1,20	0,99	0,89	**1,00**	1,14	0,84	0,68	0,97	1,07	0,83
health protection activities and nec	0,85	1,79	1,09	0,92	0,81	0,79	0,93	0,80	0,85	**1,13**	1,01	0,69	0,54	1,63	1,26	1,42

S o u r c e : Wasiluk A., *Tworzenie klastra specjalistycznych usług medycznych*, „Ekonomika i Organizacja Przedsiębiorstw" 2011, nr 12.

Table 3.7. Changes of LQ index and the number of agents that might form the core of the potential cluster of medical services in Podlaskie province

Indexes / Type of activities	ΔLQ 2009-2004	Number of agents 2009	Δ number of agents 2009–2004
hospital services	6,68%	40	25,00%
medical practice	-2,96%	2807	4,62%
dental practice	-1,04%	892	6,57%
physiotherapeutic service	-5,10%	215	-38,92%
nurses and midwives services	-17,95%	461	34,80%
psychological and psychtherapeutic practice	15,01%	108	881,82%
health protection activities and nec	-13,28%	201	101,00%

Source: Wasiluk A., *Tworzenie klastra …*, op. cit.

In 2004–2009 the highest growth rate in the number of entities was noticed in the area of psychological and psychotherapeutic practices (simultaneously, there was the highest growth rate of LQ index) and the activities related to health protection nec (simultaneously, there was a decrease in the growth rate of concentration dynamics, which means that the number of such entities was higher in other areas of Poland).

Interesting conclusions can be drawn also from the observation of the companies in the analyzed area placed on the matrix of agents' development (Figure 3.3).

Figure 2.3. Matrix of agents' development

Source: Wasiluk A., *Tworzenie klastra …*, op. cit.

The greatest opportunities for growth have the activities placed in Area I of the matrix where ΔLQ>0 and LQ>1,25. They can be called a kind of driving force for the regional economic growth. There were exclusively hospitals in this area. In total there were 40 entities, which makes it the smallest group of all

the analyzed agents. Area II, in which ΔLQ> 0 and 1.25 ≥ LQ ≥ 1 was filled by entities for which defining true specialization was difficult, but their density in Podlaskie province was higher than the national average and the growth rate of concentration was positive. There were 108 companies in this area dealing with psychology and psychotherapy. Area III of the matrix included entities which can be truly defined as regionally specialized, but the dynamics of LQ index for the years 2009–2004 was negative. The area was filled by companies of medical and dental practice. In total there were 3699 entities registered in these subclasses and therefore it was the largest group of companies. In the IV area of the matrix appeared entities with 1,25≥ LQ≥1 and the LQ dynamics was negative. These were the least promising growth areas in the whole analyzed group. There were entities dealing with nurses and midwives services and activities related to health protection, not elsewhere classified. In total, there were 662 entities.

Table 3.8. Participation structure of the agents of Podlaskie province that might form the core of potential cluster of medical services in different areas of the development matrix

Area	No of companies	% of all companies in sub-classes with LQ ≥1 (N = 4509)	% of all the researched companies (N = 4724)
I. ΔLQ>0; LQ>1,25	40	0,89%	0,85%
II. ΔLQ>0; 1,25≥LQ≥1	108	2,40%	2,29%
III. ΔLQ<0; LQ>1,25	3699	82,03%	78,30%
IV. ΔLQ<0; 1,25≥ LQ≥1	662	14,68%	14,01%
TOTAL	**4509**	**100%**	**95,45%**

Source: Wasiluk A., *Tworzenie klastra …*, op. cit.

The overall conclusion is that the entities belonging to the subclass for which the LQ index value was at least 1.0 constitute as much as 95.45% of all companies operating in the analyzed group. The largest group in the researched structure included entities of the third quarter. In their case we could speak about specialization, but the dynamics of LQ index in the analyzed period was negative. The agents included in the first area of matrix constituted admittedly a small percentage of the analyzed entities, but it is worth noting at this point that in this group there were 90% of all large companies of the whole researched area.

Table 3.9. LQ index for chosen sub-classes of building industry

Province / Sub-classes of building industry	dolnośląskie	kujawsko-pomorskie	lubelskie	lubuskie	łódzkie	małopolskie	mazowieckie	opolskie	podkarpackie	*podlaskie*	pomorskie	śląskie	świętokrzyskie	warmińsko - mazurskie	wielkopolskie	zachodnio-pomorskie
General building work in buildings construction	1,05	0,92	1,06	0,93	0,62	1,27	1,05	1,24	0,99	**1,19**	0,99	0,94	0,82	0,81	0,95	1,12
Roof constructions and covering	0,92	1,02	1,01	0,87	1,14	0,95	0,74	1,30	0,99	**1,24**	1,11	0,86	1,14	1,04	1,50	0,85
Building roads and railway tracks	1,06	0,84	1,17	1,12	0,99	0,88	0,93	1,10	1,13	**1,28**	0,84	0,99	1,03	1,20	1,21	0,74
Building sea ports	0,00	0,00	0,00	2,31	0,00	0,00	1,20	0,00	0,00	**2,71**	6,38	0,00	0,00	0,00	0,70	3,46
Foundation works	0,79	1,04	1,06	1,01	1,28	1,05	0,94	0,66	0,98	**1,23**	1,59	0,56	1,46	1,61	1,09	0,60
Wiring of buildings and constructions	0,84	0,81	1,07	0,83	0,82	0,89	1,23	1,03	1,18	**1,01**	0,92	0,86	0,98	1,01	1,30	0,87
Insulation work	0,87	1,18	1,37	0,75	1,02	0,76	0,68	1,32	1,42	**1,24**	1,53	0,79	2,14	1,10	0,92	0,98
Central heating and ventilation systems installation	1,04	0,91	1,18	0,92	0,90	0,94	0,91	1,11	1,06	**1,16**	1,04	0,94	0,78	0,81	1,25	1,12
Plastering	0,98	0,83	1,10	1,02	0,97	1,26	0,74	1,12	1,25	**1,93**	0,88	0,62	1,70	2,14	0,95	0,92
Construction woodwork	0,96	0,98	0,96	0,81	1,02	0,79	0,92	0,97	0,71	**1,04**	1,29	0,95	1,11	0,97	1,33	1,08
Floor topping, putting wallpaper and facing walls	0,74	0,78	1,09	1,50	1,14	1,03	0,90	0,91	1,43	**1,42**	1,29	0,71	1,19	1,14	1,16	0,73
Painting	0,48	1,16	0,85	0,54	0,92	0,92	0,77	0,99	1,75	**1,30**	0,96	0,75	0,97	1,99	1,99	0,58
Glazing	1,03	0,76	1,11	0,79	1,08	1,33	0,86	0,72	1,37	**1,32**	0,76	1,06	1,07	0,91	1,09	0,82
Construction and demolition equipment and service hiring	1,21	1,09	0,77	0,75	0,82	1,03	0,78	0,83	1,27	**1,06**	0,93	1,24	2,17	1,30	0,81	0,72
Index LQ – total in building trade	1,01	0,97	0,94	0,90	0,84	1,11	0,94	1,12	0,98	**1,01**	1,10	0,94	1,08	1,01	1,13	1,03

S o u r c e : Matwiejczuk W., Wasiluk A., *Economic and organisational conditions for creating transborder building cluster in Podlaskie,* "Quarterly of International Sociology" 2012, Vol. 21, No. 1.

3.3.2. Analysis of building trade companies in Podlaskie province

The analysis of the location index calculated for the building trade, in general, shows that there is higher concentration of building companies in Podlasie province than on average in the country and reaches 1.01 (Table 3.9). The same index value was noticed in Dolnośląskie province and Warmińsko-Mazurskie province, whereas the highest in Wielkopolskie province – 1.13. The specialization of Podlasie province[141] is noticeable in plastering companies – 1.93 (the highest index of all the provinces), floor topping, putting wallpaper and facing walls (1.40), glassing (1.32), painting (1.30) and building roads and railway tracks – 1.28 (the highest index of all the provinces)[142]. For other building sectors, mentioned in Table 3.9, the location index LQ proves higher than average concentration.

Although the LQ index for building trade in Podlaskie province is only slightly above 1.0 the value of building – construction production is significant and is increasing against sold production of industrial processing.

In the sectors where the index LQ > 1, over 82% of all building companies operate in Podlasie province (Table 3.10). It is worth mentioning that, although the location index is high, the presence of companies from the sea ports building, foundation work, glassing, building and demolition equipment and service hiring, in the building structure in Podlaskie province is quite small – below 1%

Table 3.10. Changes in the number of building industry companies by sub-classes

Indexes / Building industry sub-classes	ΔLQ 2009–2004	Number of entities in 2009	Δ No of entities in 2009–2004	% of entities in the whole building industyr in2009
Demolition and wrecking of buildings, earth works	21%	239	206,41%	2,46%
Geological and engineering trenching and drilling	–13,45%	12	100%	0,12%
General construction works related to buildings	–8,60%	3378	–5,14%	34,72%
General construction works related to bridges	–49,09%	7	–12,50%	0,07%
General construction works related to transmission line facilities: pipelines, power lines, electric and telecommunication tractions	42,57%	51	240%	0,52%

141 The index value LQ>1.25

142 High value of the index LQ for the sea port building companies is a result of the fact that out of 15 companies in Poland only one is based in Podlasie province. Therefore it is hard to talk about specialization in this branch.

Table 3.10 continue

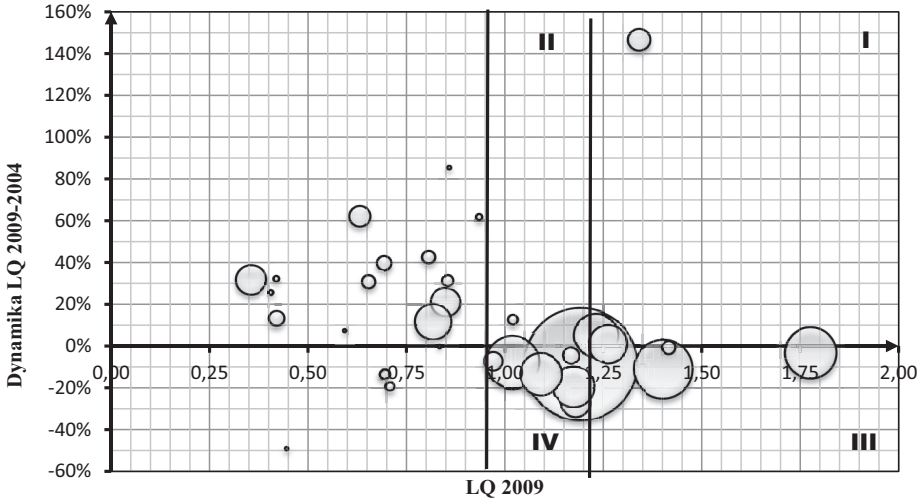
General construction of distribution lines: pipelines, power lines and telecommunication lines	31,24%	41	64%	0,42%
General construction works related to mining and production facilities	n.d	0	n.d	0%
General construction works related to engineering nec	25,66%	11	120%	0,11%
General construction works related to assembly and construction of buildings and structures from prefabricated elements	12,68%	32	220%	0,33%
Roof constructions and covering	5,20%	527	32,08%	5,42%
Building roads and railway tracks	–26,91%	241	30,27%	2,48%
Pavement works for the construction of sports facilities	n.d	6	n.d	0,06%
Building sea ports	n.d	1	n.d	0,01%
Construction of other water engineering facilities	–19,23%	27	–35,71%	0,28%
Scaffolding	61,72%	15	150%	0,15%
Foundation works	–10,68%	25	8,70%	0,26%
Building works for steel constructions erection	32,26%	14	40%	0,14%
Bricklaying construction works	62,11%	123	59,74%	1,26%
Specialized construction works net	13,41%	73	151,72%	0,75%
Wiring of buildings and structures	–7,64%	773	2,11%	7,94%
Installation of electrical signaling	–7,04%	102	–7,27%	1,05%
Installation of passenger and freight elevators and escalators	85,56%	8	166,67%	0,08%
Other electric installation works	39,73%	62	40,91%	0,64%
Building isolation works	146,91%	137	158,49%	1,41%
Installation of central heating and ventilation systems	–19,27%	466	1,97%	4,79%
Installation of plumbing	11,69%	345	18,97%	3,55%
Installation of gas	–13,47%	35	–14,63%	0,36%
Other construction installations	30,91%	52	79,31%	0,53%
Plastering	–3,10%	704	130,07%	7,24%
Construction woodwork	–13,35%	480	15,94%	4,93%
Floor topping; wall-papering and facing walls	–10,79%	938	23,75%	9,64%
Stucco	7,37%	6	50,00%	0,06%
Painting	1,02%	407	19,01%	4,18%
Glazing	–0,53%	56	–15,15%	0,58%
Other finishing building works	31,89%	249	126,36%	2,56%
Rental of construction and demolition equipment with operators	–4,50%	87	–20,91%	0,89%
Total in building trade	–0,36%	9730	16,21%	100%

n . d . – no data

S o u r c e : own study based on statistic data by CSO and RSO in Białystok.

For further analyses the sub-classes were placed at the development matrix (Picture 3.4).

Picture 3.4. Matrix of building industry development



Wheel diameter depends on the number of firms at the end of 2009.

S o u r c e : own work based on GUS data.

The biggest chances of development have the sub-classes that appeared in Area I in which ΔLQ>0 and LQ>1,25. The area was filled by the companies classified in sub-classes building insulation works and painting. There were almost 550 entities in total. Area II, in which ΔLQ>0 and 1,25≥LQ≥1 was composed with companies that can hardly be described as specialization but their density of appearance in Podlaskie province was higher than the average in Poland and the dynamics of concentration indicator was positive. This area included more than 520 companies working in roof constructions and covering. The III area of the matrix was composed by companies that can be described as regional specialization, but the LQ indicator dynamics in 2009–2004 was negative. There were foundation work companies, plastering, glassing and floor topping, putting wallpaper and facing walls. 1723 companies were registered in those 4 sub-classes in total and half of them in sub-classes: flooring, wallpapering and wall-covering. The IV area of the matrix included sub-classes in which 1,25≥ LQ≥1 and LQ dynamics was negative. In the whole analyzed group there were the least promising increase areas. They included companies in general building work in building construction, wiring of buildings and constructions and central heating and ventilation system installation, construction woodwork and construction and demolition equipment and service hiring. This was the

most numerous group of companies including 5204 subjects in total which was over a half of all the companies in the building trade.

Table 3.11. The structure of building companies share in different areas of the development matrix

Area	No of companies	% of all companies in sub-classes with LQ ≥1 (N = 7997)	% of all the researched companies (N = 9730)
I. ΔLQ>0; LQ>1,25	550	6,88%	5,65%
II. ΔLQ>0; 1,25≥LQ≥1	520	6,50%	5,34%
III. ΔLQ<0; LQ>1,25	1723	21,55%	17,71%
IV. ΔLQ<0; 1,25≥ LQ≥1	5204	65,07%	53,47%
TOTAL	**7997**	**100%**	**82,19%**

Source: own study based on CSO data.

The overall conclusion is that the entities belonging to the subclass for which the LQ index value was at least 1.0 constitute as much as 82.19% of all companies in the section 45 – building. The biggest group was constituted by companies of the IV quarter. Companies of the III area also had a significant share. In their case we can speak about specialization, although the LQ index dynamics in the analyzed period was negative. Entities in I and II area of the matrix made only a small percentage of building companies, but quantitatively their number was significant (Table 3.11).

3.3.3. Analysis of wood and furniture industry companies concentration in Podlaskie province

The analyses of location index values calculated for the whole sector of„Wood and woodwork production" show higher concentration of this industry companies in Podlasie province than the average in Poland, it reaches the level of 1.69 and therefore we can almost speak about a specialization[143] of the province in this business (Table 3.12). Higher LQ index was only in Podkarpackie province (2.03). Similar concentration of companies in wood and woodwork production was only in Małopolskie province (1.60). We can speak about specialization of Podlaskie province in regard to almost all of the subclasses, except for service companies in wood impregnation, wooden packaging production and other woodwork production, whereas for the last category of production the LQ index shows that concentration of these companies in Podlaskie province is

[143] Value of LQ index > 1,25.

higher than the average in Poland. It is worth to notice here that in case of sawmill products (LQ – 2,18), veneer sheets production, boards and plywood (LQ – 2,60), production of goods made of cork, straw and materials used in weaving (LQ – 7,09), since the LQ was higher than 2, we can speak about so called strong clusters[144].

Similarly to the analyses of location index values calculated for the section of „Wood and woodwork production" there were calculations made for the group of "Furniture production" in general and the results show also higher concentration of the subjects in Podlaskie province than the average in Poland (LQ – 1.51). In this business we can even speak about specialization[145] of Podlasie province. The fact worth to notice is that this LQ index is the highest of all the provinces. High concentration of companies producing furniture is also observed in Wielkopolskie province (LQ – 1,48), Podkarpackie province (LQ – 1,45) and Warmińsko – Mazurskie province (LQ – 1,41). We can also speak about Podlasie province specialization in case of almost all subclasses except for companies that produce chairs and furniture to sit down and service companies in furniture finishing. In case of kitchen furniture production subclass and production of other furniture except service, similarly to the whole group of furniture production in Podlaskie province there was the highest value of LQ index of all the provinces. In office and shop furniture production higher than in Podlaskie concentration of companies was noticed only in Małopolskie province (1,46) and Warmińsko – Mazurskie province (1,36).

The localization index value for whole wood production sector and wood product manufacturing in 2004–2009 declined by more than 3% and there was a decrease of nearly 21% of entities involved in the production of wood and wood products (Table 3.13). Among the subclasses of this section the highest localization index dynamics in the analyzed period was noted in wood impregnation – over 87% and production of veneer sheets, boards and plywood – almost 43%. In these areas, as the only ones, there has been growth in the number of companies. Other subclasses recorded decreases in their number. It is worth noting, however, that the two most growing groups of companies constitute only a small percentage of all companies in the sector of wood and woodwork production (respectively 0.36% and 1.78%).

In case of furniture production section in 2004–2009 there was almost 7% decrease in the value of location indicator, but at the same time there was an

144 European Commission, *Innovation Clusters in Europe: A statistical analysis and overview of current policy suport*, DG Enterprise and Industry Report, p. 5.

145 Value of LQ index > 1,25.

Table 3.12. LQ index for the section of wood and woodwork production and furniture production

Province / Sub-classes of wood and woodwork production and furniture production	dolnośląskie	kujawsko-pomorskie	lubelskie	lubuskie	łódzkie	małopolskie	mazowieckie	opolskie	podkarpackie	*podlaskie*	pomorskie	śląskie	świętokrzyskie	warmińsko - mazurskie	wielkopolskie	zachodnio-pomorskie
Sawmilling and planning of wood	0,71	1,00	2,05	1,30	0,75	0,98	0,60	0,69	2,66	**2,18**	0,59	0,60	2,49	1,80	0,84	0,92
Impregnation of wood	0,82	1,72	1,72	1,57	1,33	0,96	0,50	1,75	0,62	**0,62**	0,83	0,60	1,28	1,48	1,52	0,91
Manufacture of veneer sheets, manufacture of particle board and plywood	0,57	0,62	1,03	2,16	1,20	1,37	0,62	2,55	2,09	**2,60**	0,66	0,79	0,81	1,00	0,96	0,63
Manufacture of builders' carpentry and joinery	0,94	0,71	1,47	1,09	0,66	1,57	0,54	1,48	1,76	**1,36**	1,01	0,95	1,06	1,20	1,01	0,92
Manufacture of wooden containers	0,92	0,85	0,95	1,34	1,07	1,10	0,56	0,77	1,41	**0,74**	1,31	0,67	1,65	0,79	1,44	1,54
Manufacture of other products of wood	0,62	1,06	0,89	0,99	0,85	2,61	0,45	1,01	1,49	**1,04**	0,86	0,89	1,14	0,90	1,21	0,68
Manufacture of articles of cork, straw and plaiting materials	0,34	0,47	0,81	1,06	0,20	2,18	0,24	0,56	5,53	**7,09**	0,22	0,38	0,51	0,70	1,30	0,49
Total: Manufacture of wood and wood products	*0,80*	*0,87*	*1,41*	*1,15*	*0,75*	*1,60*	*0,52*	*1,11*	*2,03*	***1,69***	*0,87*	*0,80*	*1,49*	*1,25*	*1,06*	*0,92*
Manufacture of chairs and seats	0,96	1,06	0,45	0,80	0,82	1,31	0,42	1,90	1,59	**0,80**	1,07	0,83	0,66	1,14	2,20	0,60
Manufacture of other office and shop furniture	0,71	0,94	0,95	0,53	1,31	1,46	0,92	0,85	1,12	**1,33**	0,99	0,81	0,83	1,36	1,08	0,96
Manufacture of kitchen furniture	0,57	0,91	1,24	0,61	1,84	1,39	0,80	1,10	1,40	**1,89**	0,81	0,84	1,08	1,57	0,85	0,63
Manufacture of other furniture	0,66	1,01	0,67	1,15	1,19	1,17	0,72	0,91	1,83	**1,96**	1,03	0,49	0,58	1,68	1,79	0,63
Service activities in furniture finishing	0,94	1,14	0,77	0,95	0,86	0,90	1,05	1,29	0,93	**0,55**	1,00	0,68	0,95	0,77	1,78	0,89
Manufacture of mattresses	0,81	1,09	0,36	1,13	1,80	0,80	0,35	0,59	1,96	**1,56**	0,81	0,53	0,54	2,24	2,66	0,27
Total: Manufacture of furniture	*0,72*	*1,00*	*0,85*	*0,84*	*1,29*	*1,25*	*0,78*	*1,12*	*1,45*	***1,51***	*0,97*	*0,70*	*0,81*	*1,41*	*1,48*	*0,71*

S o u r c e : Own study based on CSO data.

Table 3.13. Changes in the number of companies in wood and woodwork production section and furniture production sector by subclasses

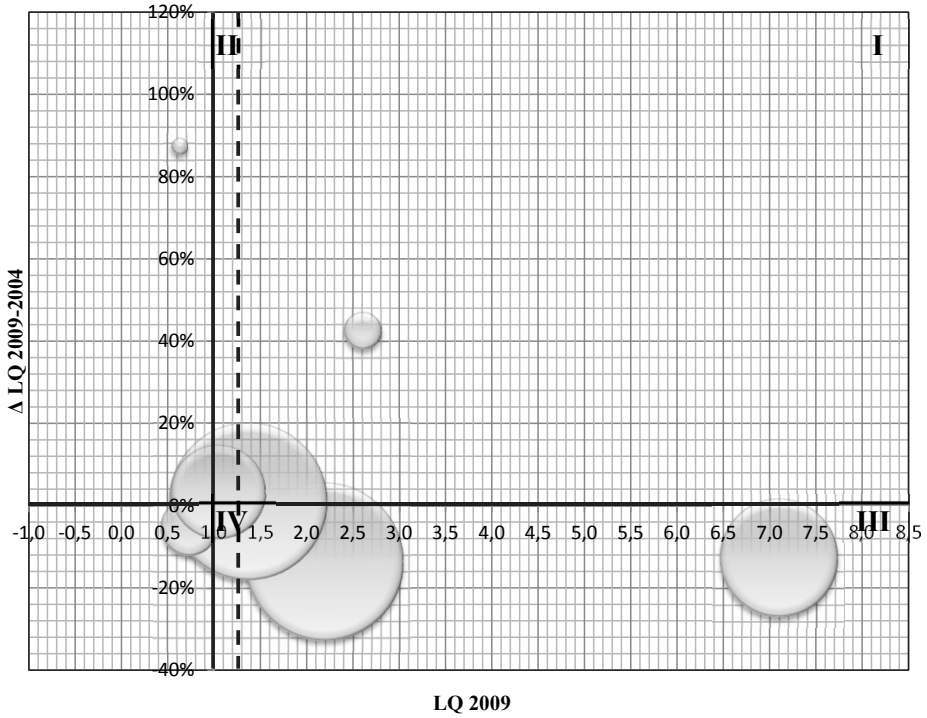
Indexes / Sub-classes of wood and woodwork production and furniture production	ΔLQ 2009-2004	Δ number of entities in 2009-2004	% entities of wood and furniture sector in 2009
Sawmilling and planning of wood	-13,49%	-6,61%	32,24%
Impregnation of wood	87,41%	66,67%	0,36%
Manufacture of veneer sheets, manufacture of particle board and plywood	42,58%	47,06%	1,78%
Manufacture of builders' carpentry and joinery	1,09%	-17,58%	32,10%
Manufacture of wooden containers	-5,24%	-25,32%	4,21%
Manufacture of other products of wood	3,34%	-28,63%	11,55%
Manufacture of articles of cork, straw and plaiting materials	-12,63%	-36,80%	17,76%
Total: Manufacture of wood and wood products	*-3,65%*	*-20,70%*	*100,00%*
Manufacture of chairs and seats	116,49%	161,90%	6,08%
Manufacture of other office and shop furniture	3,07%	157,14%	13,92%
Manufacture of kitchen furniture	-24,17%	34,70%	32,60%
Manufacture of other furniture	-6,04%	-26,37%	41,66%
Service activities in furniture finishing	11,81%	-2,08%	5,19%
Manufacture of mattresses	29,18%	66,67%	0,55%
Total: Manufacture of furniture	*-6,61%*	*6,22%*	*100 %*

S o u r c e : own study based on the data of CSO and RSO in Białystok.

increase of more than 6% in the number of entities involved in the production of furniture. This indicates that in the studied period there was more rapid growth in the number of companies in this business area in other regions of Poland than in Podlaskie province. Among the subclasses of this section negative growth rate of localization index was observed only in the activities related to the kitchen furniture production, with at the same time an increase higher than 34% in the number of entities. In the subclass of other furniture production, excluding services a decrease in the number of enterprises was also reported. Most of the new entities were involved in the manufacture of chairs and seats, office and shop furniture and mattresses. These entities in 2009 accounted for one fifth of all companies of this section.

In order to identify opportunities for development of sub-classes within each of the analyzed sections they were placed on the development matrix (Figure 3.5).

Figure 3.5. Matrix of companies' development in wood and woodwork production section



Wheel diameter depends on the number of firms at the end of 2009.

S o u r c e : own study based on CSO data.

The biggest chances of development have the sub-classes that appeared in Area I in which ΔLQ>0 and LQ>1,25. The area was filled by the companies classified in sub-classes of veneer sheets, particle board and plywood manufacture and builders' carpentry and joinery manufacture. There were 475 entities in total. Area II, in which ΔLQ>0 and 1,25≥LQ≥1 was composed by companies that can hardly be described as specialized but their density of appearance in Podlaskie province was higher than the average in Poland and the dynamics of concentration indicator was positive. This area included more than 162 companies working within the subclass of other products of wood manufacture. The III area of the matrix was composed by companies that can be described as regional specialization, but the LQ indicator dynamics in 2009–2004 was negative. There were companies in the subclass of sawmilling and planning of wood and manufacture of articles of cork, straw and plaiting materials. In those 2 sub-classes in total 701 companies were registered. The IV area of the matrix

included sub-classes in which 1,25≥ LQ≥1 and LQ dynamics was negative there was no companies in the subclass of wood production and wood products manufacturing section. Out of the growth matrix area there were only two subclasses with 64 in total number of registered companies.

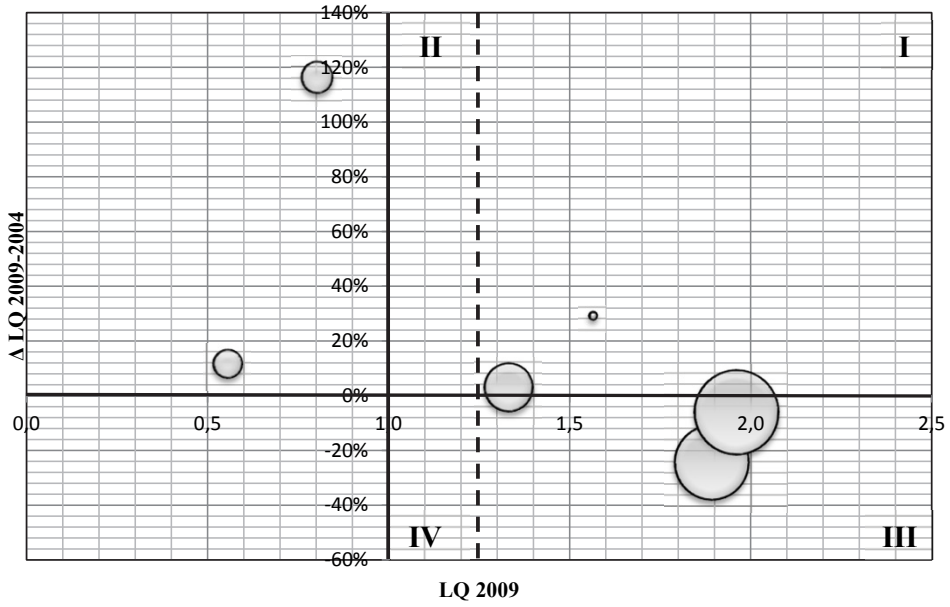
The overall conclusion is that the entities belonging to the subclass for which the LQ index value was at least 1.0 constitute as much as 95.03% of all

Table 3.14. The structure of wood and woodwork production companies share in different areas of the development matrix

Area	No of companies	% of all companies in sub-classes with LQ ≥1 (N = 1338)	% of the companies in wood production and wood products manufacturing (N = 1408)
I. ΔLQ>0; LQ>1,25	475	35,50%	33,74%
II. ΔLQ>0; 1,25≥LQ≥1	162	12,11%	11,51%
III. ΔLQ<0; LQ>1,25	701	52,39%	49,78%
IV. ΔLQ<0; 1,25≥ LQ≥1	0	0%	0%
TOTAL	**1338**	**100%**	**95,03%**

S o u r c e : own study based on CSO data.

Figure 3.6. Matrix of furniture production companies development



W h e e l diameter depends on the number of firms at the end of 2009

S o u r c e : own study based on CSO data.

companies in the section 20 – wood and woodwork production. The biggest group in the structure made companies of the III quarter. In their case we can speak about specialization, although the LQ index dynamics in the analyzed period was negative. It seems very positive that entities in I area of the matrix constituted 35% of all the entities in the section 20 (Table 3.14).

In the area I of the development matrix of furniture production section there were companies registered in the subclass of office and shop furniture production and mattress manufacturing. There were 131 entities in total.

There was no subclasses of furniture production section in the areas II and IV, while the III area included companies manufacturing the kitchen furniture and other furniture. In those 2 sub-classes in total as many as 667 companies were registered. Out of the growth matrix area there were only two subclasses: chairs and seats manufacturing and service activities in furniture finishing, with 102 in total number of registered companies.

Table 3.15. The structure of furniture production companies share in different areas of the development matrix

Area	No of companies	% of all companies in sub-classes with LQ ≥1 (N = 798)	% of the companies in furniture production (N = 1183)
I. ΔLQ>0; LQ>1,25	131	16,42%	11,07%
II. ΔLQ>0; 1,25≥LQ≥1	0	0%	0%
III. ΔLQ<0; LQ>1,25	667	83,58%	56,38%
IV. ΔLQ<0; 1,25≥ LQ≥1	0	0%	0%
TOTAL	**798**	**100%**	**67,45%**

Source: own study based on CSO data

The overall conclusion is that the entities belonging to the subclasses for which the LQ index value was at least 1.0 constitute almost 68% of all companies operating in furniture production sector. The companies of the first quarter constitute over 11% of all the companies in furniture production business. However, the largest group included entities of the third quarter in the matrix – over 56% of all entities in this section.

Chapter IV.
ANALYSIS OF THE RESEARCH RESULTS

4.1. Trust and cooperation in the researched sectors

In view of the nature of trust and cooperation between the entities in the cluster structure, highlighted in section 1.4, the respondents were first asked to express their opinion about the level of those issues within the industries in which they operate (Table 4.1). Polish respondents assessed by far the lowest level of confidence to building industry (2.97, dominant 2), and wood and furniture industry (3.04, dominant 3). The greatest variability of ratings was also noted in these groups, although it was at comparatively low level. The situation was similar in case of co-operation evaluation, and the variability rating showed greater diversity of assessments, at a moderate level. Therefore, it should be noted that both the trust and cooperation in either industry has been badly rated by respondents. It is difficult to say in this case, what the cause is and what is the effect. Does low trust between firm affect the lack of interest in cooperation or lack of cooperation affects the low trust? Polish respondents unfavorable rating of the wood and furniture industry may reflect the causes of failed attempts to develop the structure of cluster in the sector, which was formed for couple of years but survived only about one year. The building sector respondents' opinion may be surprising. The specificity of their activities, running for tenders and forming consortia require entering into cooperation relationship, so as it seemed, both the level of trust and the level of cooperation should have been rated higher. Other respondents far better assessed both confidence among companies in their industry and the level of cooperation between them. Particularly high ranks awarded by Polish and Lithuanian respondents of healthcare industry (respectively 3.83 and 3.90 and 4.31 and 4.25, dominant at level 4) deserve special attention, while differentiation of these assessments were low or very low.

Table 4.1. The level of trust and cooperation in the surveyed sectors in the respondents' opinion

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Level of trust in the sector	1	4	5,48	-	-	2	1,29	-	-	-	-	-	-
	2	20	27,40	42	46,15	7	4,52	2	5,00	2	4,17	-	-
	3	23	31,51	19	20,88	42	27,10	9	22,50	18	37,50	4	12,50
	4	22	30,14	22	24,18	73	47,10	20	50,00	20	41,67	15	46,88
	5	3	4,11	7	7,69	27	17,42	9	22,50	7	14,58	12	37,50
	6	1	1,37	1	1,10	4	2,58	-	-	1	2,08	1	3,13
Level of cooperation in the sector	1	15	20,55	30	32,97	3	1,94	-	-	-	-	-	-
	2	8	10,96	14	15,38	7	4,52	2	5,00	2	4,17	-	-
	3	13	17,81	13	14,29	30	19,35	18	45,00	14	29,17	6	18,75
	4	27	36,99	26	28,57	79	50,97	16	40,00	24	50,00	16	50,00
	5	9	12,33	7	7,69	35	22,58	3	7,50	7	14,58	6	18,75
	6	1	1,37	1	1,10	1	0,65	1	2,50	1	2,08	4	12,50
Level of trust in the sector	average	3,04		2,97		3,83		3,90		3,73		4,31	
	median	3		3		4		4		4		4	
	mode	3		2		4		4		4		4	
	mode quantity	23		42		73		20		20		15	
	standard dev.	1,05		1,06		0,91		0,81		0,84		0,74	
	variation coeff.	34,42		35,69		23,67		20,77		22,63		17,11	
Level of cooperation in the sector	average	3,14		2,66		3,90		3,58		3,81		4,25	
	median	4		3		4		3,5		4		4	
	mode	4		1		4		3		4		4	
	mode quantity	27		30		79		18		24		16	
	standard dev.	1,39		1,44		0,89		0,81		0,82		0,92	
	variation coeff.	44,23		54,12		22,87		22,74		21,41		21,55	

Where 1 is lack of trust/cooperation and 6 – very high trust/very good co-operation.

Source: own study based on conducted research.

Analysis of the U Mann-Whitney test results lead to the conclusion that among the analyzed groups only in the wood and furniture, and medical sectors the evaluation of cooperation revealed no statistically significant differences. In other cases the situation was reverse (Table 4.2).

Table 4.2. Trust and cooperation in the sector – compilation of U Mann-Whitney test results

Sector	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
TRUST				
Building	Sum of rank Belarus	Sum of rank Poland	**4,077642**	**0,000046**
	4281,00	5449,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**4,091783**	**0,000043**
	2962,00	3479,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	**–2,70843**	**0,006761**
	3763,50	13814,50		
COOPERATION				
Building	Sum of rank Belarus	Sum of rank Poland	**4,307992**	**0,000016**
	4333,00	5397,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	1,053717	0,292013
	2456,00	3985,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	–1,35780	0,174527
	3387,00	14191,00		

Marked results are relevant to p<,05000

Source: own study based on conducted research.

While analyzing the respondents' opinions about the possibility of increasing the existing cooperation between companies in the surveyed industries (Table 4.3) we should note that most optimistic in this regard were the respondents from Belarus, and most pessimistic were Polish respondents. In Lithuania the respondents believed more in the possibility of improving co-operation in order to reduce operating costs (over 62%) than in order to increase sales or improve the quality of products / services (although in these two cases, over 31% indicated that it was possible) or better access to raw materials (less than 16%).

Comparing the different sectors to each other (Table 4.4) it should be noted that the differences in the assessment of the prospects for improving cooperation between companies of individual industries are statistically significant, which in the perspective of forming homogeneous cross-border structures may constitute additional difficulties

Table 4.3. The respondents' opinion about the possibility of strengthening the existing cooperation of companies in the researched sectors over the next 2–3 years

Specification		Respondents											
		POLAND						BELARUŚ				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
in order to reduce operating costs	1	22	30,14	16	17,58	14	9,03	-	-	-	-	1	3,13
	2	19	26,03	23	25,27	31	20,00	1	2,50	-	-	2	6,25
	3	16	21,92	28	30,77	68	43,87	5	12,50	16	33,33	9	28,13
	4	13	17,81	16	17,58	37	23,87	21	52,50	22	45,83	15	46,88
	5	3	4,11	8	8,79	5	3,23	12	30,00	7	14,58	5	15,63
	6	-	-	-	-	-	-	1	2,50	3	6,25	-	-
in order to increase sales volume	1	15	20,55	59	18,50	30	19,35	-	-	-	-	2	6,25
	2	13	17,81	72	22,57	32	20,65	-	-	3	6,25	6	18,75
	3	30	41,10	117	36,68	68	43,87	4	10,00	17	35,42	14	43,75
	4	11	15,07	48	15,05	17	10,97	19	47,50	15	31,25	5	15,63
	5	3	4,11	21	6,58	8	5,16	13	32,50	11	22,92	5	15,63
	6	1	1,37	2	0,63	-	-	4	10,00	2	4,17	-	-
in order to improve the quality of products / services	1	31	42,47	83	26,02	36	23,23	-	-	-	-	2	6,25
	2	23	31,51	116	36,36	55	35,48	-	-	5	10,42	7	21,88
	3	14	19,18	89	27,90	48	30,97	5	12,50	8	16,67	13	40,63
	4	5	6,85	24	7,52	11	7,10	21	52,50	14	29,17	5	15,63
	5	-	-	7	2,19	5	3,23	13	32,50	18	37,50	5	15,63
	6	-	-	-	-	-	-	1	2,50	3	6,25	-	-
in order to improve access to resources	1	17	23,29	71	22,26	39	25,16	1	2,50	-	-	3	9,38
	2	9	12,33	99	31,03	53	34,19	1	2,50	1	2,08	8	25,00
	3	28	38,36	116	36,36	57	36,77	1	2,50	14	29,17	16	50,00
	4	15	20,55	27	8,46	4	2,58	21	52,50	14	29,17	3	9,38
	5	4	5,48	6	1,88	2	1,29	16	40,00	18	37,50	2	6,25
	6	-	-	-	-	-	-	-	-	1	2,08	-	-

1 means definitely not, 2 – not, 3 – rather not, 4 – rather yes, 5 – yes, 6 – definitely yes

Source: own study based on conducted research.

Table 4.4. The respondents' opinion about the possibility of strengthening the existing cooperation of companies in the researched sectors over the next 2–3 years – compilation of U Mann-Whitney test results

Sector	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
in order to reduce operating costs				
Building	Sum of rank Belarus	Sum of rank Poland	5,295840	0,000000
	4556,00	5174,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	6,487413	0,000000
	3361,00	3080,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	–3,70033	0,000215
	4040,00	13538,00		
in order to increase sales volume				
Building	Sum of rank Belarus	Sum of rank Poland	4,086502	0,000044
	4283,00	5447,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	6,751593	0,000000
	3405,00	3036,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	–2,21338	0,026872
	3625,50	13952,50		
in order to improve the quality of products / services				
Building	Sum of rank Belarus	Sum of rank Poland	7,147502	0,000000
	4974,00	4756,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	8,087501	0,000000
	3627,50	2813,50		
Medical	Sum of rank Lithuania	Sum of rank Poland	–3,51558	0,000439
	3988,50	13589,50		
in order to improve access to resources				
Building	Sum of rank Belarus	Sum of rank Poland	7,712303	0,000000
	5102,50	4628,50		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	6,226235	0,000000
	3317,50	3123,50		
Medical	Sum of rank Lithuania	Sum of rank Poland	–2,83757	0,004546
	3799,50	13778,50		

Marked results are relevant to p<,05000

Source: own study based on conducted research.

Conclusion and recommendations

The environment in which businesses operate today requires them to search for new sources of competitive advantage. Building it on the basis of traditional solutions such as low cost of production factors or the use of

traditional marketing instruments is no longer sufficient. There is a change in the paradigm of competition in both the socio-economic life and science. The traditional concept, based solely on competition, is being displaced by the idea of competition based on interaction. In order to make the modern economy innovative and knowledge based companies should necessarily be able to use the values that are produced in the society, i.e social capital. It is created through trust, norms and networks of mutual relations, cooperation. These elements are interdependent. Some representatives of both the world of science and business point out that the most important of the above is trust, without which neither cooperation is possible, nor shaping of generally recognized standards. In business trust allows reducing the risk and determines joint actions. However, it is difficult to clearly determine what cause is and what effect is. Does a low level of trust result from weak interaction between entities, or poor contacts are due to the lack of trust. There is, however, no doubt that these two elements are essential in the development of clusters, which are seen as an important tool for economic development. They facilitate innovation and competitiveness development of entities participating in them, especially the entrepreneurs, but also the regions in which they operate. They are based on mutual trust and cooperation of members, in spite of the existing competition between them.

Summing the analysis conducted in this section, it should be stated that in the perspective of cluster structures formation and development the pictures of situation in trust and cooperation in various Polish, Belarusian and Lithuanian industries are very different. The common opinion that Poles are people with very low level of confidence is reflected in the results of the research. According to the respondents in Poland there is the least favorable climate of trust and cooperation between companies in an industry. What may be worrying is also the largest skepticism of Polish respondents about the possibility of closer cooperation between companies in the next 2–years. It should be noted that without undertaking actions to change this situation, the lack of trust and willingness to cooperate will remain one of the main barriers to economic development. Trust and cooperation are two key factors needed for more dynamic development of Polish clusters.[146]

Respondents from Lithuania highly assessed both trust and the level of cooperation between the entities in medical industry, but they indicated greater skepticism in assessing the prospects for improving the cooperation. However, given the relatively high level of current assessment, maintaining its current

146 *Zaufanie i współpraca budują klastry*, V Europejski Kongres Gospodarczy, www.eec2011.eu /wiadomosci/zaufanie-i-wsp-praca-buduj-klastry,140217.html as of 5.05.2013.

level is not something as negative as it is in case of Polish companies. Good image of the building industry and wood and furniture was also outlined by respondents from Belarus, who were also optimistic about the future.

Statistically significant differences of opinions represented in all of the surveyed groups should also be noted. Obviously the lack of representativeness of the study should be taken into account, but it seems that the respondents' opinions should be recognized by decision-makers who will play the role of initiators of cross-border cluster structures in the future. The climate of trust and cooperation between potential actors of such structures is the capital that could determine the success of such initiatives. It should also be noted that both the confidence and positive climate of cooperation in various industries is formed very slowly and the goodwill of policy makers is merely not enough.

4.2. The respondents' trust and cooperation with competitors

In addition to expressing an opinion on the situation in the industry that the respondents represent, they were asked to determine the level of their company's trust to competitors and cooperation with them (Table 4.5). Polish respondents showed lower level of confidence than respondents from other countries. However, it should be noted that, although the differences are statistically significant (Table 4.6), in no group of respondents they exceed 4.00. Their own confidence was rated highest by the Belarusian (3.92, median and dominant at level 4) and Lithuanian (3.81 median and dominant at level 4) respondents of the wood and furniture section. In these two cases also the coefficient of variation was the lowest, indicating a very low divergence in the respondents' assessments (respectively 17.68% and 19.35%). In other cases it did not exceed 32%, which reflects high similarity of ranking.

All groups of respondents found their level of cooperation lower than the level of cooperation in the industry. It should be stated that Polish respondents from building industry and wood and furniture industry, in principle, did not cooperate with the competitors (average rating was 2.29 and 2.68 respectively). The highest level of cooperation was shown by the entities of Lithuania (3,81). The results received from Polish respondents had a higher variance than the ratings of foreign respondents. Results of the Mann-Whitney test showed a significant statistical divergence between the studied areas (Table 4.6).

Table 4.5. The level of respondents' trust and cooperation with competitors

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Level of trust in the section	1	1	1,37	6	6,59	8	5,16	-	-	-	-	-	-
	2	10	13,70	13	14,29	19	12,26	1	2,50	3	6,25	1	3,13
	3	38	52,05	53	58,24	54	34,84	8	20,00	23	47,92	9	28,13
	4	19	26,03	14	15,38	55	35,48	24	60,00	17	35,42	17	53,13
	5	4	5,48	4	4,40	15	9,68	7	17,50	5	10,42	5	15,63
	6	1	1,37	1	1,10	4	2,58	-	-	-	-	-	-
Level of cooperation in the sector	1	15	20,55	42	46,15	19	12,26	-	-	-	-	-	-
	2	13	17,81	13	14,29	13	8,39	1	2,50	3	6,25	3	9,38
	3	30	41,10	14	15,38	42	27,10	19	47,50	17	35,42	6	18,75
	4	11	15,07	14	15,38	63	40,65	17	42,50	22	45,83	17	53,13
	5	3	4,11	6	6,59	16	10,32	2	5,00	6	12,50	6	18,75
	6	1	1,37	2	2,20	2	1,29	1	2,50	-	-	-	-
Level of trust in the section	average	3,25		3,00		3,40		3,92		3,50		3,81	
	median	3		3		3		4		3		4	
	mode	3		3		4		4		3		4	
	mode quantity	38		53		55		24		23		17	
	standard dev.	0,86		0,92		1,07		0,69		0,77		0,74	
	variation coeff.	26,57		30,63		31,55		17,68		22,05		19,35	
Level of cooperation in the sector	average	2,68		2,29		3,32		3,57		3,65		3,81	
	median	3		2		4		3,5		4		4	
	mode	3		1		4		3		4		4	
	mode quantity	30		42		63		19		22		17	
	standard dev.	1,17		1,46		1,19		0,75		0,79		0,86	
	variation coeff.	43,40		63,66		35,80		20,90		21,54		22,53	

Where 1 is lack of trust/cooperation and 6 – very high trust/very good co-operation.

Source: own study based on conducted research.

Table 4.6. The respondents' trust and cooperation with competitors – compilation of U Mann--Whitney test results

Sector	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
RESPONDENTS TRUST TO COMPETITORS				
Building	Sum of rank Belarus	Sum of rank Poland	**3,023347**	**0,002500**
	4043,00	5687,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**4,079775**	**0,000045**
	2960,00	3481,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	**–2,09859**	**0,035854**
	3593,50	13984,50		
RESPONDENTS' COOPERATION WITH COMPETITORS				
Building	Sum of rank Belarus	Sum of rank Poland	**5,329064**	**0,0000001**
	4563,50	5166,50		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**4,028740**	**0,000056**
	2951,50	3489,50		
Medical	Sum of rank Lithuania	Sum of rank Poland	**–2,07168**	**0,038296**
	3586,00	13992,00		

marked results are relevant to p<,05000

S o u r c e : own study based on conducted research.

Respondents from Poland were skeptical about the possibility of strengthening the existing cooperation with competitors over the next 2–3 years, in each of the survey area indicated in the questionnaire (Table 4.7). By far the most optimistic about the future were the entities in Belarus. Respondents in Lithuania were particularly interested in improving cooperation in order to reduce operating costs (over 65%).

Results of the U. Mann-Whitney test indicate statistically significant divergence in the evaluation of the possibility of strengthening the existing cooperation with the competition over the next 2–3 year time horizon. They included reducing the operating costs, and also increasing sales, improving the quality of products or services, and better access to resources (Table 4.8).

Table 4.7. The interest in the possibility of strengthening the existing cooperation of respondents with competitors over the next 2-3 years

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
in order to reduce operating costs	1	17	23,29	14	15,38	4	2,58	-	-	-	-	1	3,13
	2	24	32,88	24	26,37	28	18,06	5	12,50	5	10,42	-	-
	3	23	31,51	26	28,57	70	45,16	6	15,00	15	31,25	10	31,25
	4	7	9,59	19	20,88	48	30,97	21	52,50	17	35,42	16	50,00
	5	2	2,74	8	8,79	5	3,23	8	20,00	10	20,83	5	15,63
	6	-	-	-	-	-	-	-	-	1	2,08	-	-
in order to increase sales volume	1	13	17,81	13	14,29	6	3,87	-	-	-	-	1	3,13
	2	15	20,55	28	30,77	41	26,45	1	2,50	10	20,83	5	15,63
	3	30	41,10	18	19,78	77	49,68	2	5,00	9	18,75	14	43,75
	4	11	15,07	20	21,98	25	16,13	14	35,00	20	41,67	7	21,88
	5	3	4,11	10	10,99	6	3,87	23	57,50	7	14,58	5	15,63
	6	1	1,37	2	2,20	-	-	-	-	2	4,17	-	-
in order to improve the quality of products / services	1	31	42,47	16	17,58	7	4,52	-	-	-	-	1	3,13
	2	23	31,51	38	41,76	66	42,58	1	2,50	2	4,17	5	15,63
	3	14	19,18	28	30,77	63	40,65	2	5,00	15	31,25	15	46,88
	4	5	6,85	7	7,69	14	9,03	18	45,00	14	29,17	6	18,75
	5	-	-	2	2,20	5	3,23	19	47,50	16	33,33	5	15,63
	6	-	-	-	-	-	-	-	-	1	2,08	-	-
in order to improve access to resources	1	13	17,81	18	19,78	15	9,68	1	2,50	1	2,08	2	6,25
	2	14	19,18	43	47,25	65	41,94	3	7,50	7	14,58	7	21,88
	3	26	35,62	24	26,37	67	43,23	18	45,00	12	25,00	17	53,13
	4	16	21,92	6	6,59	6	3,87	16	40,00	16	33,33	4	12,50
	5	4	5,48	-	-	2	1,29	2	5,00	11	22,92	2	6,25
	6	-	-	-	-	-	-			1	2,08	-	-

1 means definitely not, 2 – not, 3 – rather not, 4 – rather yes, 5 – yes, 6 – definitely yes

Source: own study based on conducted research.

Table 4.8. The interest in the possibility of strengthening the existing cooperation of respondents with competitors over the next 2–3 years – compilation of U Mann-Whitney test results

Sector	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
in order to reduce operating costs				
Building	Sum of rank Belarus	Sum of rank Poland	**4,079857**	**0,000045**
	4281,50	5448,50		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**5,962056**	**0,000000**
	3273,50	3167,50		
Medical	Sum of rank Lithuania	Sum of rank Poland	**–3,47971**	**0,000502**
	3978,50	13599,50		
in order to increase sales volume				
Building	Sum of rank Belarus	Sum of rank Poland	**3,027776**	**0,002464**
	4044,00	5686,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**6,943723**	**0,000000**
	3437,00	3004,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	**–2,03581**	**0,041770**
	3576,00	14002,00		
in order to improve the quality of products / services				
Building	Sum of rank Belarus	Sum of rank Poland	**7,236098**	**0,000000**
	4994,00	4736,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**8,165554**	**0,000000**
	3640,50	2800,50		
Medical	Sum of rank Lithuania	Sum of rank Poland	**–3,26805**	**0,001083**
	3919,50	13658,50		
in order to improve access to resources				
Building	Sum of rank Belarus	Sum of rank Poland	**6,542832**	**0,000000**
	4837,50	4892,50		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**6,361327**	**0,000000**
	3340,00	3101,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	**–2,52727**	**0,011496**
	3713,00	13865,00		

marked results are relevant to p<,05000

Source: own study based on conducted research.

Conclusion and recommendations

Summing the conducted analysis it should be stated that Polish respondents were characterized by the greatest distrust to competitors among other surveyed groups. This influenced the cooperation between the entities in the same industry, which either did not occur or was at a very low level. Respondents

also showed a great skepticism about the possibility of improving cooperation in the next 2–3 year period. This result of the analysis is not optimistic in regard to the prospects for establishing a real, effective cooperation within the cluster structures. It should be noted again that the basis for clusters success is trust between entrepreneurs who form them and their willingness to cooperate. However, both the studies presented here as well as studies conducted by other authors show that Polish society, and thus the entrepreneurs, is one of the most distrustful in Europe.[147]

Some authors try to explain this situation claiming that it is largely a heritage and legacy of Polish communist era, that for decades political, social and economic circumstances were not conducive to cooperation or collaboration in any area of the public sphere, and the dominant attitude – natural in the reality ruled by the repressive apparatus of the State – was high caution, egoism and low confidence in dealing with others. It is difficult to accept such a position while analyzing the results received from the studies in Lithuania and Belarus, where either functioned or still functions, the system which in Poland lasted for many years. Opinions of foreign respondents were much more optimistic than those got from Polish agents. The foreigners declared a higher level of trust and cooperation with companies of their sectors. Whereas the situation in the Belarusian companies could be explained by another economic system which does not force the competitors to operate a "market war", the same explanation could not be applied to Lithuanian entities.

The conducted studies reflect the situation of low social potential of Polish society, which is indicated in the number of scientific publications and policy documents in the field of economic and social development of Poland. Meetings hold in frames of the Project with representatives of science and business from Lithuania and Belarus enabled us to recognize their openness to cooperation, definitely higher than Polish companies and it seems that it was higher in case of Belarusian companies than Lithuanian ones. It can also be observed in the results of the respondents' assessments of their willingness to strengthen cooperation in the near future. In case of Lithuanian respondents the majority of surveyed entities stated that it would be possible only in order to reduce operating costs, while in case of Belarusian entities such a high percentage was indicated for each of the objectives given in the questionnaire, which were: reduction of operating costs, increase of sales, improving the quality of products / services and better

147 *Zaufanie i współpraca budują klastry*, V Europejski Kongres Gospodarczy, www.eec2011.eu /wiadomosci/zaufanie-i-wsp-praca-buduj-klastry,140217.html as of 5.05.2013.

access to raw materials (except only for wood and furniture industry, that in many cases supplied raw materials – the percentage of indications regarding the possibility of increasing co-operation was 45%).

Mutual trust is necessary to build friendly and stable relations between members of the cluster. The cluster without them would be only a fiction. Overcoming mental barriers in the form of lack of trust in business partners is the key to the whole project success. The Polish economic system is unfortunately still dominated by the ideology of competition, rivalry or even open hostility. The rule "I may not benefit, or I may even lose, but my rival will lose also" is very common. Therefore the reluctance to share know-how with other participants in the market game is to some extent understandable. In Poland rivalry and competition is very often badly understood. Higher openness of entrepreneurs is necessary. The reluctance to collaborate and failure to cooperate undoubtedly hinder the creation and development of cluster structures.

We should therefore think carefully about how to convince companies to strengthen the bonds of cooperation and bestow a greater trust. It appears that building two-level relations may be useful. The first level would be formed of formal contacts, based on codified standards, including, for example the cluster rules, partnership agreements between its individual members, creation of a joint offer, conclusion of licensing and other agreements.

Noteworthy is the fact that clusters typically gather small and medium-sized companies, because the most natural development strategy for them is the one based on trust to local connections. In loose connections, with which we are dealing in clusters, trust becomes a very important factor that can not be decreed or implemented "by force". Therefore, it seems that long cooperation in the frames of ethically conducted business will also steadily increase confidence. It may be, therefore, useful to develop a Code of Ethics that companies, determined to join the cluster, would accept as one of the documents conditioning their participation in it. Such a code should include the principle of positive competition, partner interaction and acting in accordance with the businessman ethos.

The first level, possibly determining the success, would be formed of informal contacts that allow building a kind of social network among entities of the cluster. It should be emphasized that only the use of both types of communication channels gives the desired results and enables building really close and long-term relations between the cluster members.

We should remember that the cluster is not only a group of companies, institutions, research bodies, but above all it is a social group. The strength of this

type of business relationship is in large part the quality and intensity of personal contacts that connect people. Therefore, the social life of these structures should no doubt be intense. Meetings of cluster members work well, called not only to exchange information and ideas, but also to establish social contacts. Thus a good solution is to enrich formal meetings with some unofficial parts.

4.3. The respondents' trust to research and development sphere and cooperation with it

The correct relations between R&D and business spheres constitute an essential element of well-functioning clusters. Good cooperation between the two can, and often is the factor determining innovativeness of these structures. With the above in mind the surveyed entities were asked to respond to these issues

Polish companies of the wood and furniture (2.82) and building (3.44) sectors indicated the lowest level of confidence in the sphere of research and development. It is also worth noting that in their case the coefficient of variation reached the highest value of all the surveyed groups (respectively 46.63% and 36.06%), showing a significant variation between respondents' ratings. The highest level of confidence was represented by medical companies, both Polish (4.14, with a median and the dominant level 4) and Lithuanian (4.41, with a median of 4.5 and the dominant level 5), which may be due to the specific nature of the sector and its long-term relationship with the world of science.

The level of cooperation with the R&D sphere was rated lower by the respondents than the level of their cooperation, although in this case the medical entities were leading (Polish – average rating 3.79, while the Lithuanian – 4.19, median and dominant at level 4, differences in ratings at low level). The level of cooperation of Polish companies in wood and building sectors was at a very low level – below 2.5. For these two groups of respondents the highest values of the variation coefficients were also reported – at a moderate level for the wood and furniture sector, and at high level in the case of building sector (in this group, median and dominant is 1, which means a total lack of cooperation).

Table 4.9. The respondents' trust to research and development sphere and cooperation with it

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Level of trust in the sector	1	16	21,92	5	5,49	4	2,58	1	2,50	1	2,08	1	3,13
	2	15	20,55	20	21,98	2	1,29	-	-	4	8,33	-	-
	3	15	20,55	17	18,68	30	19,35	9	22,50	17	35,42	5	15,63
	4	20	27,40	30	32,97	63	40,65	20	50,00	22	45,83	10	31,25
	5	7	9,59	17	18,68	44	28,39	9	22,50	3	6,25	11	34,38
	6	-	-	2	2,20	12	7,74	1	2,50	1	2,08	5	15,63
Level of cooperation in the sector	1	23	31,51	50	54,95	17	10,97	1	2,50	2	4,17	2	6,25
	2	17	23,29	4	4,40	9	5,81	7	17,50	8	16,67	-	-
	3	17	23,29	9	9,89	24	15,48	5	12,50	17	35,42	4	12,50
	4	13	17,81	16	17,58	57	36,77	18	45,00	17	35,42	13	40,63
	5	3	4,11	12	13,19	36	23,23	7	17,50	2	4,17	10	31,25
	6	-	-	-	-	12	7,74	2	5,00	2	4,17	3	9,38
Level of trust in the sector	average	2,82		3,44		4,14		3,98		3,52		4,41	
	median	3		4		4		4		4		4,5	
	mode	4		4		4		4		4		5	
	mode quantity	20		30		63		20		22		11	
	standard dev.	1,32		1,24		1,03		0,89		0,90		1,13	
	variation coeff.	46,63		36,06		24,83		22,42		25,53		25,69	
Level of cooperation in the sector	average	2,40		2,30		3,79		3,73		3,31		4,19	
	median	2		1		4		4		3		4	
	mode	1		1		4		4		3/4		4	
	mode quantity	23		50		57		18		17		13	
	standard dev.	1,22		1,57		1,37		1,18		1,07		1,18	
	variation coeff.	50,97		68,54		36,23		31,58		32,45		28,08	

Where 1 is lack of trust/cooperation and 6 – very high trust/very good co-operation.

Source: own study based on conducted research.

Table 4.10. The respondents' trust and cooperation with research and development sphere – compilation of U Mann-Whitney test results

Sector	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
RESPONDENTS TRUST TO R&D SPHERE				
Building	Sum of rank Belarus	Sum of rank Poland	0,146184	0,883776
	3393,50	6336,50		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**4,277910**	**0,000019**
	2993,00	3448,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	–1,35422	0,175669
	3386,00	14192,00		
RESPONDENTS COOPERATION WITH R&D SPHERE				
Building	Sum of rank Belarus	Sum of rank Poland	**3,698893**	**0,000217**
	4195,50	5534,50		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**4,824282**	**0,000001**
	3084,00	3357,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	–1,45645	0,145268
	3414,50	14163,50		

Source: own study based on conducted research.

Analysis of the U Mann-Whitney test results lead to the conclusion that statistically significant differences in the evaluation of trust existed only between Polish and Belarusian respondents from the wood and furniture sector. For the assessment of the cooperation level such differences did not occur only between medical entities (Table 4.11).

The vast majority of Polish respondents in the wood and furniture sectors, and building sector did not expect strengthening cooperation with the R&D sphere in the next 2–3 years. On the background of the researched foreign groups, also surveyed Polish medical companies were placed quite low, although about 40% of them indicated that they were interested in cooperation in order to implement joint research projects, and more than half of them also in order to order to develop new solutions. In the opinion of Lithuanian companies of the same sector, these indicators were respectively 65.63% and 75.01%. Most open to strengthening their cooperation were the surveyed Belarusian entities. More than half of them expressed interest in each purpose given for assessment .

Analysis of the U Mann-Whitney test results lead to the conclusion that there were statistically significant differences in the respondents' perception of the possibility of strengthening the existing cooperation with the research and development sphere in the near future in order to undertake joint research projects, to commission the development of new solutions and to commercialize

Table 4.11. The interest in the possibility of strengthening the existing cooperation of respondents with research and development sphere over the next 2–3 years

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
in order to undertake joint research projects	1	28	38,36	46	50,55	17	10,97	-	-	1	2,08	2	6,25
	2	22	30,14	15	16,48	10	6,45	2	5,00	6	12,50	-	-
	3	18	24,66	25	27,47	65	41,94	7	17,50	17	35,42	9	28,13
	4	5	6,85	4	4,40	45	29,03	20	50,00	18	37,50	12	37,50
	5	-	-	1	1,10	12	7,74	11	27,50	4	8,33	6	18,75
	6	-	-	-	-	6	3,87	-	-	2	4,17	3	9,38
in order to develop new solutions	1	18	24,66	37	40,66	17	10,97	-	-	-	-	2	6,25
	2	18	24,66	21	23,08	9	5,81	3	7,50	7	14,58	-	-
	3	22	30,14	8	8,79	46	29,68	3	7,50	12	25,00	6	18,75
	4	13	17,81	18	19,78	59	38,06	21	52,50	16	33,33	15	46,88
	5	2	2,74	7	7,69	17	10,97	13	32,50	10	20,83	6	18,75
	6	-	-	-	-	7	4,52	-	-	3	6,25	3	9,38
in order to commercialize the research results	1	49	67,12	74	81,32	51	32,90	-	-	1	2,08	6	18,75
	2	11	15,07	4	4,40	45	29,03	-	-	1	2,08	11	34,38
	3	10	13,70	10	10,99	34	21,94	7	17,50	16	33,33	5	15,63
	4	3	4,11	3	3,30	15	9,68	17	42,50	21	43,75	4	12,50
	5	-	-	-	-	4	2,58	16	40,00	7	14,58	3	9,38
	6	-	-	-	-	6	3,87	-	-	2	4,17	3	9,38

1 means definitely not, 2 – not, 3 – rather not, 4 – rather yes, 5 – yes, 6 – definitely yes

Source: own study based on conducted research.

the research results. In the latter case there were no differences only in the researched medical sector (Table 4.12).

Table 4.12. The interest in the possibility of strengthening the existing cooperation of respondents with the research and development sphere over the next 2–3 years – compilation of U Mann-Whitney test results

Section	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
in order to undertake joint research projects				
Building	Sum of rank Belarus	Sum of rank Poland	**6,808621**	**0,000000**
	4897,50	4832,50		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**7,466079**	**0,000000**
	3524,00	2917,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	**–2,72637**	**0,006404**
	3768,50	13809,50		
in order to develop new solutions				
Building	Sum of rank Belarus	Sum of rank Poland	**5,492967**	**0,000000**
	4600,50	5129,50		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**6,316297**	**0,000000**
	3332,50	3108,50		
Medical	Sum of rank Lithuania	Sum of rank Poland	**–2,31203**	**0,020777**
	3653,00	13925,00		
in order to commercialize the research results				
Building	Sum of rank Belarus	Sum of rank Poland	**8,660282**	**0,000000**
	5315,50	4414,50		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**8,273628**	**0,000000**
	3658,50	2782,50		
Medical	Sum of rank Lithuania	Sum of rank Poland	–1,76855	0,076970
	3501,50	14076,50		

marked results are relevant to p<,05000

Source: own study based on conducted research.

Conclusion and recommendations

Modern economy is characterized by rapid and radical changes. One of the basic conditions for survival and development of enterprises in the conditions of changing and competitive environment is the need for broad expertise and a variety of resources and skills. The fast pace of change and increasing complexity of the environment affects significantly the autonomy of individual companies and their managers' activities, forcing the search for sources of

competitive advantage outside companies. The specificity of many today's business enterprises, and especially short product life cycles, along with a strong competitive pressures, make it to the market success is largely affected by the flexibility to adapt to changing environmental conditions.

Economic growth in the modern world is conditioned by the development of intangible resources, such as knowledge and innovation. It is assumed that in many areas, and their number will continue to grow, a minor role in developing economies and countries, material factors of production are beginning to play and more important becomes the contribution of the human factor. Appreciation of knowledge as the main factor influencing the company success becomes therefore increasingly common. Business development requires a continuous exchange of ideas in science and technology, access to modern technology, research laboratories that can be provided by the research and development sphere operators. In the light of these aspects cooperation between science and business becomes an essential factor in ensuring a competitive advantage and long-term development of companies.

To sum up the analysis it should be noted that not all respondents could see these relationships. Particularly alarming situation in this respect is among respondents from Poland, whose activity is related to the wood and furniture industry and building industry. These entities not only showed a low level of trust (it was higher in case of building industry) and cooperation with the sphere of science, but they also did not provide for improvement in this regard in the near future. Such a situation certainly can not be explained with specificity of activities in these sectors, as the situation among the respondents from Belarus, representing the same area of activity, was definitely better. Surely this resulted from:

- no tradition of proper partner cooperation between the two spheres in the past, relying often on stereotypes (many opinions obtained during the interviews and various other contacts the position was very common that "those people from universities live in isolation from reality and create their theories", "what they can offer wise, since they can not even teach students", "universities on the occasion of my order want to fund other research, that I just don't need," etc.);
- high level distrust of Poles to institutions.[148]

Medical companies, due to their relationship, both personal (often employees are, or were employed in both spheres – science and business) and institutional with science entities, represent much better position. Only low

[148] http://www.carpatiabiznes.pl/felietony,bez_zaufania_nie_ma_wspolpracy.html as of 5.05.2013.

percentage of Polish respondents in this group who plan to strengthen their cooperation in the near future may be worrying.

Intensive development of the knowledge based economy leads to an increased research links between science and business. The need for comprehensive and sustainable combination of both spheres no longer raises doubts, but is considered a necessity. Such cooperation is profitable for operators of both parties involved in it. In business, the usefulness of knowledge and ideas can be verified, and at the same time receive material benefits. Business practice may lead to ideas for new research. For a university – as an institution – cooperation with business can be a source of funding, prestige, and scientific-program inspiration. In the light of the research, the challenge is to convince Polish entities that such cooperation is beneficial for both parties, and without it even the best, modern relationship structures leading to a competitive advantage can not exist. It is also important that Polish decision-makers for regional and local development have realized the situation seriousness in this area and no longer limit their activities only to the provisions in strategic documents. Including the desired clusters, from the regional perspective, in development strategies of individual provinces does not guarantee their real development. Essential is actual, not merely fictional – on paper, cooperation between the science and business, necessary in these structure.

4.4. The respondents' trust and cooperation with foreign companies

Respondents from Poland and Lithuania indicated a very low level of trust in foreign companies in the same industry, below 2 (the median and the dominant level 1, which means a complete lack of trust). At the same time we should pay attention to the high value of the coefficient of variation, which in case of medical entities achieved a moderate level of differentiation ratings. Trust of entities in Belarus was far from that level and reached in the wood and furniture sector the level of 4.0 (median and dominant 4), and in the building section – 3.56 (median 3.5, the dominant 3). Poor differentiation between test ratings in the same industry was also noted (Table 4.13).

Analysis of U Mann-Whitney test results lead to the conclusion that there were statistically significant differences in the assessments of trust between the actors of the building sector as well as the wood and furniture sector.

Table 4.13. The level of respondents' trust to foreign companies

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
The level of trust to foreign companies	1	42	57,53	72	79,12	123	79,35	1	2,50	2	4,17	22	68,75
	2	15	20,55	15	16,48	8	5,16	1	2,50	2	4,17	1	3,13
	3	11	15,07	4	4,40	16	10,32	7	17,50	20	41,67	3	9,38
	4	5	6,85	-	-	6	3,87	21	52,50	17	35,42	4	12,50
	5	-	-	-	-	2	1,29	8	20,00	5	10,42	2	6,25
	6	-	-	-	-	-	-	2	5,00	2	4,17	-	-
	average	1,71		1,25		1,43		4,00		3,56		1,84	
	median	1		1		1		4		3,5		1	
	mode	1		1		1		4		3		1	
	mode quantity	42		72		123		21		20		22	
	standard dev.	0,96		0,53		0,92		0,96		1,03		1,37	
	variation coeff.	56,32		42,23		64,41		24,02		28,90		74,33	

Where 1 is lack of trust/cooperation and 6 – very high trust/very good co-operation.
Tested level of trust between:

- Poland: companies in wood and furniture sector and building sector to the companies in these two sectors in Belarus, whereas the medical section companies to Lithuanian ones;
- Belarus: companies in wood and furniture sector and building sector to the companies in these two sectors in Poland;
- Lithuania: medical section companies to this sector companies in Poland.

Source: own study based on conducted research.

Such differences did not exist between Polish and Lithuanian medical companies (Table 4.14).

Table 4.14. The level of respondents' trust to foreign companies – compilation of U Mann-Whitney test results

Sector	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
ZAUFANIE RESPONDENTÓW DO FIRM ZAGRANICZNYCH				
Building	Sum of rank Belarus	Sum of rank Poland	**8,906137**	**0,000000**
	5371,00	4359,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**7,553138**	**0,000000**
	3538,50	2902,50		
Medical	Sum of rank Lithuania	Sum of rank Poland	–1,16409	0,244389
	3333,00	14245,00		

marked results are relevant to p<,05000

Source: own study based on conducted research.

Polish and Lithuanian respondents indicated a very low level of their cooperation with foreign companies in the same industry (below 2.0, the median and the dominant level 1, which means a complete lack of cooperation). Respondents from Belarus declared significantly higher level of cooperation with foreign companies, except for construction firms which operate poorly on the Polish market (Table 4.15).

Analysis of U Mann-Whitney test results allow for identification of no statistically significant differences in the assessment of the level of cooperation between the entities in the medical sector only. Such differences between Polish and Belarusian entities were identified in the wood and furniture sector and building sector (Table 4.16).

Table 4.15. The level of respondents' cooperation with foreign companies

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Foreign company as a market	1	40	54,79	88	96,70	132	85,16	-	-	13	27,08	26	81,25
	2	15	20,55	2	2,20	9	5,81	3	7,50	11	22,92	-	-
	3	12	16,44	-	-	9	5,81	19	47,50	7	14,58	1	3,13
	4	6	8,22	1	1,10	3	1,94	6	15,00	12	25,00	2	6,25
	5	-	-	-	-	2	1,29	10	25,00	5	10,42	3	9,38
	6	-	-	-	-	-	-	2	5,00	-	-	-	-
	average	1,78		1,05		1,28		3,73		2,69		1,63	
	median	1		1		1		3		2,5		1	
	mode	1		1		1		3		1		1	
	mode quantity	40		88		132		19		13		26	
	standard dev.	1,00		0,35		0,77		1,09		1,39		1,36	
	variation coeff.	56,35		32,72		60,04		29,15		51,58		83,81	
Foreign company as supplier of raw materials etc.	1	42	57,53	91	100	143	92,26	-	-	8	16,67	27	84,38
	2	13	17,81	-	-	8	5,16	3	7,50	5	10,42	1	3,13
	3	11	15,07	-	-	4	2,58	19	47,50	9	18,75	2	6,25
	4	7	9,59	-	-	-	-	12	30,00	16	33,33	2	6,25
	5	-	-	-	-	-	-	5	12,50	6	12,50	-	-
	6	-	-	-	-	-	-	1	2,50	4	8,33	-	-

Table 4.15continue

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Foreign company as supplier of raw materials etc.	average	1,76		1,00		1,10		3,55		3,40		1,34	
	median	1		1		1		3		4		1	
	mode	1		1		1		3		4		1	
	mode quantity	42		91		143		19		16		27	
	standard dev.	1,03		0,00		0,38		0,90		1,50		0,87	
	variation coeff.	58,54		0,00		34,53		25,48		44,12		64,41	
Foreign company as a partner for joint ventures	1	45	61,64	89	97,80	138	89,03	-	-	10	20,83	25	78,13
	2	19	26,03	-	-	5	3,23	1	2,50	5	10,42	-	-
	3	9	12,33	2	2,20	6	3,87	6	15,00	10	20,83	2	6,25
	4	-	-	-	-	4	2,58	21	52,50	7	14,58	3	9,38
	5	-	-	-	-	2	1,29	7	17,50	14	29,17	2	6,25
	6	-	-	-	-	-	-	5	12,50	2	4,17	-	-
	average	1,51		1,04		1,24		4,23		3,33		1,66	
	median	1		1		1		4		3		1	
	mode	1		1		1		4		5		1	
	mode quantity	45		89		138		21		14		25	
	standard dev.	0,71		0,29		0,76		0,95		1,60		1,31	
	variation coeff.	47,09		28,24		61,08		22,41		48,07		79,11	

Where 1 is lack of trust/cooperation and 6 – very high trust/very good co-operation.
Tested level of trust between:

- Poland: companies in wood and furniture sector and building sector to the companies in these two sectors in Belarus, whereas the medical section companies to Lithuanian ones;
- Belarus: companies in wood and furniture sector and building sector to the companies in these two sectors in Poland;
- Lithuania: medical section companies to this sector companies in Poland.

Source: own study based on conducted research.

Table 4.16. The level of respondents' cooperation with foreign companies – compilation of U Mann-Whitney test results

Sector	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
FOREIGN COMPANIES AS A MARKET				
Building	Sum of rank Belarus	Sum of rank Poland	**6,810836**	**0,000000**
	4898,00	4832,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**6,826644**	**0,000000**
	3417,50	3023,50		
Medical	Sum of rank Lithuania	Sum of rank Poland	–0,52375	0,600453
	3154,50	14423,50		
FOREIGN COMPANIES AS SUPPLIER OF RAW MATERIALS ETC				
Building	Sum of rank Belarus	Sum of rank Poland	**8,060043**	**0,000000**
	5180,00	4550,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**6,643519**	**0,000000**
	3387,00	3054,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	–0,76410	0,444808
	3221,50	14356,50		
FOREIGN COMPANIES AS A PARTNER OF JOINT VENTURES				
Building	Sum of rank Belarus	Sum of rank Poland	**7,524036**	**0,000000**
	5059,00	4671,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**8,489775**	**0,000000**
	3694,50	2746,50		
Medical	Sum of rank Lithuania	Sum of rank Poland	–1,06723	0,285869
	3306,00	14272,00		

marked results are relevant to p<,05000

S o u r c e : own study based on conducted research.

The vast majority of respondents in Poland and Lithuania have not expressed interest in the possibility of strengthening their cooperation with foreign companies, neither perceiving foreign companies as a market, nor as suppliers of raw materials or as potential partners in joint ventures. Respondents from Belarus represented a different position. They were interested in improving relations with Polish companies in every field specified in the survey (Table 4.17).

Analysis of U Mann-Whitney test results allow for identification of statistically significant differences in the assessment of the possibility of strengthening cooperation with Polish and Belarus respondents of the building sector as well as the wood and furniture sector. Such differences did not exist between Polish and Lithuanian medical entities (Table 4.18).

Table 4.17. The interest in the possibility of strengthening the existing cooperation of respondents with foreign companies over the next 2–3 year

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Foreign company as a market	1	22	30,14	47	51,65	57	36,77	-	-	-	-	10	31,25
	2	15	20,55	18	19,78	32	20,65	1	2,50	8	16,67	6	18,75
	3	19	26,03	20	21,98	36	23,23	11	27,50	15	31,25	8	25,00
	4	14	19,18	6	6,59	25	16,13	8	20,00	15	31,25	5	15,63
	5	2	2,74	-	-	5	3,23	18	45,00	9	18,75	3	9,38
	6	1	1,37	-	-	-	-	2	5,00	1	2,08	-	-
Foreign company as supplier of raw materials etc.	1	30	41,10	83	91,21	115	74,19	-	-	-	-	22	68,75
	2	13	17,81	8	8,79	10	6,45	3	7,50	8	16,67	-	-
	3	21	28,77	-	-	27	17,42	7	17,50	7	14,58	5	15,625
	4	8	10,96	-	-	3	1,94	18	45,00	16	33,33	5	15,625
	5	1	1,37	-	-	-	-	8	20,00	15	31,25	-	-
	6	-	-	-	-	-	-	4	10,00	2	4,17	-	-
Foreign company as a partner for joint ventures	1	41	56,16	78	85,71	85	54,84	-	-	-	-	17	53,13
	2	20	27,40	9	9,89	41	26,45	-	-	7	14,58	5	15,625
	3	12	16,44	2	2,20	-	-	3	7,50	11	22,92	-	-
	4	-	-	2	2,20	22	14,19	18	45,00	16	33,33	5	15,625
	5	-	-	-	-	7	4,52	16	40,00	11	22,92	5	15,625
	6	-	-	-	-	-	-	3	7,50	3	6,25	-	-

1 means definitely not, 2 – not, 3 – rather not, 4 – rather yes, 5 – yes, 6 – definitely yes

Tested level of trust between:

- Poland: companies in wood and furniture sector and building sector to the companies in these two sectors in Belarus, whereas the medical section companies to Lithuanian ones;
- Belarus: companies in wood and furniture sector and building sector to the companies in these two sectors in Poland;
- Lithuania: medical section companies to this sector companies in Poland.

S o u r c e : own study based on conducted research.

Table 4.18. The interest in the possibility of strengthening the existing cooperation of respondents with foreign companies over the next 2–3 year – compilation of U Mann-Whitney test results

Sector	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
FOREIGN COMPANIES AS A MARKET				
Building	Sum of rank Belarus	Sum of rank Poland	**7,169651**	**0,000000**
	4979,00	4751,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**6,049115**	**0,000000**
	3288,00	3153,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	–0,87351	0,382384
	3250,00	14326,00		
FOREIGN COMPANIES AS SUPPLIER OF RAW MATERIALS ETC				
Building	Sum of rank Belarus	Sum of rank Poland	**9,530740**	**0,000000**
	5512,00	4218,00		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**6,721572**	**0,000000**
	3400,00	3041,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	–0,87710	0,380432
	3253,00	14325,00		
FOREIGN COMPANIES AS A PARTNER OF JOINT VENTURES				
Building	Sum of rank Belarus	Sum of rank Poland	**9,191860**	**0,000000**
	5435,50	4294,50		
Wood and furniture	Sum of rank Belarus	Sum of rank Poland	**8,654887**	**0,000000**
	3722,00	2719,00		
Medical	Sum of rank Lithuania	Sum of rank Poland	–0,76051	0,446948
	3220,50	14357,50		

marked results are relevant to p<,05000

Source: own study based on conducted research.

Conclusion and recommendations

In the short period of its development, the European Union wants to continue to create clusters. However, it would not be the matter of their initiation, but

the selective development of the best of them. Particularly important will be the initiatives enhancing development of trans-regional and cross-border structures. Development of cooperation in the framework of international clusters is part of the strategy Europe 2020. Companies from different countries work together in the cross-border clusters. Every day they operate in different realities, which on one hand create difficulties, but on the other hand give companies much better chance for development.

The results of this research project, however, point to significant difficulties that may arise in the construction and development of such structures in north-east Poland (and neighboring countries) and thus hinder full benefits of such cooperation. The surveyed entities on both Polish and Lithuanian side indicated a very low level of trust and cooperation with foreign partners in the same industry. They were also not interested, or did not see a possibility to improve the situation in the near future.

The results obtained from Polish respondents fit into the picture of other studies, which show that while the Polish society – at least in their declarations – is relatively open to visitors from abroad[149], foreigners perceive Poles as intolerant people, stereotype minded, secretive and difficult to make friends, blaming their failures but themselves.[150] Numerous sociologic research show[151], that only one in five Poles trust strangers.[152] Distrust is a problem of Polish society and somehow our national characteristic. Limited openness to immigrants from the East is also associated with prejudice.[153] Studies show that in relation to the Belarusians, Russians and Ukrainians, there is still a significant reluctance. Slavs from the former Soviet Union rather often face the hostile attitude.[154]

In the course of the authors' project abroad quite frequently appeared also the matter of partnership treatment of foreigners. It was claimed that Polish party often put themselves, from the very beginning, higher than partners from abroad, which strongly interferes with the opportunity to establish honest relationships based on trust. This confirms the results of a study carried out by Synovate on behalf of recruitment service GazetaPraca.pl. They show that Poles have a higher tolerance

149 Wenzel M., *Stosunek do obcokrajowców w Polsce*, Instytut Spraw Publicznych, www.isp.org.pl as of 10.05.2013.

150 Karp D., *Jak oceniają nas pracujący w Polsce obcokrajowcy?*, http://gazetapraca.pl/gazetapraca/1,90439,4232579.html as of 1.05.2013.

151 inter alia: *Diagnoza społeczna* J. Czaplińskiego.

152 www.diagnoza.com stan na dzień 30.04.2013.

153 Wenzel M., *Stosunek do obcokrajowców …* , op. cit.

154 *Stosunek Polaków do innych narodów*, komunikat CBOS, 2008.

for foreigners as subordinates than superiors.[155] Probably the negative experience of cooperation had also a negative impact on the evaluations obtained from respondents in Lithuania. The positive attitude of respondents from Belarus is very interesting. It seems that, especially in this direction, potential cross-border structures should be built, with the obvious need to change the attitude of Polish companies. Cross-border structures formation is both a great challenge and an opportunity for regions close to the border. That has already been noticed by the regions of both Western and Southern Poland. Also the project "Podlasie development strategy" contains the provisions of the priority direction for development in cooperation with Belarus. However, there is still a problem to solve, which is low confidence of public, and therefore entrepreneurs, to foreign entities from the East. Trusting them would help in creating partnership relations. Without trust the possibility of creating cluster structures and development of cross-border cluster will be lost.

4.5. The respondents' attitudes to the idea of clustering

A small percentage of Polish respondents, in comparison to the foreigners, had never heard about clusters before. Similar percentage can be observed only in case of the medical sector. The idea of clustering was least known among respondents from Belarus. This is understandable because no structures resembling clusters operate so far in this country. The idea of clustering was, however, known to scientists, but it was losing popularity in Belarusian environment.

Polish respondents were skeptical about the idea of clustering. The highest percentage of respondents believed that the initiatives were unimportant or even unnecessary, of little real impact on the competitiveness improvement of both companies and regions, working only in theory. This approach may be due to the observation of the functioning and development of the existing cluster structures. With no such experience a significant proportion of Belarusian respondents rated them very highly, noting that these initiatives were very or fairly important. Only a few of them shared the position of Polish respondents. Lithuanian entities represented a similar position to the Polish respondents. This is probably due to similar experience in terms of clustering (Table 4.19).

155 Anam R., *Tolerancja Polaków a obcokrajowcy w pracy*, http://www.egospodarka.pl/33182,Tolerancja-Polakow-a-obcokrajowcy-w-pracy,2,39,1.html as of 9.05.2013.

Table 4.19. The respondents' attitudes to the idea of clustering

Specification	Respondents											
	POLAND						BELARUS				LITHUANIA	
	Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
I have not heard before about such initiatives	8	10,96	8	8,79	28	18,06	15	37,50	16	33,33	7	21,88
Very important initiative	-	-	7	7,69	5	3,23	6	15,00	6	12,50	3	9,38
Quite important initiative	6	8,22	5	5,49	8	5,16	16	40,00	13	27,08	3	9,38
Not very important initiative	12	16,44	27	29,67	7	4,52	1	2,50	6	12,50	-	-
Unnecessary initiative, doing nothing to improve the competitiveness of both companies and regions	33	45,21	24	26,37	29	18,71	1	2,50	5	10,42	7	21,88
Such initiatives work well only in theory	15	20,55	20	21,98	78	50,32	-	-	6	12,50	12	37,50

Source: own study based on conducted research.

A significant skepticism about the idea of clustering can be seen in the structure of the respondents' declarations regarding joining the existing or potential (that may arise in the future), cluster structures. Only respondents from Belarus showed optimism in this regard. As many as 82.5% of respondents from the wood and furniture sector, and nearly 67% of building sector respondents answered affirmatively. In the other groups, few respondents shared this position (Table 4.20).

Respondents, who expressed their willingness to join the cluster or their membership in it, were asked to identify their main reasons. Belarusian entities earliest indicated them as an interesting initiative, which might provide additional advantages to companies that join it (over 30% in one and the other sector). No fear of working with competitors reported nearly 60% of Polish medical entities and 40% of Lithuanian. An important reason for belonging to clusters, for all entities with a positive attitude to participation in them, were potential additional benefits of enhanced bargaining power in relation to

Table 4.20. The respondents' declaration to join the existing or potential clusters

Specification	Respondents											
	POLAND						BELARUS				LITHUANIA	
	Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Yes	5	6,85	33	36,26	14	9,03	33	82,50	32	66,67	5	15,62
No	68	93,15	58	63,74	141	90,97	7	17,50	16	33,33	27	84,38

Source: own study based on conducted research.

both the suppliers and customers and the ability to raise additional funds for development. A high proportion of this group of respondents also indicated the possibility of increasing profits by carrying out joint activities, the costs of which were shared by a larger number of entities, burdening not only their companies. Benefits in terms of better access to laboratories and training were indicated in particularly high proportion by medical entities (Table 4.21).

Table 4.21. Reasons for joining the existing or potential clusters

Specification	Respondents											
	POLAND						BELARUS				LITHUANIA	
	Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
This is an interesting initiative, which could provide additional advantages to companies that join it at the earliest	-	-	7	21,21	2	14,29	11	33,33	12	37,50	1	20,00
I'm not afraid to cooperate with competitors	-	-	2	6,06	8	57,14	7	21,21	8	25,00	2	40,00

Table 4.21 continue

Specification	Respondents											
	POLAND						BELARUS				LITHUANIA	
	Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
It can provide companies with the advantage of a greater bargaining power in relation to both suppliers and customers	4	80,00	13	39,39	9	64,29	13	39,39	11	34,38	2	40,00
An opportunity to obtain additional funds for development may occur	5	100,0	21	63,64	3	21,43	12	36,36	10	31,25	2	40,00
It may be beneficial to companies because of better access to laboratories, training, etc.)	1	20,00	-	-	5	35,71	12	36,36	8	25,00	3	60,00
I would hope to increase profits through joint activities such as promotion actions	3	60,00	5	15,15	4	28,57	13	39,39	8	25,00	3	60,00

S o u r c e : own study based on conducted research.

The main reason for skepticism of Polish respondents about clusters was especially their conviction that these concepts work well only on paper, in theoretical considerations of scientists and that the ideas exist as long as there are opportunities to raise funds for their purposes. This second reason was also indicated by more than 33% of Lithuanian respondents who did not intend to join clusters. A significant proportion of Polish companies in the wood and furniture sector – 41.18% indicated lack of confidence in the idea of this type of activities. This position was also shared by a significant proportion of respondents from Belarusian building industry (similar percentage also believed that such ideas may work well only in theory, and could not imagine such a close cooperation with the

competition) and Lithuanian medical sector companies. The highest percentage of respondents from the Belarusian wood and furniture sector pointed to the lack of benefits of belonging to the projects of this type (Table 4.22).

Table 4.22. Reasons for reluctance to join the existing or potential clusters

Specification	Respondents											
	POLAND						BELARUS				LITHUANIA	
	Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
	N	%indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
I have no confidence in this type of activities	28	41,18	15	25,86	41	29,08	2	28,57	6	37,50	12	44,44
Such ideas work well only on paper or in the theoretical considerations of scientists	39	57,35	26	44,83	57	40,43	2	28,57	6	37,50	8	29,63
Such ideas last as long as there are opportunities to raise funds for their purpose	43	63,24	31	53,45	61	43,26	2	28,57	5	31,25	9	33,33
I can not imagine such a close cooperation with competition	15	22,06	13	22,41	33	23,40	1	14,29	6	37,50	7	25,93
I do not trust the competition	10	14,71	8	13,79	14	9,93	1	14,29	2	12,50	1	3,70
I do not see the benefits for companies belonging to this type of initiatives	19	27,94	9	15,52	30	21,28	3	42,86	-	-	5	18,52
No realistic prospect of true partnership cooperation and benefiting from it (taking care only for the interests of the selected companies)	13	19,12	12	20,69	40	28,37	-	-	3	18,75	9	33,33
Company has no realistic chance of joining such a cluster	10	14,71	1	1,72	15	10,64	-	-	-	-	2	7,41

S o u r c e : own study based on conducted research.

Polish and Lithuanian respondents were skeptical about their accession to the potential cross-border cluster. Only respondents from Belarus in the vast majority spoke for such a possibility (Table 4.23).

Table 4.23. Declaration of joining the potential international cluster

Specification	Respondents											
	POLAND						BELARUS				LITHUANIA	
	Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Would definitely not join it	26	35,62	59	64,83	85	54,84	5	12,50	6	12,50	17	53,13
Would rather not join it	21	28,77	30	32,97	41	26,45	4	10,00	14	29,17	9	28,13
Would rather join it	23	31,51	2	2,20	23	14,84	26	65,00	26	54,17	4	12,50
Would definitely join it	3	4,11	–	–	6	3,87	5	12,50	2	4,16	2	6,24

Source: own study based on conducted research.

Interestingly, respondents who declared their readiness to join, or membership in existing or potential national clusters declared also their positive attitude to the potential cross-border clusters. The exception was the vast majority of Polish respondents from the building industry and medical sector, who said that such a structure did not interest them.

The vast majority of respondents who were skeptical about belonging to the national clusters were also skeptical about the international range of ideas of this type. It should be noted, however, that a significant proportion of Polish companies of wood and furniture sector (almost 34%) were interested in this possibility (Table 4.24).

The vast majority of respondents shared the view that the attempts of creating a cross-border initiatives should be bilateral, a joint initiative. Only a small percentage of respondents stated that their country should, in this regard, take the role of a leader, or would assign the task to the foreign party (Table 4.25).

Table 4.24. Declaration of respondents to join the potential or existing national cluster and declaration of joining the potential international cluster

Specification	Respondents in total											
	POLAND						BELARUS				LITHUANIA	
	Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
	Membership or readiness to join an existing or potential national cluster											
	Wood and furniture sector (N=5)		Building sector (N=33)		Medical sector (N=14)		Wood and furniture sector (N=33)		Building sector (N=32)		Medical sector (N=5)	
	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Would definitely not join it	1	20,00	22	66,67	9	64,29	1	3,03	1	3,13	-	-
Would rather not join it	1	20,00	10	30,30	4	28,57	2	6,06	6	18,75	-	-
Would rather join it	2	40,00	1	3,03	1	7,14	26	78,79	23	71,88	4	80,00
Would definitely join it	1	20,00	-	-	-	-	4	12,12	2	6,25	1	20,00
Specification	*Reluctance to join the existing or potential national cluster*											
	Wood and furniture sector (N=68)		Building sector (N=51)		Medical sector (N=141)		Wood and furniture sector (N=7)		Building sector (N=16)		Medical sector (N=27)	
	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Would definitely not join it	25	36,76	37	63,79	76	53,90	4	57,14	5	31,25	17	62,96
Would rather not join it	20	29,41	20	34,48	37	26,24	2	28,57	8	50,00	9	33,33
Would rather join it	21	30,88	1	1,72	22	15,60	-	-	3	18,75	-	-
Would definitely join it	2	2,94	-	-	6	4,26	1	14,29	-	-	1	3,70

S o u r c e : own study based on conducted research.

Table 4.25. Respondents' opinion about which of the parties should initiate the cross-border cluster

Specification	Respondents											
	POLAND						BELARUS				LITHUANIA	
	Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Respondents' country	7	9,59	20	21,98	28	18,06	6	15,00	4	8,33	7	21,88
Foreign party	–	–	–	–	3	1,94	7	17,50	9	18,75	–	–
Common initiative of both parties	66	90,41	71	78,02	124	80,00	27	67,50	35	72,92	25	78,12

S o u r c e : own study based on conducted research.

Table 4.26. Respondents' opinion about the need to formalize the organizational structure of the potential cross-border cluster

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Cross-border cluster should have	Formal organizational structure	67	91,78	85	93,41	127	81,94	29	72,50	33	68,75	29	90,63
	Informal organizational structure	6	8,22	6	6,59	28	18,06	11	27,50	15	31,25	3	9,37

S o u r c e : own study based on conducted research.

The vast majority of respondents said that in the case of creating a cross-border cluster, it should have a formal organizational structure. The percentage of respondents who share this position differed slightly in case of Belarusian companies (Table 4.26). It seems that this may be due to lack of experience in the operation of these structures or unwillingness to further formal and top-down orders.

Conclusion and recommendations

To sum up the analysis carried out by the authors it should be said that a high proportion of the medical industry entities, which declared their allegiance and willingness to join the cluster, pointed to the potential benefits of improved access to training and laboratories. It should be noted that the actors of the industry showed the highest level of trust and cooperation with the R&D sphere and a significant interest in strengthening it in the future.

High skepticism of Polish and Lithuanian respondents should be emphasized in regard to joining the cluster structures. Among the reasons for this position, they pointed to the lack of confidence in this type of ideas that last as long as they are funded, and that these ideas work well only in theory. This position may result from monitoring the development of such initiatives in their home countries. These reasons were also indicated by the interviewed people. They pointed to the many failures of this type of domestic ventures. A significant proportion of respondents had a positive attitude towards their affiliation to existing and potential cluster structures. They indicated their hope for easier access to additional financial resources for development. This belief is probably due to the fact that in many competitions for EU funding entities belonging to clusters get extra points, making them easy to get. In addition, projects organized by cluster structures are in a way privileged in their access to many funds, as cluster development forms a part of strategic documents at various levels of regional development

Polish and Lithuanian respondents were skeptical about their accession to a potential cross-border cluster. Only respondents from Belarus in the vast majority spoke for such a possibility. This is probably due to the lack of negative experiences of the respondents in this kind of projects.

Significantly higher proportion of respondents, form all the researched groups, favored formalization of the organizational structure of a potential cross-border cluster initiative. It should be noted that its correctness can have a considerably positive impact on both the image creation of the new cluster and

overcoming the reluctance of the parties remaining outside it. It seems that, for the proper functioning of the cluster at the formal level, it is advisable to create the organizational bodies such as:

- Cluster Members Assembly;
- Cluster Council;
- Cluster Animator;
- Cluster Administrator;
- Task Groups.

Appropriate organizational structure would also help in maintaining the real commitment of both sides of the cross-border cluster in the development of such a structure. It should be noted that creating of an authentic social environment can break the barrier of distrust and, consequently, result in effective cooperation in many important areas. Verbalized willingness to cooperate alone is not enough to think about the real benefits resulting from it. It is necessary to develop appropriate mechanisms, channels and principles of cooperation.

4.6. The analysis of conditions related to taking up and conducting joint investment projects

Considering the importance of various reasons for the effects of potential cooperation and their impact on the decision to implement joint projects in cross-border structures, the respondents within the surveyed industries in Poland, Belarus and Lithuania were asked for their assessment of the individual factors. Analysis of the responses shows that the category, which was lowest rated in all groups, was meeting the legal requirements for the environment protection, adaptation of the legal requirements for export, improving working conditions and the impact of decisions taken at national level in each country. Lowest scores were obtained in case of medical industry, both in Poland and in Lithuania. This indicates that the legal and administrative aspects are of little relevance for the potential implementation of joint projects. On the other hand, there may be lack of knowledge about conditions for the implementation of joint investment projects in this area in the potential partner's country. Legal and bureaucratic barriers can be a significant obstacle to the effective implementation of joint investment. Market-oriented factors dominated the top rates, they were: an increase in sales volume, expanding

the scope of activities and the area of business, in principle, regardless of the studied country or industry. Therefore, it can be concluded that the market conditions are a major stimulus, prompting actors to undertake joint projects of cross-border nature. Some differences in approach were observed at the level of industries and especially high scores were obtained for the building industry, regardless of the country. However, the relatively lowest ratings were given to market-oriented factors by the entities of medical industry. This may be due to the fact that the building industry is characterized by a significant growth of potential if it has the possibility of entering the foreign markets with products and services. A large scale projects and the time of their implementation in the building industry gives hope for above-average returns in case of foreign contracts. It also affects the development potential of the company more than in proportion, regardless of the country. It's different in the medical industry, dominated by large global corporations. Their top-down policy significantly inhibits the possibility of rapid expansion of the various actors to the international markets. Other factors related to aspects such as: savings in the consumption of raw materials, reduction of production costs, increasing product innovation and technology or improving the quality of products were not granted a special recognition as a very important condition for taking up investments in any of the industries. Only among Belarusian enterprises of the building industry and the wood industry indications can be observed showing higher interest in the factors than in any other study groups. This may be due to the fact that these companies operate in a specific command economy, but at the same time they are forced "top-down" to improve quality and lower prices of their products. This is an important indication, which also affects the possibilities of cooperation in the framework of cross-border structures. Finding solutions to reduce operating costs, improve quality and innovate are natural areas of cooperation of companies in clusters. The evaluation of these factors at the average level may result in a lack of common ground for possible cooperation between actors from different countries. Implementation of joint projects on the market for short-term benefits may create unhealthy competition between the partners and undermine the position of co-operating entities to take over their customers.

Relatively little variation of assessments were observed in each group of the surveyed companies. The coefficient of variation was the highest in the building industry, which may result from the fact that it included the largest group of respondents with considerable dispersion in terms of size.

Table 4.27. Rating conditions for the taking up and pursuit of investment in respondents' companies/institutions

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Decisions taken at the level of Ministry/Central Office	1	8	10,96	12	13,19	27	17,42	3	7,50	4	8,33	8	25,00
	2	23	31,51	15	16,48	73	47,10	2	5,00	4	8,33	15	46,88
	3	30	41,10	21	23,08	36	23,23	7	17,50	9	18,75	8	25,00
	4	10	13,70	21	23,08	15	9,68	19	47,50	12	25,00	1	3,13
	5	2	2,74	21	23,08	3	1,94	6	15,00	7	14,58	–	–
	6	–	–	1	1,10	–	–	3	7,50	12	25,00	–	–
	average	2,66		3,30		2,31		3,80		4,04		2,06	
	median	3		3		2		4		4		2	
	mode	3		3/4		2		4		4/6		2	
	mode quantity	30		21		73		19		12		15	
	standard dev.	0,95		1,37		0,94		1,22		1,57		0,80	
	variation coeff.	35,60		41,57		40,64		32,20		38,86		38,82	
Increase in sales volume	1	–	–	–	–	–	–	1	2,50	–	–	–	–
	2	2	2,74	–	–	43	27,74	2	5,00	6	12,50	2	6,25
	3	9	12,33	2	2,20	31	20,00	–	–	10	20,83	10	31,25
	4	18	24,66	15	16,48	43	27,74	12	30,00	12	25,00	16	50,00
	5	38	52,05	52	57,14	36	23,23	21	52,50	11	22,92	4	12,50
	6	6	8,22	22	24,18	1	0,65	4	10,00	9	18,75	–	–
	average	4,51		5,03		3,49		4,55		4,15		3,69	
	median	5		5		4		5		4		4	
	mode	5		5		1/3		5		4		4	
	mode quantity	38		52		43		21		12		16	
	standard dev.	0,91		0,71		1,15		1,04		1,30		0,78	
	variation coeff.	20,30		14,03		32,99		22,78		31,46		21,16	
Extension of business activities	1	2	2,74	–	–	–	–	–	–	–	–	–	–
	2	12	16,44	–	–	1	0,65	1	2,50	2	4,17	1	3,13
	3	26	35,62	2	2,20	23	14,84	3	7,50	4	8,33	11	34,38
	4	20	27,40	15	16,48	41	26,45	11	27,50	22	45,83	6	18,75
	5	11	15,07	48	52,75	78	50,32	19	47,50	14	29,17	14	43,75
	6	2	2,74	26	28,57	11	7,10	6	15,00	6	12,50	–	–
	average	3,44		5,08		4,49		4,65		4,38		4,03	
	median	3		5		5		5		4		4	
	mode	3		5		5		5		4		5	
	mode quantity	26		48		78		19		22		14	
	standard dev.	1,11		0,73		0,86		0,92		0,96		0,97	
	variation coeff.	32,15		14,45		19,11		19,81		21,93		23,98	

Table 4.27 continue

Extension of the business area	1	2	2,74	6	6,59	–	–	–	–	–	–	–	–
	2	15	20,55	24	26,37	51	32,90	1	2,50	–	–	21	65,63
	3	22	30,14	3	3,30	21	13,55	11	27,50	14	29,17	3	9,38
	4	17	23,29	22	24,18	56	36,13	11	27,50	14	29,17	8	25,00
	5	17	23,29	30	32,97	23	14,84	12	30,00	16	33,33	–	–
	6	–	–	6	6,59	3	1,94	5	12,50	4	8,33	–	–
	average	3,44		3,70		3,39		4,23		4,21		2,59	
	median	3		4		4		4		4		2	
	mode	3		5		4		5		5		2	
	mode quantity	22		30		56		12		16		21	
	standard dev.	1,14		1,49		1,15		1,07		0,97		0,87	
	variation coeff.	33,23		40,15		33,95		25,42		22,97		33,72	
Improving work conditions	1	12	16,44	16	17,58	12	7,74	–	–	–	–	–	–
	2	22	30,14	18	19,78	22	14,19	1	2,50	2	4,17	15	46,88
	3	33	45,21	36	39,56	66	42,58	4	10,00	13	27,08	13	40,63
	4	6	8,22	15	16,48	54	34,84	14	35,00	13	27,08	4	12,50
	5	–	–	6	6,59	–	–	13	32,50	13	27,08	–	–
	6	–	–	–	–	–	–	8	20,00	7	14,58	–	–
	average	2,45		2,75		3,05		4,58		4,21		2,66	
	median	3		3		3		5		4		3	
	mode	3		3		3		4		3/4/5		2	
	mode quantity	33		36		66		14		13		15	
	standard dev.	0,87		1,13		0,90		1,01		1,13		0,70	
	variation coeff.	35,35		41,18		29,45		22,07		26,83		26,38	
Savings in the consumption of raw materials	1	–	–	28	30,77	4	2,58	1	2,50	1	2,08	12	37,50
	2	17	23,29	4	4,40	43	27,74	–	–	2	4,17	3	9,38
	3	35	47,95	18	19,78	73	47,10	3	7,50	8	16,67	11	34,38
	4	18	24,66	33	36,26	29	18,71	16	40,00	13	27,08	6	18,75
	5	3	4,11	7	7,69	5	3,23	17	42,50	12	25,00	–	–
	6	–	–	1	1,10	–	–	3	7,50	12	25,00	–	–
	average	3,10		2,89		2,92		4,43		4,44		2,34	
	median	3		3		3		4,5		4,5		3	
	mode	3		4		3		5		4		1	
	mode quantity	35		33		73		17		13		12	
	standard dev.	0,80		1,43		0,84		0,93		1,27		1,18	
	variation coeff.	25,91		49,59		28,63		21,03		28,62		50,38	
Production costs reduction	1	–	–	29	31,87	3	1,94	–	–	1	2,08	2	6,25
	2	14	19,18	4	4,40	18	11,61	2	5,00	2	4,17	18	56,25
	3	20	27,40	7	7,69	104	67,10	6	15,00	8	16,67	6	18,75
	4	29	39,73	25	27,47	18	11,61	8	20,00	13	27,08	6	18,75
	5	9	12,33	19	20,88	10	6,45	21	52,50	15	31,25	–	–
	6	1	1,37	7	7,69	1	0,65	3	7,50	9	18,75	–	–
	average	3,49		3,24		3,11		4,43		4,38		2,50	
	median	4		4		3		5		4,5		2	
	mode	4		1		3		5		5		2	
	mode quantity	29		29		104		21		15		18	
	standard dev.	0,99		1,76		0,79		1,01		1,21		0,88	
	variation coeff.	28,28		54,28		25,35		22,82		27,74		35,20	

Table 4.27 continue

Increase in product innovation	1	–	–	28	30,77	6	3,87	1	2,50	–	–	12	37,50
	2	17	23,29	4	4,40	64	41,29	1	2,50	1	2,08	6	18,75
	3	31	42,47	1	1,10	17	10,97	6	15,00	15	31,25	12	37,50
	4	18	24,66	10	10,99	61	39,35	11	27,50	18	37,50	–	–
	5	4	5,48	36	39,56	3	1,94	19	47,50	11	22,92	2	6,25
	6	3	4,11	12	13,19	3	1,94	2	5,00	3	6,25	–	–
	average	3,25		3,64		3,00		4,30		4,00		2,19	
	median	3		5		3		5		4		2	
	mode	3		5		2		5		4		1/3	
	mode quantity	31		36		64		19		18		12	
	standard dev.	1,01		1,95		1,11		1,04		0,95		1,15	
	variation coeff.	31,13		53,52		36,95		24,25		23,63		52,49	
Increase in technological innovation	1	3	4,11	28	30,77	9	5,81	1	2,50	–	–	14	43,75
	2	20	27,40	4	4,40	26	16,77	–	–	2	4,17	4	12,50
	3	27	36,99	3	3,30	53	34,19	5	12,50	8	16,67	5	15,63
	4	21	28,77	30	32,97	55	35,48	18	45,00	27	56,25	8	25,00
	5	2	2,74	17	18,68	11	7,10	15	37,50	7	14,58	1	3,13
	6	–	–	9	9,89	–	–	1	2,50	4	8,33	–	–
	average	2,99		3,34		3,21		4,22		4,06		2,31	
	median	3		4		3		4		4		2	
	mode	3		4		4		4		4		1	
	mode quantity	27		30		55		18		27		14	
	standard dev.	0,92		1,78		1,00		0,89		0,91		1,35	
	variation coeff.	30,82		53,22		31,21		21,09		22,37		58,57	
Improving products quality	1	–	–	13	14,29	–	–	–	–	–	–	3	9,38
	2	5	6,85	19	20,88	15	9,68	1	2,50	3	6,25	18	56,25
	3	24	32,88	2	2,20	44	28,39	4	10,00	8	16,67	4	12,50
	4	31	42,47	13	14,29	79	50,97	8	20,00	13	27,08	7	21,88
	5	10	13,70	30	32,97	15	9,68	20	50,00	13	27,08	–	–
	6	3	4,11	14	15,38	1	0,65	7	17,50	11	22,92	–	–
	average	3,75		3,77		3,63		4,70		4,44		2,47	
	median	4		4		4		5		4,5		2	
	mode	4		5		4		5		4/5		2	
	mode quantity	31		30		79		20		13		18	
	standard dev.	0,92		1,75		0,82		0,97		1,20		0,95	
	variation coeff.	24,64		46,47		22,48		20,56		27,07		38,47	
Products adaptation to the legal requirements for export	1	8	10,96	32	35,16	10	6,45	1	2,50	–	–	7	21,88
	2	28	38,36	–	–	38	24,52	–	–	1	2,08	12	37,50
	3	22	30,14	12	13,19	42	27,10	5	12,50	14	29,17	7	21,88
	4	14	19,18	24	26,37	61	39,35	9	22,50	14	29,17	2	6,25
	5	1	1,37	21	23,08	3	1,94	19	47,50	12	25,00	4	12,50
	6	–	–	2	2,20	–	–	6	15,00	7	14,58	–	–
	average	2,62		3,09		3,06		4,58		4,21		2,50	
	median	3		4		3		5		4		2	
	mode	2		1		4		5		3/4		2	
	mode quantity	28		32		61		19		14		12	
	standard dev.	0,97		1,68		0,99		1,06		1,09		1,27	
	variation coeff.	36,94		54,33		32,43		23,16		25,92		50,80	

Table 4.27 continue

Compliance with environmental legislation	1	17	23,29	32	35,16	40	25,81	–	–	–	–	21	65,63
	2	32	43,84	–	–	44	28,39	6	15,00	6	12,50	5	15,63
	3	20	27,40	31	34,07	66	42,58	8	20,00	10	20,83	6	18,75
	4	4	5,48	25	27,47	4	2,58	12	30,00	12	25,00	–	–
	5	–	–	3	3,30	–	–	12	30,00	11	22,92	–	–
	6	–	–	–	–	–	–	2	5,00	9	18,75	–	–
	average	2,15		2,64		2,22		3,90		4,15		1,53	
	median	2		3		2		4		4		1	
	mode	2		1		3		4/5		4		1	
	mode quantity	32		32		66		12		12		21	
	standard dev.	0,84		1,30		0,87		1,15		1,30		0,80	
	variation coeff.	39,26		49,44		38,95		29,49		31,46		52,41	

Where 1 is irrelavant and 6 – very important

S o u r c e : own study based on conducted research.

Table 4.28. Rating conditions for the taking up and pursuit of investment in respondents' companies/institutions respondents – U Mann-Whitney test results

Sector	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
Decisions taken at the level of Ministry/Central Office				
Building	Sum of rank Belarus 5770,00	Sum of rank Poland 3960,00	**–2,65567**	**0,007915**
Wood and furniture	Sum of rank Belarus 3098,00	Sum of rank Poland 3343,00	**–4,90834**	**0,000001**
Medical	Sum of rank Lithuania 4133,50	Sum of rank Poland 57291,50	**2,716419**	**0,006600**
Increase in sales volume				
Building	Sum of rank Belarus 7237,00	Sum of rank Poland 2493,00	**3,83843**	**0,000124**
Wood and furniture	Sum of rank Belarus 2350,00	Sum of rank Poland 4091,00	–0,41728	0,676471
Medical	Sum of rank Lithuania 4137,00	Sum of rank Poland 57288,00	**2,710003**	**0,006729**
Extension of business activities				
Building	Sum of rank Belarus 2431,00	Sum of rank Poland 7299,00	**4,11308**	**0,000039**
Wood and furniture	Sum of rank Belarus 3135,50	Sum of rank Poland 3305,50	**–5,13349**	**0,000000**
Medical	Sum of rank Lithuania 4553,00	Sum of rank Poland 56872,00	1,947500	0,051476
Extension of the business area				
Building	Sum of rank Belarus 3705,00	Sum of rank Poland 6025,00	–1,52607	0,126993
Wood and furniture	Sum of rank Belarus 2799,00	Sum of rank Poland 3642,00	**–3,11312**	**0,001851**
Medical	Sum of rank Lithuania 3536,00	Sum of rank Poland 57889,00	**3,811601**	**0,000138**
Improving work conditions				
Building	Sum of rank Belarus 4690,50	Sum of rank Poland 5039,50	**–5,89165**	**0,000000**
Wood and furniture	Sum of rank Belarus 3558,00	Sum of rank Poland 2883,00	**–7,67022**	**0,000000**
Medical	Sum of rank Lithuania 4894,50	Sum of rank Poland 56530,50	1,321551	0,186319

Table 4.28 continue

Savings in the consumption of raw materials				
Building	Sum of rank Belarus 4566,50	Sum of rank Poland 5163,50	**–5,34235**	**0,000000**
Wood and furniture	Sum of rank Belarus 3334,00	Sum of rank Poland 3107,00	**–6,32530**	**0,000000**
Medical	Sum of rank Lithuania 4233,00	Sum of rank Poland 57192,00	**2,534041**	**0,011276**
Production costs reduction				
Building	Sum of rank Belarus 4132,00	Sum of rank Poland 5598,00	**–3,41760**	**0,000632**
Wood and furniture	Sum of rank Belarus 3001,00	Sum of rank Poland 3440,00	**–4,32594**	**0,000015**
Medical	Sum of rank Lithuania 3671,00	Sum of rank Poland 57754,00	**3,564154**	**0,000365**
Increase in product innovation				
Building	Sum of rank Belarus 3303,50	Sum of rank Poland 6426,50	0,24807	0,804081
Wood and furniture	Sum of rank Belarus 3085,50	Sum of rank Poland 3355,50	**–4,83329**	**0,000001**
Medical	Sum of rank Lithuania 3470,00	Sum of rank Poland 57955,00	**3,932575**	**0,000084**
Increase in technological innovation				
Building	Sum of rank Belarus 3714,50	Sum of rank Poland 6015,50	–1,56815	0,116846
Wood and furniture	Sum of rank Belarus 3246,00	Sum of rank Poland 3195,00	**–5,79694**	**0,000000**
Medical	Sum of rank Lithuania 3827,50	Sum of rank Poland 57597,50	**3,277299**	**0,001048**
Improving products quality				
Building	Sum of rank Belarus 3764,00	Sum of rank Poland 5966,00	–1,78743	0,073869
Wood and furniture	Sum of rank Belarus 3047,00	Sum of rank Poland 3394,00	**–4,60213**	**0,000004**
Medical	Sum of rank Lithuania 2765,00	Sum of rank Poland 58660,00	**5,224799**	**0,000000**
Products adaptation to the legal requirements for export				
Building	Sum of rank Belarus 4096,00	Sum of rank Poland 5634,00	**–3,25813**	**0,001122**
Wood and furniture	Sum of rank Belarus 3459,50	Sum of rank Poland 2981,50	**–7,07882**	**0,000000**
Medical	Sum of rank Lithuania 4474,00	Sum of rank Poland 56951,00	**2,092302**	**0,036412**
Compliance with environmental legislation				
Building	Sum of rank Belarus 4552,50	Sum of rank Poland 5177,50	**–5,28034**	**0,000000**
Wood and furniture	Sum of rank Belarus 3364,00	Sum of rank Poland 3077,00	**–6,50543**	**0,000000**
Medical	Sum of rank Lithuania 57986,50	Sum of rank Poland 3438,50	**3,990313**	**0,000066**

marked results are relevant to p <, 05000

S o u r c e : own study based on conducted research.

Analysis of the results of the U Mann-Whitney test for reasons of investment establishment in companies/institutions leads to the conclusion that there are no statistically significant differences only in the following areas:

- building industry – extending the area of business, increasing product innovation, increasing technological innovation, improving product quality;

- wood and furniture industry – increase in sales volume;
- medical industry – expanding the scope of activities and improving work conditions.

In other cases significant statistical differences were observed (Table 4.28). In the perspective of initiation of homogeneous cross-border structures they may be affected adversely by creating additional barriers to cooperation

Table 4.29. Evaluation of strategic reasons for taking up and pursuit of investment projects in respondents' companies/institutions

Specification		Respondents											
		POLAND						BELARUS				LITHUANIA	
		Wood and furniture sector (N=73)		Building sector (N=91)		Medical sector (N=155)		Wood and furniture sector (N=40)		Building sector (N=48)		Medical sector (N=32)	
		N	% indications	N	% indications	N	% indications	N	% indications	N	% indications	N	% indications
Decisions taken at the level of Ministry/Central Office	1	17	23,29	26	28,57	47	30,52	2	5,00	3	6,25	15	46,88
	2	30	41,10	12	13,19	69	44,81	3	7,50	4	8,33	7	21,88
	3	9	12,33	11	12,09	27	17,53	8	20,00	18	37,50	7	21,88
	4	13	17,81	21	23,08	5	3,25	19	47,50	12	25,00	–	
	5	4	5,48	21	23,08	6	3,90	7	17,50	4	8,33	3	9,38
	6	–	–	–	–	–	–	1	2,50	7	14,58	–	–
	average	2,41		2,99		2,05		3,72		3,65		2,03	
	median	2		3		2		4		3		2	
	mode	2		1		2		4		3		1	
	mode quantity	30		26		69		19		18		15	
	standard dev.	1,19		1,57		0,98		1,09		1,36		1,26	
	variation coeff.	49,29		52,42		47,86		29,15		37,31		61,88	
Production of a new product together with another company in the industry	1	–	–	14	15,38	7	4,55	–	–	–	–	5	15,63
	2	12	16,44	14	15,38	40	25,97	4	10,00	6	12,50	12	37,50
	3	28	38,36	7	7,69	63	40,91	6	15,00	8	16,67	9	28,13
	4	22	30,14	21	23,08	38	24,68	18	45,00	21	43,75	6	18,75
	5	10	13,70	24	26,37	5	3,25	10	25,00	9	18,75	–	–
	6	1	1,37	11	12,09	1	0,65	2	5,00	4	8,33	–	–
	average	3,45		3,66		2,98		4,00		3,94		2,50	
	median	3		4		3		4		4		2	
	mode	3		5		3		4		4		2	
	mode quantity	28		24		63		18		21		12	
	standard dev.	0,97		1,65		0,94		1,01		1,10		0,98	
	variation coeff.	28,17		45,22		31,51		25,32		27,92		39,35	

Table 4.29 continue

Entering new markets with another company in the industry	1	3	4,11	8	8,79	12	7,79	1	2,50	1	2,08	4	12,50
	2	23	31,51	17	18,68	41	26,62	1	2,50	3	6,25	8	25,00
	3	29	39,73	8	8,79	64	41,56	9	22,50	12	25,00	8	25,00
	4	10	13,70	22	24,18	35	22,73	9	22,50	17	35,42	7	21,88
	5	7	9,59	24	26,37	2	1,30	14	35,00	15	31,25	5	15,63
	6	1	1,37	12	13,19	–	–	6	15,00	–	–	–	–
	average	2,97		3,80		2,83		4,30		3,88		3,03	
	median	3		4		3		4,5		4		3	
	mode	3		5		3		5		4		2/3	
	mode quantity	29		24		64		14		17		8	
	standard dev.	1,07		1,55		0,91		1,20		1,00		1,28	
	variation coeff.	35,89		40,79		32,26		27,97		25,87		42,30	
Research into new products and technologies	1	–	–	16	17,58	6	3,90	–	–	–	–	2	6,25
	2	6	8,22	15	16,48	31	20,13	7	17,50	3	6,25	13	40,63
	3	27	36,99	21	23,08	53	34,42	3	7,50	7	14,58	14	43,75
	4	34	46,58	30	32,97	47	30,52	8	20,00	18	37,50	3	9,38
	5	6	8,22	9	9,89	17	11,04	18	45,00	18	37,50	–	–
	6	–	–	–	–	–	–	4	10,00	2	4,17	–	–
	average	3,55		3,01		3,25		4,22		4,19		2,56	
	median	4		3		3		5		4		3	
	mode	4		4		3		5		4/5		3	
	mode quantity	34		30		53		18		18		14	
	standard dev.	0,76		1,27		1,02		1,27		0,96		0,76	
	variation coeff.	21,55		42,15		31,56		30,08		22,92		29,63	
Building a distribution network with another operator in the industry	1	–	–	2	2,20	1	0,65	–	–	–	–	–	–
	2	18	24,66	19	20,88	43	27,92	–	–	4	8,33	7	21,88
	3	24	32,88	39	42,86	78	50,65	13	32,50	16	33,33	13	40,63
	4	19	26,03	25	27,47	31	20,13	13	32,50	18	37,50	11	34,38
	5	11	15,07	6	6,59	1	0,65	13	32,50	8	16,67	1	3,13
	6	1	1,37	–	–	–	–	1	2,50	2	4,17	–	–
	average	3,36		3,15		2,92		4,05		3,75		3,19	
	median	3		3		3		3/4/5		4		3	
	mode	3		3		3		13		4		3	
	mode quantity	24		39		78		13		18		13	
	standard dev.	1,06		0,91		0,73		0,88		0,98		0,82	
	variation coeff.	31,55		28,72		24,91		21,62		26,09		25,74	
Creation of a common brand with another company	1	–	–	10	10,99	3	1,95	–	–	3	6,25	–	–
	2	25	34,25	41	45,05	52	33,77	–	–	3	6,25	14	43,75
	3	36	49,32	34	37,36	89	57,79	14	35,00	13	27,08	13	40,63
	4	9	12,33	6	6,59	10	6,49	9	22,50	18	37,50	3	9,38
	5	3	4,11	–	–	–	–	14	35,00	8	16,67	2	6,25
	6	–	–	–	–	–	–	3	7,50	3	6,25	–	–
	average	2,86		2,40		2,69		4,15		3,71		2,78	
	median	3		2		3		4		4		3	
	mode	3		2		3		3/5		4		2	
	mode quantity	36		41		89		14		18		14	
	standard dev.	0,79		0,77		0,62		1,00		1,20		0,87	
	variation coeff.	27,50		32,26		23,11		24,13		32,42		31,28	

Table 4.29 continue

joint advertising for products	1	–	–	9	9,89	6	3,90	–	–	3	6,25	2	6,25
	2	15	20,55	27	29,67	41	26,62	1	2,50	4	8,33	9	28,13
	3	27	36,99	32	35,16	51	33,12	4	10,00	8	16,67	14	43,75
	4	22	30,14	15	16,48	55	35,71	19	47,50	18	37,50	6	18,75
	5	9	12,33	8	8,79	1	0,65	15	37,50	13	27,08	1	3,13
	6	–	–	–	–	–	–	1	2,50	2	4,17	–	–
	average	3,34		2,85		3,03		4,28		3,83		2,84	
	median	3		3		3		4		4		3	
	mode	3		3		4		4		4		3	
	mode quantity	27		32		55		19		18		14	
	standard dev.	0,95		1,09		0,90		0,78		1,23		0,92	
	variation coeff.	28,30		38,46		29,74		18,34		31,99		32,34	
Agreement with another entity regarding the strategic objectives	1	2	2,74	9	9,89	–	–	–	–	3	6,25	5	15,63
	2	21	28,77	17	18,68	20	12,99	2	5,00	4	8,33	6	18,75
	3	36	49,32	11	12,09	91	59,09	8	20,00	13	27,08	14	43,75
	4	14	19,18	32	35,16	27	17,53	14	35,00	20	41,67	7	21,88
	5	–	–	20	21,98	16	10,39	14	35,00	7	14,58	–	–
	6	–	–	2	2,20	–	–	2	5,00	1	2,08	–	–
	average	2,85		3,47		3,25		4,15		3,56		2,72	
	median	3		4		3		4		4		3	
	mode	3		4		3		4/5		4		3	
	mode quantity	36		32		91		14		20		14	
	standard dev.	0,76		1,34		0,81		0,98		1,11		0,99	
	variation coeff.	26,59		38,72		24,99		23,50		31,13		36,47	
Merger with another company in the industry to concentrate production	1	3	4,11	15	16,48	2	1,30	1	2,50	2	4,17	6	18,75
	2	33	45,21	15	16,48	84	54,55	–	–	5	10,42	13	40,63
	3	21	28,77	18	19,78	41	26,62	9	22,50	9	18,75	11	34,38
	4	12	16,44	16	17,58	18	11,69	19	47,50	14	29,17	2	6,25
	5	4	5,48	22	24,18	9	5,84	9	22,50	16	33,33	–	–
	6	–	–	5	5,49	–	–	2	5,00	2	4,17	–	–
	average	2,74		3,33		2,66		4,03		3,90		2,28	
	median	3		3		2		4		4		2	
	mode	2		5		2		4		5		2	
	mode quantity	33		22		84		19		16		13	
	standard dev.	0,97		1,54		0,92		0,95		1,22		0,85	
	variation coeff.	35,49		46,32		34,41		23,53		31,43		37,32	
Taking over other companies in the industry	1	2	2,74	35	38,46	13	8,44	–	–	2	4,17	12	37,50
	2	19	26,03	39	42,86	57	37,01	5	12,50	2	4,17	12	37,50
	3	38	52,05	15	16,48	72	46,75	4	10,00	15	31,25	3	9,38
	4	10	13,70	1	1,10	11	7,14	14	35,00	19	39,58	3	9,38
	5	4	5,48	1	1,10	1	0,65	15	37,50	7	14,58	2	6,25
	6	–	–	–	–	–	–	2	5,00	3	6,25	–	–
	average	2,93		1,84		2,55		4,12		3,75		2,09	
	median	3		2		3		4		4		2	
	mode	3		2		3		5		4		1/2	
	mode quantity	38		39		72		15		19		12	
	standard dev.	0,86		0,82		0,78		1,09		1,10		1,20	
	variation coeff.	29,17		44,69		30,49		26,44		29,37		57,36	

Table 4.29 continue

expertise in the specific products	1	–	–	23	25,27	24	15,58	–	–	2	4,17	5	15,63
	2	20	27,40	37	40,66	81	52,60	3	7,50	2	4,17	19	59,38
	3	43	58,90	28	30,77	48	31,17	9	22,50	11	22,92	8	25,00
	4	10	13,70	3	3,30	1	0,65	17	42,50	19	39,58	–	–
	5	–	–	–	–	–	–	9	22,50	13	27,08	–	–
	6	–	–	–	–	–	–	2	5,00	1	2,08	–	–
	average	2,86		2,12		2,17		3,95		3,88		2,09	
	median	3		2		2		4		4		2	
	mode	3		2		2		4		4		2	
	mode quantity	43		37		81		17		19		19	
	standard dev.	0,63		0,83		0,68		0,99		1,06		0,64	
	variation coeff.	22,03		39,03		31,54		24,96		27,47		30,59	

Where 1 is irrelevant and 6 – very important

S o u r c e : own study based on conducted research.

The studies were also focused on the conditions of strategic nature that have an impact on decision-making about investing activities of analyzed entities (Table 4.29). Determining strategic factors for various sectors development in the researched countries allowed for the identification of potential cross-border co-operation areas. It can be concluded, while analyzing the responses, that the overall assessment of reasons is lower than in case of the previously analyzed factors. The areas that were rated the highest relate primarily to entering new markets with another company in the industry and conducting research on new products and technologies. The highest score was obtained in case of the companies in wood industry from Belarus (average values respectively 4.3 and 4.22). Slightly lower notes were given by the Belarusian building companies (3.88 and 4.1). This confirms the special interest of the party in the opportunity to work with other companies. As the previous studies revealed, this also applies to cross-border cooperation, particularly with actors from Lithuania. These results indicate the existence of potential, particularly in Belarus, for the creation of cluster structures for which one of the essential objectives of the operation is to transfer research results to the sphere of economy. Building companies and the wood industry in Belarus are also most willing to cooperate in the production of the new product together with another company in the industry or creation of a joint distribution network with other entities in the industry. In case of other sectors, in all the researched countries, ratings for specific factors oscillate around the middle values. It can therefore be concluded that the direct market conditions are again a major stimulus, prompting actors to undertake joint projects.

On the other hand, the category rated lowest in Poland and in Lithuania refers to decisions taken at the level of ministries/central level (average values well below 3). This indicates a significant independence of the surveyed industries from the activities of the central structures. It is different in case of Belarus, where this factor obtained ratings of average value at the level of 3.72 in the wood and 3.65 in the building industry, reaching values close to categories rated at the maximum level. In this case, no doubt this is due to completely different principles of operation of the Belarusian economy, based largely on the decisions taken at the central level. Also, low-rated were the activities related to the ability to take over other companies in the industry and expertise in the specific products. Again, however, the respondents in the surveyed industries in Belarus evaluated these categories significantly higher than respondents in other countries.

At the sector level some differences were observed in the approach to the assessment of individual factors. Depending on the surveyed category, the coefficient of variation was the largest in the medical industry in Lithuania (in relation to decisions taken at the level of ministries/central level or take over of other companies in the industry) and the building sector in Poland (also for the given categories). Again, it should be noted that the cause was a significant dispersion in terms of the size of the surveyed companies.

Table 4.30. Evaluation of strategic reasons for taking up and pursuit of investment projects in respondents' companies/institutions – U Mann-Whitney test results

Sector	Sum of rank Belarus/Lithuania	Sum of rank Poland	Z	p
Decisions taken at the level of Ministry/Central Office				
Building	Sum of rank Belarus 3799,00	Sum of rank Poland 5931,00	–1,94247	0,052081
Wood and furniture	Sum of rank Belarus 3102,50	Sum of rank Poland 3338,50	**–4,93536**	**0,000001**
Medical	Sum of rank Lithuania 2810,50	Sum of rank Poland 14580,50	0,65315	0,513660
Production of a new product together with another company in the industry				
Building	Sum of rank Belarus 3463,50	Sum of rank Poland 6266,50	–0,45627	0,648196
Wood and furniture	Sum of rank Belarus 2733,00	Sum of rank Poland 3708,00	**–2,71685**	**0,006591**
Medical	Sum of rank Lithuania 2350,00	Sum of rank Poland 15041,00	**2,31489**	**0,020619**
Entering new markets with another company in the industry				
Building	Sum of rank Belarus 3330,50	Sum of rank Poland 6399,50	0,12846	0,897781
Wood and furniture	Sum of rank Belarus 3134,50	Sum of rank Poland 3306,50	**–5,12749**	**0,000000**
Medical	Sum of rank Lithuania 3198,50	Sum of rank Poland 14192,50	–0,74336	0,457262

Table 4.30 continue

Research into new products and technologies				
Building	Sum of rank Belarus 4482,00	Sum of rank Poland 5248,00	**–4,96803**	**0,000001**
Wood and furniture	Sum of rank Belarus 2851,50	Sum of rank Poland 3589,50	**–3,42833**	**0,000607**
Medical	Sum of rank Lithuania 2043,00	Sum of rank Poland 15348,00	**3,42272**	**0,000620**
Building a distribution network with another operator in the industry				
Building	Sum of rank Belarus 4061,00	Sum of rank Poland 5669,00	**–3,10308**	**0,001915**
Wood and furniture	Sum of rank Belarus 2816,50	Sum of rank Poland 3624,50	**–3,21819**	**0,001290**
Medical	Sum of rank Lithuania 3430,50	Sum of rank Poland 13960,50	–1,58055	0,113982
Creation of a common brand with another company				
Building	Sum of rank Belarus 4751,50	Sum of rank Poland 4978,50	**–6,16187**	**0,000000**
Wood and furniture	Sum of rank Belarus 3231,50	Sum of rank Poland 3209,50	**–5,70988**	**0,000000**
Medical	Sum of rank Lithuania 2982,50	Sum of rank Poland 14408,50	0,03248	0,974092
Joint advertising for products				
Building	Sum of rank Belarus 4367,50	Sum of rank Poland 5362,50	**–4,46082**	**0,000008**
Wood and furniture	Sum of rank Belarus 3049,00	Sum of rank Poland 3392,00	**–4,61414**	**0,000004**
Medical	Sum of rank Lithuania 2694,00	Sum of rank Poland 14697,00	1,07355	0,283026
Agreement with another entity regarding the strategic objectives				
Building	Sum of rank Belarus 3372,00	Sum of rank Poland 6358,00	–0,05094	0,959371
Wood and furniture	Sum of rank Belarus 3265,00	Sum of rank Poland 3176,00	**–5,91102**	**0,000000**
Medical	Sum of rank Lithuania 2376,50	Sum of rank Poland 15014,50	**2,21927**	**0,026469**
Merger with another company in the industry to concentrate production				
Building	Sum of rank Belarus 3815,50	Sum of rank Poland 5914,50	**–2,01556**	**0,043846**
Wood and furniture	Sum of rank Belarus 3222,00	Sum of rank Poland 3219,00	**–5,65285**	**0,000000**
Medical	Sum of rank Lithuania 2549,50	Sum of rank Poland 14841,50	1,59499	0,110716
Taking over other companies in the industry				
Building	Sum of rank Belarus 5149,50	Sum of rank Poland 4580,50	**–7,92493**	**0,000000**
Wood and furniture	Sum of rank Belarus 3144,50	Sum of rank Poland 3296,50	**–5,18753**	**0,000000**
Medical	Sum of rank Lithuania 15219,50	Sum of rank Poland 2171,50	**2,95902**	**0,003086**
Expertise in the specific products				
Building	Sum of rank Belarus 5070,50	Sum of rank Poland 4659,50	**–7,57498**	**0,000000**
Wood and furniture	Sum of rank Belarus 3182,50	Sum of rank Poland 3258,50	**–5,41568**	**0,000000**
Medical	Sum of rank Lithuania 2845,50	Sum of rank Poland 14545,50	0,52685	0,598298

marked results are relevant to p<,05000

S o u r c e : own study based on conducted research.

Analyzing the results of the U Mann-Whitney test for reasons of a strategic nature, related to taking up and conducting investment in companies/institutions, it can be concluded that there are statistically significant differences in most of the surveyed areas (Table 4.30). Dissimilarity of perception of strategic objectives in different sectors definitely weakens the potential to form cluster structures, particularly across borders. Apart from companies in the wood industry and building industry in Belarus, actors from other groups considered very carefully the possibility of establishing links with other companies in the industry to achieve common strategic objectives.

Absence of statistically significant differences was observed only in the following areas:

- building industry – decisions taken at the ministry/central level, production of a new product together with another company in the industry, entering new markets with another company of the sector, an agreement with another entity in regard to the strategic objectives;
- medical industry – decisions taken at the ministry/central level, entering new markets with another company in the industry, building a common sales network with another company in the industry, creating a common brand with other company, the merger with another company in the industry aimed at concentration of production, specialization in the specific products.

This indicates a possibility of cross-border cooperation between entities in the building industry to combine the production potential and expand on the market, in particular by providing sales network to products of other companies in the industry. In case of medical industry opportunities are observed for cooperation in the field of niche products that could be produced and sold in the cooperating countries under a common brand.

Conclusion and recommendations

Already indicated variability of the business environment is reflected in particular in the field of strategic management. Business entities are aware that the lonely struggle for improvement in their current position in the market exhausts the potential of the company, leaving no provision for effective strategic actions. Companies are beginning to recognize that strategies based solely on competing do not work well in the conditions of globalization and implementation of the knowledge-based economy. On the other hand, the significant reduction of co-

operation with the science sector, companies clearly lack the guidance and best practices in the current environment. Building social capital and reliance on the values of cooperation and trust is now essential. The present, difficult economic situation in Europe, makes the companies, left alone, feel particularly at risk. National governments, in the absence of effective system solutions enabling rapid improvements, perceive companies mainly as a source of tax revenue to rescue budgets. On the other hand, at the same time the entities have no sense of opportunities for support, for example on the part of the scientific sphere. Occurring deficit of trust and co-operation between business and science, which was confirmed in the study, may result in frustration of companies when looking for effective solutions to their problems. Therefore, bearing in mind the limited willingness of cooperation between the parties themselves, in the absence of trust, we should consider the possibility of creating institutions which would be a kind of intermediaries in building future relations between them. It seems that, in spite of everything, research centers should play the role of such intermediaries, because they have the right intellectual potential and they feel now a deficit of possibilities to transfer the created theoretical concepts into practice and commercialize their research results. The centers should work in close cooperation with other institutions, the business environment and in particular with local governments to create regional development policy.

Taking into account the existence of statistically significant differences of opinion represented by all the surveyed groups in terms of strategic goals of potential cooperation, it would be advisable to establish a common platform for exchange of views on this matter. This could be done in the form of periodic meetings, a series of international seminars and conferences of practical profile. The study found a high need for cooperation on the part of Belarus in the sphere of joint projects, including the companies with Polish. The interest of Polish companies was smaller. Factors that significantly limit the willingness of cross-border cooperation can be indicated here, related to the existence of cultural and linguistic barriers between the researched countries. In addition, barriers increased by the fact of operating in different political-economic systems of Poland and Belarus. This moves the decisions that regard shaping a climate for cooperation on the level of government, significantly reducing the possibility of local authorities on both sides of the border to take initiatives related to activating forms of cross-border cooperation.

Conclusion

Initially, European regional policy was implemented on the basis of a centralized regional development paradigm, based on the assumption that the state has the obligation to compensate for disparities in spatial development of the country through the redistribution of inter-budget section. The basis of this kind of regional policy was the conviction that in underdeveloped, lagging regions there are no endogenous growth factors and without the state support the development of spatial disparity will only grow. Regional Development with its major factor – industrialization, was seen as a derivative of the high rate of economic growth. Centralized state regional policy consisted mainly of: [156]

- financing infrastructure investment in lagging regions;
- creating „growth poles" in the underdeveloped areas (the construction of large industrial complexes financed by the state or private investors attracted by appropriate fiscal policy);
- financing of large industrial centers deglomeration (moving them from regions with a high concentration of economic activity to underdeveloped areas).

Analysis of the data for 2001 of EU-15 indicate that economic activity in the area was unevenly distributed and concentrated in the area between North Yorkshire in the UK, the Department of Franche – Comte in France, Hamburg in Germany and Milan, Italy. This area, which constitutes 18% of the „old" EU countries, was inhabited by 41% of the population producing 48% of the EU income and using as many as 75% of expenditure on research and development.[157] There is therefore a strong need to change this situation. The concept of clusters gained immense popularity very quickly, as a way to improve innovation and competitiveness of companies and entire regions. The Commission

156 Pietrzyk I., *Polityka regionalna Unii Europejskiej I region w państwach członkowskich*, PWN, Warszawa 2000, pp. 16–19.

157 *Eine neue Partnerschaft für die Kohäsion. Konvergenz Wettbewerbsfähigkeit Kooperation. Dritter Bericht über den wirtschaftlichen und sozialen Zusammenhalt*, Europäische Kommission, Luxemburg 2004.

has recognized creating of clusters and supporting their development as an important priority of the new industrial policy. Today, however, solutions and goals are focused not so much on the concept of clusters initiation in different regions, but on the selective support for those of them that are characterized by high efficiency. There is a strong interest in wide inter-regional initiatives, especially cross-border, not only within the European Union, but also with countries outside it.

A strong European Union policy to support the initiation of clusters meant that they began to emerge as the proverbial "mushrooms". Also in Poland there was a "cluster fashion". According to E. Bojar and Z. Olesiński, until 2006, Poland was perceived by the prestigious business analysts as a country without clusters.[158] However, at the beginning of May 2006, there were 43 cluster initiatives and economic clusters.[159] Some areas were typed in the development strategies of individual regions, in which the cluster structures should be developed. The respected principle was to include in them industries with high innovation potential, such that can be "praised" in front of other regions and "look nice" in the strategic documents. Currently, the number of clusters, or rather all the creations with the "magic" word cluster in the name is counted in hundreds in Poland.

The relative ease of obtaining funding for measures aimed at facilitating the emergence of clusters led to great interest of various institutions, earning on the projects co-financed from the EU funds. Clusters appeared when the projects started and disappeared afterwards. This has led to the situation that currently business people have become very cautious when it comes to joining clusters, and in many cases they are very skeptical even about the very idea of clusters functioning. For many, the word "cluster" is as the red light. Interestingly, after the first infatuation, also in the sphere of science and administration, more and more common and bold are voices critical of the clustering theory itself and relying development of individual regions on clusters.

However, it seems worth emphasizing that the idea of clustering itself is not bad. The bad part is identifying it with the universal panacea for all the problems of development of regions, companies and other entities. Clusters development largely depends not so much on fashion for them, or the relevant provisions in the development strategies, but mainly on the entities that would be able to

158 Bojar E., Olesiński Z. (eds.), *The emergence and development of clusters in Poland,* Difin, Warszawa 2007, p. 7

159 Bojar E., *Uwarunkowania sukcesu Doliny Ekologicznej Żywności jako klastra gospodarczego,* www.dolina-eko.wspa.lublin.pl as of 18.06.2007.

"catch" this idea of cooperation with all the necessary "players", and first of all the entrepreneurs. The fact that decision-makers would like to have a cluster in their area, which could be a boast to others, does not mean that such a structure will arise. On the other hand, no records about clusters in relevant documents, mean that the "unwanted" cluster can not be created. It should also be noted that the realities of business operation in the last decade has changed significantly. While at the end of the XXth century the access to a lot of information was still very limited, at the beginning of the twenty-first century, with the rapid development of the Internet and other ICT solutions, many of these barriers were eliminated. It is therefore appropriate to ask whether the solutions in the form of clusters actually correspond to the contemporary realities of the developed economies. The ease of accessing information about the product range, transactions, providing jobs, share experiences, etc., with the use of all the modern technology, greatly reduces the advantages of clusters exposed in the early years of interest in the concept. It seems that the geographical proximity of different entities can now provide an important premise for the creation of cluster structures in case of service activities, including specialized medical services, rehabilitation and wellness center, and less important in case of productive activities. In addition to the above considerations, attention should also be focused on the essence of social capital for real and not merely apparent, development of clusters. It should be emphasized that no cluster is just a group of companies, institutions, research entities – it is also a social group. The strength of this type of business relationship is in large part the quality and intensity of contacts between the parties associated in the cluster. However, both in theory and in practice of clustering too little attention is paid to the social aspects of clusters. Overcoming mental barriers seems to be crucial for their development. Mutual trust is necessary to build friendly and stable relations between members of the cluster. Without trust the cluster will be only a facade structure. Overcoming mental barriers in the form of lack of trust in business partners is the key to the success of the project. Distrust is the problem of the entire Polish population and in a sense also a national trait. The results of research carried out by the authors in Podlasie companies, though not sample surveys, constitute a part of the picture typical of Polish business, which operators *"have the lock on cooperation with other companies. They lack confidence"*[160]. It should be clear that clusters must be built not only on the technical and organizational level, but also on the social one. And it will require both time and highly considered actions. Thus, ten years,

160 Sacharczuk S., *PARP bierze się za wspieranie klastrów,* „Puls Biznesu" 15.04.2011, p. 6.

which are mentioned in the literature as a period after which the clusters achieve adequate effectiveness, may be in this case too short.

As mentioned above, the results of the authors' research show a large deficit of trust as well as willingness of the surveyed companies in Podlasie to cooperate with competition, the science sector and foreign entities. Although there are favorable conditions for the concentration of entities as well as natural conditions for the development of cross-border clusters in the building industry, wood and furniture, and specialized medical services, rehabilitation and wellness, it is the social aspects that will constitute very strong barriers to the development of such potential structures in the near future. Other barriers include also a bad reputation among the surveyed respondents of the idea of clustering, which probably results from the negative experiences of the past. The situation is only slightly better in the opinion of the respondents from Lithuania. Definitely different view represented the respondents from Belarus, where no cluster initiative has been developed yet. Analysis of the respondents' willingness to cooperate in the framework of cross-border cluster structures do not inspire optimism. In fact, the entities from Poland and Lithuania were not interested in such a possibility. The respondents from Belarus expressed more favorable attitude to the idea.

Current observations confirm the continuing relevance of authority figures' statements made many years ago, that the work of M.E. Porter should be only a starting point for further research and analysis.[161] Other ways of developing cooperation between the entities of the spheres of business, science and administration, and working on their own solutions in this area, tailored to the specific circumstances of the area, industry, etc. should be sought. Trust, the most valuable element of social capital, is here the basis for the creation of any structure of network cooperation. In addition, we should consider carefully whether there are indeed universal solutions that can work in all conditions. Does the factor that contributed to the success of some, automatically guarantee the success of others. It does not appear to be possible.

161 See for ex.: Bergman E., Feser, E., *Industrial and Regional Clusters: Concepts and Comparative Applications*, Regional Research Institute, West Virginia University 1999; Enright, M., *The Globalization of Competition …* op.cit.

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This book presents the results of research carried out under the grant NN 114293938. The main attention is focused on the analysis of trust and willingness to cooperate within the structure of cluster by companies in Poland, Belarus and Lithuania. The records of EU documents on cluster policy were analyzed.

The authors present recommendations that can be used by any entity interested in the development of cross-border relations.

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Anna Wasiluk
Andrzej Daniluk

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