

Intra-Cluster Cooperation Enhancing SMEs' Competitiveness - The Role of Cluster Organisations in Poland

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ABSTRACT: The determinants of SMEs' competitiveness and, in particular, the constraints faced by SMEs, as well as the implications of the barriers for a firm's growth have been investigated by a great number of researchers. Despite the popularity of the studies focused on SMEs competitiveness this topic is not losing its relevance, since SMEs are backbone of national economies. The issue is of even greater importance for post-transition economies. In this paper, we argue that intra-cluster cooperation, which should epitomise the genuine and fully fledged cluster, provides cluster firms, in particular SMEs, with advantages and thus can assist SMEs in upgrading their competitiveness. Special role play in this respect also dedicated cluster organisations. The conceptual part of the paper is accompanied by empirical considerations. Best practices from selected Polish clusters dominated by micro, small and medium enterprises are presented-

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Keywords: cluster; cooperation; competitiveness; cluster organisation; SME; Poland.

La cooperación intraclúster mejora la competitividad de las PYME: el papel de las organizaciones de clusters en Polonia

RESUMEN: Los factores determinantes de la competitividad de las PYME y, en particular, las limitaciones que deben afrontar, así como la implicación de barreras para el crecimiento de cualquier empresa, han sido investigados por un gran número de expertos. A pesar de la popularidad de los estudios centrados en la com-

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petitividad de las PYME, este continúa siendo un tema de especial relevancia, ya que las PYME son la columna vertebral de las economías nacionales. La cuestión cobra mayor importancia en el caso de las economías posteriores a la transición. En este estudio sostenemos que la cooperación dentro del clúster, que ha de ser el epítome del clúster genuino y plenamente desarrollado, ofrece a las empresas del grupo, y en particular a las PYME, una serie de ventajas que pueden ayudarlas a ser más competitivas. En dicho contexto las organizaciones de clusters juegan un papel destacado. La parte conceptual del estudio vendrá acompañada de consideraciones empíricas. Asimismo, presentaremos las mejores prácticas de una selección de clusters polacos dominados por las microempresas, las pequeñas empresas y las medianas empresas.

Clasificación JEL: O30; D85, R10.

Palabras clave: clúster; cooperación; competitividad; organización de clusters; PYME; Polonia.

1. Introduction

The focus of this study is the intra-cluster cooperation. The literature provides a huge number of definitions of clusters. The roots of this phenomenon go back to the works of Alfred Marshall (1920) and his theory of industrial districts. In his theory, Marshall highlighted the significance of agglomerations and resulting externalities from localized cooperation among entities within industrial districts. Nowadays, the most popular approach to business clusters is associated with Michael Porter who defined clusters as geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries and associated institutions (e.g., universities, standard agencies, trade associations) in a particular field that compete but also cooperate (Porter, 2000, pp. 15-34). Enright (1996, p. 191) explained that «A regional cluster is an individual cluster in which member firms are in close proximity to each other». Van den Berg, Braun and van Winden associated clusters with «local or regional dimension of networks» (2001, p. 187).

In general, what determines a cluster is the focus on a core industry with high level of specialization, existence of a large pool of firms that constitutes the critical mass; operation of R&D and business-support institutions in spatial proximity engaged in vivid interactions based simultaneously on competition and cooperation among the three types of entities (Markusen, 1996; He and Fallah, 2011, Ketels and Memedovic, 2008).

Bearing in mind the Marshallian approach to industrial district and further the Porterian concept of a cluster based to some extent on the previous one, we can state that clusters are founded on two critical dimensions —the spatial one and the relational one, thus they can be regarded as spatially embedded networks. The entities from the three different sectors - business, R&D and administrative sectors are inter-related and the relationships are horizontal or vertical in nature. The relationships in

cluster's network are the basis for information exchange and offer access to resources and capabilities of other cluster entities (Gulati, 1999). The spatial dimension enables firms to easier share information and thus to learn from possible mistakes of other entities. Thus, clustering supports small and medium enterprises to overcome the growth constraints and compete in international markets, which means that clusters are conducive to cope with the issue of the liability of smallness (Aldrich and Auster, 1986; Kale and Ardit, 1998). Cluster SMEs can namely capitalize on different inter-firm collaborations within clusters, in order to enhance the growth in the face of various constraints deriving from the size liability (Hessels and Parker, 2013).

In this paper, we seek to unpack this positive impact in more details by distinguishing the main channels of influence. Therefore, the goal of our study is to unearth the foundations of cluster's facilitating role in enhancing SMEs competitiveness by drawing on a sample of Polish clusters. We argue that intra-cluster cooperation helps alleviating and overcoming the problems of various nature resulting from the «liability of smallness». It provides framework for developing innovations and improving efficiency, hence, it generates concrete advantages. To achieve the research goal, we conduct the literature review and put forward the framework organising our research considerations and we use the case study method drawing on Polish clusters. The rest of this article is structured as follows. First, we present the literature background briefly introducing the concept of intra-cluster cooperation —its nature and related advantages. Based on these considerations conceptual framework of the study is developed. Next, using the case study approach the key research issue is discussed on the cases of a few Polish truly operating clusters, whose growth has been fostered by cluster initiatives and cluster organisations. Finally, the paper provides some concluding remarks, summing up the conducted study.

2. Literature review

2.1. The nature of intra-cluster cooperation

The creation of value and «relational advantage» through inter-organizational relationships arising from collaboration, and the capacity to capture the «relational advantage» has been investigated by many researchers (Saxenian, 1991; Child and Faulkner, 1998; Dyer and Singh, 1998; Barringer and Harrison, 2000). In times of innovation-driven economic growth, when risks and costs of innovation substantially increased, SMEs need to focus much on the research capability and on the ways to reinforce their knowledge and research intensity (Hagedoorn and Schakenraad, 1992; Dodgson, 1993; Coombs *et al.*, 1996).

One of the distinguishing feature of a cluster is co-operative relationships among its entities, which in case of cluster firms are to be accompanied by competitive relations. According to Anderson and Narus (1990) cooperation can be defined as the complementary actions taken by firms in interdependent relationships to achieve mutual outcomes. Morgan and Hunt (1994) underline that to be an effective competitor

in the global economy firms need more cooperation and networking. However, within cluster the cooperation can take place not only among firms, but among them and R&D institutions, business-support organizations and local or regional government. Thus, the scope of potential co-operative constellations is diversified and rich.

Co-operation, which is one of a few characteristic features of a cluster creates the relational proximity among cluster entities and the relational proximity is supported by the spatial proximity. Clusters are conducive to cooperation since partners involved are sufficiently physically close to allow frequent interaction and effective exchange of information (Maskell, 2001). This proximity fosters the interaction in both formal and informal settings (Birley, 1985). Since clusters are founded on social networks, which function within a particular geographical space, they create a specific culture and often even the language and vocabulary used by local specialists can be specific to a region where a cluster operates (Saxenian, 1994). These factors facilitate the intra-cluster collaboration (Mckelvey *et al.*, 2002). The intra-cluster co-operation emerges from the focus of cluster firms and institutions on a common goal that to be achieved calls for collaboration. Co-operation is accelerated by the mutual trust, which is a kind of side-effect of co-operation on the one hand, and on the other hand it is a pre-requisite for cooperation. Schmitz and Nadvi (1999, p. 1503) state that trust enables the competing firms to cooperate which results in joint actions. This kind of actions generate collective efficiencies that emerge from complementary specializations of cluster actors and from better coordination (Pouder and St. John, 1996; Pyke and Sengenberger, 1990).

Intra-cluster cooperation develops over time, but only if there is a trust among cluster actors. Emergence of trust-based relations is within clusters on the hand easier since their actors operate in spatial proximity and can better monitor their behaviour, on the other hand however, it is more difficult since cluster firms are engaged in vivid, sometimes devastating rivalry for local markets (Florida and Kennedy, 1990) and it can create distrust (Zand, 1972). To increase the level of mutual trust among cluster actors, in particular, firms functioning of business associations, governmental and multilateral agencies, and in particular cluster organizations can be established (e.g., Altenburg and Meyer-Stamer, 1999; Schmitz and Nadvi, 1999). They are the result of implementation of cluster initiatives which according to - Sölvell, Lindquist and Ketels (2013, p. 1) «are organized efforts to increase the growth and competitiveness of clusters within a region, involving cluster firms, government and/or the research community». Cluster organizations are a formalized platform for cooperation and their activities help to reduce information asymmetry as well as limit opportunistic behaviour. A cluster organisation is a tangible manifestation of cooperation between cluster entities, though, it usually does not include all the cluster actors.

2.2. Advantages of intra-cluster cooperation

Intra-cluster cooperation and its intensity is crucial from the perspective of cluster actors, especially cluster firms trying to take advantage from their involvement in

clusters (e.g. Humphrey and Schmitz, 1996; Porter, 1998). Intra-cluster cooperation is more probable, when more cluster firms can supplement their confronting interactions with trust and collaboration. The replacement of pure rivalry in some areas with collaboration means, that linkages among actors emerge. Swann and Prevezer (1996) argue that clusters focused on industries, where multiple linkages can be created are characterized by stronger growth, which is associated with development of cluster-specific advantages.

Cluster-specific advantages can contribute to the competitive advantage of cluster entities, in particular, the cluster firms. Bearing in mind that competitive advantage enables a particular firm to perform better in comparison to rivals, generally we can argue, that the advantage may be efficiency- or innovation-driven. The efficiency driven advantage goes in line with the attempts to decrease the costs of operation and the innovation-driven advantage is related to differentiation from competitors. This approach is consistent with the simple and traditional perception of the competitive strategy characteristic for Porter. Cooperation that coexists next to competition within clusters leads often to differentiation and innovation in products and services.

Efficiency-driven advantages are related to opportunities to reduce costs of operations. The chance to decrease the cost of operations results from a set of factors, i.e. better access to specific information; easier and broader supply of labour force and access to capital resources; complementing one another activities by cluster entities and great opportunities for economies of scale. This kind of advantages contribute to the productivity, which can be leveraged outside the formal boundaries of individual firms.

Tether (2002) underlined, that cooperating firms are often involved in higher level innovative activities. Cooperation in R&D contributes positively to innovation (e.g. Faems *et al.*, 2005; Cincera *et al.*, 2004; Belderbos *et al.*, 2004) and linkages in this area may be a source of competitive advantage (Lambooy, 2004). Thus, cooperation is conducive to innovation processes (Fritsch and Lukas, 1999; Fritsch, 2003; Kaufmann and Wagner, 2005; Medda *et al.*, 2006). Innovation-driven benefits emerge very much from cooperation since it creates opportunities to share knowledge and exploit knowledge spill-overs (Lundvall and Johnson, 1994, p. 26). Innovations, which arise from operations within clusters represent often the result of interactive model of innovation processes (Johannessen, 2009), which means that innovation is the outcome of interactions between people, organisations and the environment. Innovation emerges from the relationships between entities with different knowledge resources rather than from knowledge resources alone.

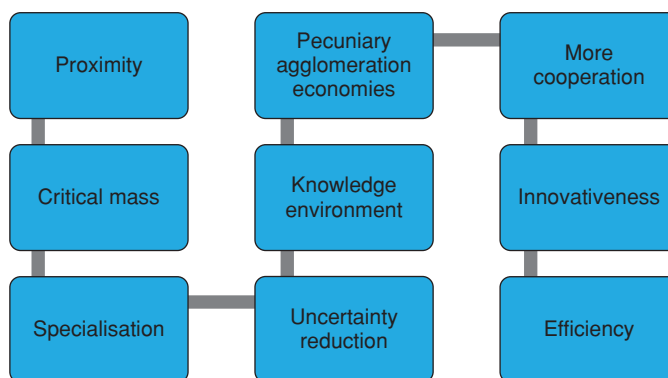
Cooperation, which manifests itself in networking is the way to exchange the tacit and codified knowledge. In case of tacit knowledge, the geographical proximity is particularly important (Cooke and Wills, 1999; Hilpert, 2006; Dosi, 1988; Leonard and Sensiper, 1998). Thus, the aspect of cluster proximity positively impacts the knowledge, in particular, the tacit knowledge exchange and further the innovation activities. Geographical and cultural proximity facilitates cooperation which makes innovation efforts less risky, allows the innovating entities to get access to critical

innovation inputs and it increases the level of trust among cluster firms (Sternberg, 1999; Arndt and Sternberg, 2000; Sapsed *et al.*, 2005; Koschatzky, 1998; Amara *et al.*, 2005). Thus, we can assume that within truly operating clusters, that grow gradually over time, a kind of self-reinforcing mechanism works that develops the pool of multiple cluster-benefits.

3. Conceptual framework linking intra-cluster cooperation with competitiveness gains for SMEs

As briefly discussed in the previous part, clusters are seen as attractive locations providing conducive environment for business, in particular for SMEs. Given the breadth and comprehensiveness of cluster definition, and, in the light of numerous possible advantages provided by clusters, in this paper we propose to look at the cluster role for SMEs competitiveness in a systemic and more focused way. We put forward some framework enabling the analysis, which refers to the cluster's features on the one hand, and innovativeness and efficiency as crucial determinates of competitiveness on the other hand (Scheme 1).

Scheme 1. Basic components linking clusters with intra-cluster cooperation and expected advantages

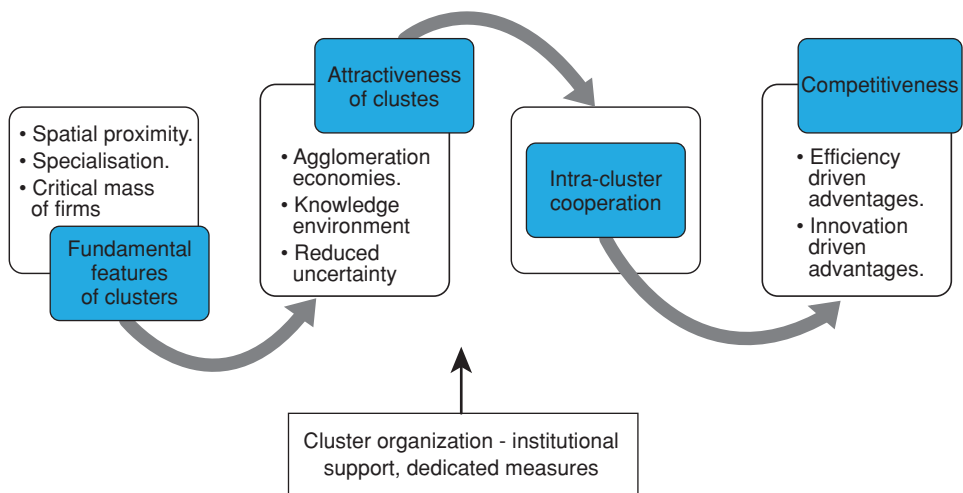


Source: Authors' own proposal based on the literature review.

The chain of our reasoning is following. The proximity and critical mass of entities being specialized in given field/industry, in other words, all this what constitutes the backbone of cluster, enables achieving three main advantages (Götz, 2009), which are: pecuniary agglomeration economies, conducive knowledge environment and reduced uncertainty. These components work towards more cooperation among firms. They facilitate closer interactions among small and medium companies inhabiting given cluster. More cooperation in turn enables reaching advantages, otherwise impossible to achieve due to size/smallness liability, which are

enjoyed usually by larger firms —such as more expertise, better negotiating power, economies of scale, more innovations due to shared activities, etc. Clusters, hence, by its very nature and thanks to the idiosyncratic features (specialization, critical mass, proximity) offer conducive environment facilitating cooperation, which in turn enables reaching advantages of innovativeness and efficiency. However, enhanced innovativeness and efficiency can be achieved also directly thanks to the distinguished sources. Namely, knowledge spillovers and environment conducive for knowledge creation certainly contribute to the innovativeness advantages. Pecuniary agglomeration economies and critical mass of specialised entities seem to create the foundations for efficiency advantages. The lower level of uncertainty as provided by mature clusters with well-developed supporting entities such as cluster organisations in turn seem to affect both types of advantages. Improved trust relations, mutual understanding, shared values, and norms all what make up the third component of cluster attractiveness positively impact both —firms’ efficiency as well as innovativeness (Scheme 2).

Scheme 2. Clusters as attractive locations facilitating inter-firm cooperation and providing competitive advantages



Source: Authors’ proposal based on literature review.

We suggest as one of the possible channels of cluster influence on firms’ competitiveness the enhanced inter-firm/intra-cluster cooperation which is a central component. It translates into efficiency —and innovation-driven advantages, which consequently determine firms’, in particular, SMEs’ competitiveness. This intra-cluster cooperation is in turn possible thanks to the idiosyncratic features constituting the backbone of clusters and making these places attractive locations. As the case of Polish clusters demonstrates, special role in additionally reinforcing these interdependencies can play cluster organisations.

The efficiency —and innovation-driven advantages impact the competitiveness of cluster firms that being more competitive in terms of costs of operations and/or innovation are better equipped to internationalize. Thus, cluster can accelerate firms' internationalisation via the efficiency and innovation-gains and additionally via the activities of cluster organizations. The locally generated advantages for cluster firms in terms of efficiency and innovativeness may trigger the internationalisation. The competitive advantage in the domestic market is a pre-requisite for internationalisation, which is presented in the Uppsala model of internationalisation (Johanson and Vahlne, 1977, 2009). The relationships with other cluster firms partially co-create the advantages for cluster firms. In case any of the related firms has internationalized, the relationships may work as a springboard for a particular firm internationalisation. The springboard mechanism was exposed in the network approach to internationalisation (Johanson and Mattson, 1988).

When cluster firms are developing their cooperation exploiting the cluster organisation, this entity may become a platform for foreign expansion. Cluster organizations are a pro-internationalisation entities since they may establish relations with other cluster organisations and it is assumed to result in creating ties between enterprises or research and development institutions, which are part of the organisations. The pro-internationalization activities of a cluster organisation manifest themselves in the initiation of international cooperation as well as their acting as an intermediary in contacts with foreign partners. Intra-cluster cooperation which may be formalized as a cluster organization supports companies in gaining access to foreign markets through identifying potential business partners as well as organising foreign business trips and trade missions. It generates additional efficiency-gains since cluster firms can promote their products without incurring large costs, and the cluster brand which a cluster organisation uses contributes to the perception of cluster firms. A cluster organisation provides often firms with information about foreign markets obtained through market research, as well as represents cluster firms in business negotiations with larger and sometimes stronger business partners.

Summing up, we can conclude that the efficiency-advantages and innovation-advantages accelerate the creation of competitive advantage of cluster firms which is of high importance, if not a necessity, for the firms which are eager to expand abroad and plan becoming international in nature. The advantage may be discounted *via* expansion of cluster firms in the domestic, as well as in foreign markets which means their active outward internationalisation.

4. Methodology of the empirical study

In our study, we apply the case study method since this method may be used to generate or develop a theory on the basis of empirical data. The case study research method may be defined as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clear; and in which multiple sources of evidence are used (Yin 1984,

p. 23). Martínez-Fernández (*et al.*, 2012) underline that this method of qualitative research represents approximately 7% of the studies on industrial clusters.

Case studies help to understand some complex issues. They can be single or multiple. In our research, we follow the multiple-case study, which may be adopted with real-life events that show numerous sources of evidence through replication rather than sampling logic (Zainal, 2007). Yin (1994) explains that generalisation of results from case studies stems on theory rather than on populations. Multiple-case studies enhance and support the previous results. Multivariate cases can be explained by a problem-solving theory among others (Yin and Moore, 1987). The products of the problem-solving theory are the results of ideas and discoveries from external sources (Zainel, 2007, p. 3).

According to Yin (1984) there are two key types of case studies —exploratory and explanatory. If we want to understand the context, the settings of a phenomenon, we apply the first type (Dyer and Wilkins, 1991; Guba and Lincoln, 1994; Langley, 1999). Applying this method, we try to answer the broad research question if the intra-cluster cooperation is a mediating force in the impact of clusters on cluster firms' competitiveness. Conducting the research presented in the paper, we attempt to extend the knowledge on the role of clusters in the upgrading of cluster firms competitiveness, we attempt to present the mechanism how clusters may support firms' efforts to be more competitive. The study is to add some new findings and arguments to what is already known from the previous research focused on the broad topic of cooperation within clusters and to bridge the Porterian concept of competitive advantage of firms with the concept of clusters.

The data sources are secondary and primary in nature. The secondary sources are the latest reports on clusters in Poland, in particular, the reports of Polish Agency for Enterprise Development (PARP, 2012; 2014), information available on the Internet and articles in the business press. The primary data is the expertise of one of the authors, who is an entrepreneur involved in one of the clusters in Poland and simultaneously a cluster manager representing a particular cluster organization.

Our unit of analysis is the cluster which is supported by a cluster initiative formalized as cluster organization. The key characteristics of our sample clusters represented by cluster organizations are presented in Table 1.

Next part discusses the findings of our study with reference to the distinguished two types of advantages.

5. Findings

5.1. Efficiency-driven advantages

Cluster firms may enjoy efficiency-advantages thanks to cooperation within a cluster and the advantages may be even greater, when the cooperation is facilitated and further formalized by a cluster organization. Cluster organizations develop ser-

Table 1. Cluster organisations in investigated sample

<i>The name</i>	<i>Core industry</i>	<i>Year of the establishment of COs and its legal form</i>	<i>Number of firms</i>	<i>No. of R&D organisations</i>	<i>No. of BSO</i>	<i>Other types of organisations</i>	<i>Foreign markets served by cluster firms and the cluster organisation</i>
Leszno Printing and Advertising Cluster	Printing	2006, association	39	3	2	2	Germany, France, Spain, Portugal, Slovakia, Czech Republic, Lithuania
Gdański Construction Cluster	Construction	2007	52	5	No data	4	No data
Bydgoszcz Industrial Cluster	Polymers	2006 association	56	4	5	3	Germany, Russia, Slovenia, Czech Republic, Denmark, Sweden, Portugal, France, Spain, China, the Netherlands, Lithuania, Romania, USA, Ukraine
Wielkopolski ICT Cluster	IT	2008 association	63	3	7	1	USA, Germany, France, Italy, Belgium, The Netherlands, Spain, Portugal, Austria, Czech Republic, Slovakia, Romania, Sweden, Denmark, Finland, Lithuania, Latvia, China, Georgia
Life Science Cluster	Life science	2006 cooperation - agreement	52	11	7	6	Germany, USA, UK, France, Russia
Aviation Valley	Aviation	2003 association	85	4	4	1	France Canada, USA, Denmark, Spain, Germany, Turkey, Hungary, UK, Italy
Eco-Energetic Cluster EEI - Energy, Ecology, Innovation	Renewable energy		10	8	3	3	Germany
West Pomeranian Chemical Cluster „Green chemistry»	Chemistry	2007 association	74	5	2	30	USA, Sweden, Denmark, Finland, Belgium, Czech Republic, France, Spain, UK, Lithuania, Latvia, China, Georgia
Kom-cast Cluster	Metallurgy	Cooperation - agreement	46	9	11	53	Russia, Kazakhstan, USA, Latin America
West Pomeranian ICT Cluster	IT	2009 foundation	119	13	4	2	Norway, Sweden, UK, Belgium, Finland, France, Spain, the Netherlands, Germany, USA, Italy

Source: authors' own expertise and web-sites of the cluster organisations.

vices aiming to support the cluster firms. The services are offered for remuneration, but the positive thing is that the cost of a service is often included in the membership fee paid by the cluster firms. Thus, the money is kept in a way within a cluster since it contributes to the cluster organization, which works as a platform of cooperation. The value-adding support stemming from the operations of a cluster organisation is visible among several clusters in Poland.

One of the supported clusters is the Life Science Cluster in Krakow, in Poland (<http://lifescience.pl/en/>). The core industry of the cluster is research and development related to biotechnology, pharmacy, medicine, cosmetology and environmental protection. The cluster embraces firms and research institutes functioning in the above-mentioned sectors. Part of the entities formally joined the cluster organization and formalized their cooperation. Cluster firms may use tools for internet communication and marketing and participate in conferences, trainings, workshops and seminars organized by the cluster organization. These events are dedicated to cluster entities and often offered at lower price. In the Life Science Cluster, firms can choose a particular package of services: standard, silver and gold. The price of each package of services depends on the scope of the package and on the size of the cluster firm. Thus, cluster entities are supported in their operations and simultaneously an income for the cluster organization is generated, which further is used to support other needs of cluster entities. Additionally, to make the communication more efficient cluster entities use a Podio platform, which is an online platform for companies and other organizations to conduct their operations. Cluster entities take advantage of Intranet. It accelerates the exchange of information among cluster's members and contributes to the exchange of codified knowledge. Despite it, the Intranet function supports cluster firms in daily activities since it includes: an events calendar, project management module, meeting notes. It allows to update information on possible sources of financing downloading the information directly from the websites of proper institutions, like e.g. the National Science Centre, the National Centre for Research and Development.

Specific cluster platforms to improve the internal communication with the use of IT tools are quite popular among ICT clusters focused on software, multimedia, telecommunication networks and IT outsourcing to enable seamless flow of information (data, documents). In the Polish reality there are a few concentrations of IT firms and related businesses, that decided to formalize their cooperation in the form of a cluster organization and exploit this mode of cooperation to generate efficiency gains for their members, e.g. the West Pomeranian ICT Cluster (www.klaster.it), Wielkopolska ICT Cluster (www.wklaster.pl/en). That all stimulates vivid cooperation within the cluster.

Attempts to increase the efficiency of communication is characteristic for a cluster concentrated around the casting industry, embracing foundries in Poland and is located in the three regions of Eastern Poland, i.e. the Podkarpackie region, the Lubelskie region, and the Świętokrzyskie region (<http://www.kom-cast.pl/en/about-us/>). This cluster grows on the foundation of the interwar traditions of the Central

Industrial District in Poland. Firms that decided to formalize their cooperation developed the Virtual Scientific and Technical Information Centre. It is a portal which gives access to current information on business trends in the industry presented in domestic and foreign journals and on results of R&D conducted by scientific centres. The Virtual Scientific and Technical Information Centre possess the Foundry Tech software enabling execution of engineering calculations. Cluster firms are offered economic consulting services (trade, marketing, intellectual and industrial property protection) and professional, industrial experts' consulting that contributes to the development management process. These benefits —free of charge consulting— are of greater importance for SMEs that lack resources. The free flow of data and knowledge among cluster entities improves on the one hand efficiency of casting technical documentation design, but has the potential to improve innovativeness since it supports the update of technical knowledge.

Offering specific services to cluster firms is sometimes accompanied by joint procurement actions. The mechanism of these actions leads to the decline of costs borne by cluster entities. Joint procurement is used by several Polish clusters and in particular it is popular in clusters focused on construction industry, like the West Pomeranian Construction Cluster, which develops different purchasing groups for fuel, energy, phone subscription. Efficiency-driven advantages are characteristic for concentration of printing and advertising firms located in a few districts of Wielkopolska region. The cluster entities have developed an interesting and efficient mode of networking, which got the name of creative homelessness (Jankowska, 2012). The meetings of cluster entities, that decided to formalize their cooperation take place each time in the premises of a cluster entity. It gives the chance to learn more about this particular entity, supports the creation of trust which is crucial in clusters and doesn't call for any extra financial support to maintain the premises dedicated to networking.

The brief review of selected cases of cluster organisations demonstrates, that Polish clusters indeed allow their member firms to increase efficiency by reducing the costs of certain business activities - transaction costs, decreasing the procedural and administrative burden, facilitating exchange of information, or increasing the bargaining power and improving the negotiating position, when it comes to joint purchases, etc.

5.2. Innovation-driven advantages

Cooperation within a cluster is to create for cluster firms the efficiency gain, but innovation-driven benefits as well. Clusters working with or without the formal representation of a cluster organization are conducive to pro-innovation business and science cooperation. To upgrade the innovativeness of firms it is important to know their innovation needs and weaknesses in terms of innovative input. Thus, cluster organizations conduct often innovation audits to diagnose the innovativeness level of cluster firms and further to start discussions with potential supporters, especially from the R&D sector. The innovation audits allow to define the training needs of clus-

ter firms, which on the one hand contributes to the level of expertise of the business sector and, on the other hand creates potential customers for the services of R&D institutions. Such activities are visible in different clusters. It works well in the spatial concentration of firms operating in the tool, processing sector and the chemical sector in the Kujawsko-Pomorskie region. There are located firms involved in modern processing tools and detailed elements made of plastics (<http://www.klaster.bydgoszcz.pl/index.php5?lang=en>).

The innovation audits allow to identify the gaps within the innovation inputs thus often the needs of firms and to define the hierarchy of the needs related to the innovation input. This kind of practises were implemented in the Leszno Printing and Advertising Cluster, too. In this case the R&D partner —the Research and Development Centre for the Graphic Arts participated in many working meetings coordinated by the cluster organization dedicated to the Leszno Printing and Advertising Cluster and provided expertise relating not only to the printing industry, but also in terms of market analyses, support programs for knowledge transfer, joint development of R&D projects, as well as assistance in obtaining public funding for the implementation of these projects (Główka, Jankowska, 2014). The established cooperation led to the development of three joint projects and applying for funding from the Polish Agency for Enterprise Development within the programme 'Innovation voucher' programme in 2008. Despite the fact, that these three projects were rejected, cooperation flourished. The entrepreneurs and the researchers improved the projects together and later two of them were successfully re-submitted. In 2009 both received funding from the Agency.

The joint projects between business and R&D are easier to develop and to realize within clusters since in this cooperation a cluster organization as an intermediary is involved. In the chemical cluster in West Pomerania, that embraces firms exporting chemical products to Western European markets, Asia or America four projects under international initiative CORNET (Collective Research Networking), aiming at combining science and business: SubWex (subcritical water as a «green» solvent used for extraction of plants), SmartFlowerPack (development and implementation of intelligent packaging system based on biomaterial designed for packing flowers - B2B solution), FreshCoat (functional use of edible coatings to extend the shelf life of fresh foods), ExtruMIBI (preparation and application of thermostable natural antimicrobial agents) are implemented. The cluster firms cooperate with the Centre of Bio-immobilisation and Innovative Packaging Materials (CBIMO) of West Pomeranian University of Technology in Szczecin.

Great advantages in the field of innovativeness are characteristic for the aviation cluster operating in the South East of Poland (<http://www.dolinalotnicza.pl/en/>). The concentration of companies from the aviation industry, research institutes and educational and training entities is famous for its innovative solutions and products. Ninety of the aviation firms developed the association - Association of the Aviation Industry Entrepreneurs «Aviation Valley». It started to cooperate with other associations of aviation companies, that represent the Polish Aeronautical Technology

Platform. Together they initiated and signed an agreement with the National Centre for Research and Development concerning the establishment of a sector programme for aeronautics INNOLOT at a national level. This programme financed by the National Centre for Research and Development in Poland aimed at intensification of the growth of R&D in strategic sectors of Polish economy, in aviation among others. The key results of the cooperation are to increase the share of end-products in Polish aviation industry and upgrade the Technology Readiness Level developed by research institutions. The cooperation resembles the approach of the European JTI Clean Sky (<http://www.cleansky.eu/>) and it is not to be limited just to the aviation cluster firms in the South East of Poland, but to all firms in Poland involved in the aviation industry, among which there are a lot of small and medium enterprises.

Advantages contributing to innovativeness of cluster firms arise often from the opportunities to develop knowledge and competences in the cluster. This kind of benefits are visible in each cluster, but in the Polish landscape there are a few clusters relatively more famous for that. In the Lower Silesia region operate many Polish and foreign enterprises, research organizations and business-support institutions focusing on the renewable energy (<http://en.klaster-eei.pl/content/offer>). The firms are often employing biomass technologies such as biogas plants or local heat plants using biomass. Since this region needs very much to shift towards green energy the companies expect growth and to respond to the challenge they need skilled workers and professionals. Within the cluster there operates the School Complex and Educational Centres in Bielawa, where into the curriculum the technician in the «Renewable energy systems» was introduced. It was the first school in Central-Eastern Europe, which decided to educate technicians in this field. Cluster firms and their association participated in the reviewing of the curriculum and assisted in implementing it. A relatively big success was the inclusion of this profession in the Ministry of Education profession list. The school cooperates with the Wrocław University of Technology, that has access to a specific laboratory owned by the school. This laboratory is used in the research and development at the University and in teaching focused on renewable energy issues. This kind of cooperation is crucial from the perspective of the human resources development. The lack of professionals is sometimes an obstacle in the growth of a cluster. It is the case of the cluster of firms focused tool and processing sector and the chemical sector mentioned at the beginning of this section. It is located in the North West of Poland. To cope with this challenge firms lobbied to open a class on-demand in one of the vocational and technical schools dedicated to tool making and processing industry. The benefits are mutual for the education sector and for firms. Students have great opportunities to get an internship in cluster companies and they receive a scholarship, which presently is financed by the Municipal Office of Bydgoszcz and is to be financed by the cluster entities in the future. To motivate young people to learn and work hard an award for the best student was established. Cluster firms cooperate with the Continual Education Centre. Thanks to the efforts of cluster firms the centre was equipped with injection pumps. Thanks to that unemployed people can be trained as injection pump setters and later to get a job in the cluster firms. Another co-operative initiative was the development of a class profile

«Cooling and Air-Conditioning», which seems to be an innovative direction in the region and even in Poland.

Similar approach to cope with the lack of human resources for the core industry firms in the cluster was implemented in the Aviation Valley in southern Poland. The cluster organisation representing the whole Aviation Valley community cooperates with the Marshal Office of the Podkarpackie Region within a project «Modernisation of the vocational training offer in relationship to the regional labour market». Five key firms from the cluster declared their willingness and readiness to conduct a series of training and coaching for the teachers and apprenticeships for the students from technical high schools. The pro-educational cooperation within the region is accompanied by study visits of cluster firms in other modern aviation companies in foreign markets. The study visits are quite popular in the case of other clusters too. Thanks to the cooperation focused on the education issue the products and services offered by the clusters are of better quality and more innovative.

Short review of selected Polish clusters offers evidence of the beneficial role played by cluster organisations in generating innovation conducive environment. This happens in various ways, by providing matchmaking forum, facilitating joint application for external research and development grants, coordinating the cooperation with high schools and universities and, last but not least, by simply being a neutral broker supervising the strategic activities in the area of science and knowledge exchange.

6. Conclusions

Sometimes clusters are perceived as a localised network of firms, embracing often small and medium enterprises that benefit from joint actions. These actions result in the development of capabilities, allows upgrading of skills and involves establishing public private partnerships.

Clusters thanks to their idiosyncratic features provide numerous advantages which can address the likely liability of smallness suffered by SMEs. This can happen via the intra-cluster cooperation which being a peculiar functional glue channels in a way the cluster externalities directly to small companies. Hence, it bridges the cluster positive effects with member's needs. This cooperation can be additionally facilitated by activities of dedicated cluster organisations. These can further reinforce the beneficial linkages, enhance more collaboration exchange of knowledge or other forms of cooperation and if necessary alleviate any conflicts, harmful processes distorting the intra-cluster relations such as abuse of domain position etc.

The aim of the paper was to highlight the mediating role of intra-cluster cooperation for the competitiveness of cluster firms. The study shows the positive impact of intra-cluster cooperation on the strategic capability and competitive strategies of cluster firms. First, we put forward the framework comprising the critical components linking cluster features with strategic advantages. This scheme derives from literature review and seeks to structure the exploration of possible cluster role in im-

proving the SMEs competitiveness. Second, we study selected pool of Polish clusters trying to assess their contribution to the identified advantages.

Presented cases of Polish clusters allow us to argue that these hubs with strong support of dedicated cluster organisations indeed facilitate cooperation enabling reaching crucial advantages. Based on these cases we can also find that, the investigated intra-cluster cooperation:

- depends to high degree on the commitment of cluster organisation's managers,
- needs some top-down assistance - ministry initiatives can often trigger the development of such collaboration not only assist it later on,
- exists even when lacking clear cluster branding and identification i.e. when there are only genuine bottom up and spontaneous interactions,
- can expand the boundaries of one cluster and stretch to other clusters.

The interactions among locally concentrated entities which manifest themselves very much within the cluster create an environment of greater productivity and subsequently provide context which is conducive to firm's international competitiveness.

In this paper, we touch upon the cluster role in reducing the SMEs size liability. We argue that the features of cluster as spatially concentrated pool of competing and cooperating entities enables achieving certain advantages. Benefiting from them is possible thanks to the intra-cluster collaboration. This cooperation is facilitated by—and in return simultaneously as a circular causation, it leads to reduced uncertainty, conducive knowledge environment and agglomeration economies. This further results in generating concrete advantages for SMEs' innovativeness and efficiency advantages.

We are fully aware of certain limitations of our study. The conceptual approach adopted here is obviously one of many other possible ways of framing the discussion on clusters' broadly understood attractiveness and clusters' contribution to competitiveness improvement. Seeing clusters as facilitators of cooperation alleviating the size liability and providing innovativeness and efficiency advantages is just one of the possible attitudes to studying this topic. The sample of investigated Polish clusters can be also further broadened. It may perhaps if possible draw on other countries cases. Future investigations may also better explore the issue of internalisation of cluster firms being an outcome of improved competitiveness due to innovativeness and efficiency advantages generated in cluster.

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