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Abstract

Purpose – The main aim of this paper is to analyse relations between geographical and competence proximity and development of cooperation in cluster initiatives.

Design/methodology/approach – The research was based on an original theoretical concept referring to the trajectory of development of cooperative relations in cluster initiatives. The research was carried out in mid-2017, in four purposefully selected clusterinitiatives. The research sample was 132 cluster enterprises. The main research strategy involved non-experimental models; the basic method of data collection was an online questionnaire.

Findings – The results indicated that the role of geographical and competence proximity depends on the level of cooperation in a cluster initiative. In both these dimensions, proximity was important during the initial stage of cluster development: to start cooperation between the members, however, when more mature forms of cooperation were undertaken, the factor of common location was not so crucial any longer. It was also recommended to maintain some competence distance between the partners.

Research limitations/implications – The main limitations referred to the static character of the data, the use of original measurement tools which had not been tested before, the small and little differentiated research sample and the subjective nature of the research. The above-mentioned limitations should be viewed as a starting point for further empirical research.

Practical implications – Knowledge on the significance of geographical and competence proximity at various levels of cooperation in clusters is valuable for efficient management of a cluster and for higher competitiveness that it can achieve.

Originality/value – The research study contributes to literature which refers to the question of proximity in clusters through the analysis of relations between geographical and competence proximity and development of cooperation in cluster initiatives. The results of the research point out

that the role of geographical and competence proximity evolves with development of cooperation in cluster initiatives.

Keywords:

Cluster; Cluster initiative; Proximity; Geographical proximity; Cooperation

JEL Classification:

L14, R12, R30

The Significance of Proximity in Cluster Initiatives

1 INTRODUCTION

1.1 Introduce the problem

The main problem presented in the article is the influence exerted by geographical and competence proximity on the development of cooperation in cluster initiatives. Expert literature in this field does not provide any explicit attitude towards an optimal level of proximity in clusters. Despite numerous positive effects resulting from common location and common industry affiliation which have been described for years (i.a. Hearn 1864, Marshall 1925, Arrow 1962, Romer 1986, 1990, Porter 1990, 1998, 2000, Jaffe et al. 1993, Doloreux 2002, Audretsch&Feldman 2004, Boschma 2005a, Broekel&Boschma 2012, Hansen 2015, Benos et al. 2015, Boschma et al. 2015, Wu et al. 2015, Marek et al. 2017), there are some proofs that excessive proximity (especially geographical) can negatively affect activities of cooperating enterprises (Grabher 1993, Coleman 1988, Malmberg&Maskell 1997, Boschma 2005a, Fitjar et al. 2016). In the most recent expert literature, it is possible to indicate studies which prove that there is no relation between geographical proximity and development of cooperation (Fontes&Sousa 2016, Guan&Yan 2016, Scherrer&Deflorin 2017, Ayoubi et al. 2017).

1.2 Develop the background

Developed by Porter in 1990s, the concept of a cluster belongs to the most popular theories of regional development, based on Marshall's industrial district (1890). Similarly to the concept of the Marshall district, the Porter's concept of a cluster emphasizes the importance of spatial and sectoral concentration for cooperation and innovation. In accordance with the definition presented by Porter (1998, 2000), geographical concentration comes as a basic attribute of the cluster structure which allows the cluster to achieve its competitive advantage in terms of efficiency, innovativeness and entrepreneurship. The main advantages of geographical concentration listed by Porter are: the common labour market of specialist skills, access to specialized suppliers (advantages of the scale and range), access to knowledge and information (including the effects of knowledge spreading and demonstration). After geographical location, sectoral concentration and similarity resulting from industrial affiliation come as the subsequent basic determinants of a cluster (Porter 1998, 2000). Enterprises in a cluster usually represent one or several affiliated sectors, therefore they are related by

a common trajectory of their development and a similar vision of development of their industry and region (facing similar opportunities and threats). Specialised competences of enterprises which function in a cluster allow them to distribute workload and to exchange complementary resources, leading to development of cooperation based on coopetition (Brandenburger&Nalebuff 1996). The attributes of geographical and sectoral concentration are most frequently mentioned ones in the definitions of a cluster which have been developed so far (i.a. Enright 1992, 1996, Rabellotti 1995, DeBresson 1996, Swann&Prevezer 1996, Rosenfeld 1997, Cooke 2002, Steinle&Schiel 2002, Maskell&Kebir 2005, Lis&Lis 2014) – both features are considered as the conditions which are indispensable for recognising a particular structure as a cluster.

The significance of the direct influence exerted by geographical proximity on the outcomes of operations undertaken by economic entities based in a particular location is widely reflected in expert literature. Although geographical proximity has long been the subject of research and analysis of scientists, the use of the category of "proximity" to the considerations in the economic field began to gain popularity at the end of the twentieth century. The development of the concept of "proximity" and its dissemination in literature were strongly influenced by the French School of Proximity (Rallet&Torre 1999, Gilly&Torre 2000, Torre&Rallet 2005). The proximity of the traits of the actors involved has been recognized as a key element in the process of coordinating their economically oriented activities (it facilitates the transfer of knowledge, improves the mechanisms of strategic information transfer, has a positive effect on conflict resolution) (Boschma et al. 2014). In addition, proximity is considered a factor significantly improving cooperation between entities (Petruzzelli et al. 2009) as well as fostering the development of innovation and reducing uncertainty in relations (Boschma 2005a, Paci et al. 2014). Researchers most often refer to the five dimensions of proximity proposed by R. Boschma[1]: geographical, cognitive, social, organizational and institutional proximity. The main problem of each of the proximity classifications developed in the literature is the ambiguity of the definitional boundaries of particular dimensions of proximity.

The geographical proximity is characterized by the relatively least ambiguity (Knoben&Oerlemans 2006) – it refers to the physical distance between economic actors, both in its absolute (distance measured in specific units) and relative meaning (e.g. as the time necessary to move from point A to point B) (Boschma et al. 2014, Boschma 2005a). In this article, geographical proximity is understood as perceived in a subjective or objective way, the relation which refers to a particular entity located at a particular point in the physical space within a short (physical and temporal) distance from other entities which are significant from a particular point of view (Author, 2018).

The second dimension of proximity, analyzed in the article – competence proximity – is not as unambiguous as geographical proximity; it is also not distinguished in Boschma's classification.

[1] The presented division of the proximity is the result of theoretical work and empirical research published by Boschma since 2004 (Boschma 2004, 2005a, 2005b, Boschma&Frenken 2010, Boschma et al. 2014, Balland et al. 2015).

Competence proximity is closest to the designatum of cognitive proximity. Cognitive proximity relates to the similarity of the processes of receiving, interpreting, understanding and evaluating the world (Wuyts et al. 2005). This dimension of proximity is essential for the proper functioning of communication processes and knowledge transfer mechanisms, as it enables accurate identification, proper interpretation and effective use of new elements in the knowledge system (Cohen&Levinthal 1990). However, the studies conducted by the Author have indicated that if we wish to explain development of inter-organisational cooperation in a better way, it is advisable to differentiate proximity in its cognitive dimension further. Cooperation relationships are established among enterprises in a different way when their similarity can be observed with regard to their competences rather than when it refers to the level of the advancement of such competences (Author, 2018). The Author's observation mentioned above has allowed her to identify a new dimension of proximity (which has not been defined in expert literature so far) – namely: competence proximity. The notion of competence can be applied not only in an individual context (as an internalized, structured and dynamic system of resources which belong only to a particular entity) but also at the level of an organisation – as a set of individual employees' competences and the features of the analysed organisation, which mostly form its competitive advantage (Hamel&Pralahad, 1998).

Competence proximity can be defined as a similarity of structured and dynamic systems of competences presented by entities (units or organisations) in the aspect of the scope as well as the level of the advancement of such competences (Author, 2018). The main difference which can be observed between the designations referring to "cognitive proximity" and "competence proximity" is the fact that the first notion mainly refers to the convergence of knowledge systems of entities, whereas the second one is focused on intellectual and competence problems, with additional consideration of a community of existence which is defined by an objective framework. In the article, the Author focuses only on the first aspect of competence proximity mentioned above which refers to the scope of competences. Considering such an approach, competence proximity may be understood as a convergence of the profiles of competences presented by entities and the related similarity of the objective framework in which such entities operate, representing the same (or complementary) sectors of economy (as for example, broadly understood material conditions, relations with suppliers and customers which are specific for a particular industry, legal regulations referring to a particular sector, common goals and common trajectory of development resulting from industry affiliation, etc.) (Author, 2018). The greatest competence proximity occurs when entities operate in the same sector and have very similar, even overlapping competences (homogeneity of competences), while the smallest one – when entities represent different sectors of the economy and have very diverse competences (heterogeneity of competences). The average level of competence proximity is based on similar and, at the same time, complementary competences.

Geographical proximity is the most basic and the earliest recognized dimension of proximity in the literature. Already in the nineteenth century Marshall (Marshall 1890) and Hearn (Hearn 1864), as

the main subject of their considerations, chose coexistence of economic entities in a given territory and activities undertaken by these entities in conditions specific to a given area. The advantages listed by Porter (1990, 1998, 2000, 2008) resulting from common location were previously described by Marshall and confirmed later in the research studies by Arrow (1962) and Romer (1986, 1990) ("MAR"exernalities). The superior role of geographical proximity in achieving externalities (especially in the context of knowledge and innovation development) is emphasized in all the theories of regional development, where a region is viewed as the centre of knowledge generation (Martin 2003), springing from the Marshall district: i.a. Italian industrial district (Pyke et al. 1990, Becattini 2002, Bellandi, 2002, Sforzi, 2002), regional innovation system (Braczyk et al. 1998, Cooke 2001, Doloreux&Parto, 2005), innovative milieu (Aydalot 1986, Camagni 1991, Maillat 1998), learning region (Florida 1995, Asheim 1996, Morgan 1997), local production system (Courlet 1994, Lombardi 2003) or the innovation ecosystem (Adner 2006, Autio&Thomas 2014). Each of these concepts indicates geographical proximity as a source of a privileged position taken by local enterprises in their access to knowledge, its generation and distribution; it is also indicated as a main determinant of development of cooperation between the actors functioning in the particular area, who undertake their operations in conditions which are characteristic not only for the particular area but also for the particular industry. The above-mentioned concepts emphasize sectoral concentration viewed in the context of a specific community of entities defined within the objective framework. Enterprises which function in the same (or affiliated) industries operate according to a certain common habitus (Bourdieu&Wacquant 1992), that is namely: they have a common pool of knowledge and competences indispensable for the proper and efficient functioning in the particular sector. Their shared fate, based on common profiles of members' competences as well as similarity in the objective framework in which such entities function, fosters development of cooperation in various fields (Lis&Lis 2014).

However, the results of some research indicate that excessive geographical proximity may negatively affect development of cooperation in clusters. In clusters, there may be some negative outcomes observed which can result from the common location, which can be related to strict specialisation (Grabher 1993), closure (Coleman 1988, Malmberg&Maskell 1997, Boschma 2005a) and overburden on the side of demand as well as on the side of supply (Swann 1998, Beaudry et al. 2000). As Jacobs argues, this applies in particular to the concentration of companies operating in the same industries. He believes that diversity (the concentration of various industries) creates greater potential for the development of innovation (Jacobs, 1969). The existence of Jacobs (1969) type of externalities was confirmed by Mendoza-Velazquez (2017). Based on research conducted in 41 industrial clusters operating in Mexico, he showed negative impact of industrial specialization on employment growth within clusters. In turn, Valdaliso et al. (2016) suggests that cluster heterogeneity (especially in terms of the diversity of knowledge) facilitates adaptation to changes in their

corresponding international industries, and thus broadens the scope of available evolutionary trajectories.

Furthermore, as Boschma states, geographical proximity may stimulate proximity of some other type (e.g. social, cognitive, organisational or institutional proximity), and it is often replaced by them (Boschma 2005a), which results in larger marginalisation of the significance of the common location factor in the process of formation and development of cooperative relations. Moreover, excessive competence proximity may hinder development of a cluster – too much similarity in competences results in duplication and lack of a possibility of distributing the workload; also at the same time, too much competition is generated between the partners, and as a result cooperation becomes very difficult or even impossible in many cases.

1.3 State the purpose and rationale background.

In the above-mentioned context, the main aim of the article is to analyse dependencies between geographical and competence proximity (in the aspect of the scope of competence) and development of cooperation relations in cluster initiatives. It would allow to evaluate the importance pertaining to the factor of common location and the factor of common industrial affiliation at various levels of cooperation in cluster initiatives, and – at the same time – to determine the most advantageous level of proximity in the analysed dimensions. Such knowledge becomes crucial for efficient management of a cluster initiative and competitive advantage that it (and its member entities) can achieve.

In the article the Author refers to the definition of the cluster initiative developed by Sölvell, Lindqvist and Ketels. According to them cluster initiatives "are organised efforts to increase the growth and competitiveness of clusters within a region, involving cluster firms, government and/or the research community" (Sölvell et al. 2003, p. 15). In this sense, the cluster initiative has the attributes of the organization, whereas the cluster, due to its definitional and practical indeterminacy and ambiguity, does not have such features.

2 CONCEPTUAL FRAMEWORK

2.1 Conceptualization

The research has been based on Author's theoretical concept referring to trajectory of development of cooperative relationships in clusters initiatives. The above-mentioned concept was developed on the basis of the previous research studies carried out by the Author in 2016 in the selected cluster initiatives. The research studies were carried out with the use of the methodology of the Grounded Theory, and their aim was to identify the levels of advancement characteristic for cooperation among cluster enterprises[2] (Author, 2018). As a result of the research, there were three central categories distinguished which became a framework for the concept which was being developed. There were four main levels of cluster cooperation defined (category 1), to which five

[2] During the research studies which are described here, some interviews were conducted with coordinators and members of the analysed cluster initiatives (35 in-depth interviews, 1 group interview). The analysis and interpretation of the data was based on the analysis of the content and coding.

developmental objectives were assigned (category 2) along with three distinctive features (category 3) (see: Table 1).

Table 1: **Theoretical concept on the trajectory of the development of cooperative relationships in cluster initiatives – relations between main categories**

Category 1: Level of cooperation	*Category 2: Objectives*	*Category 3: Distinctive features*		
		Character of operations	*Aims of institutional members*	*Interests of institutional members*
Level I "Integration at the unit level"	Creation of a base network of relationships between cluster partners	Individual	Individual	Individual
Level II "Allocation and resemblance"	Facilitation of the access to the increased pool of resources Increase the quality of products and services and / or reduce costs	Collective	Individual	Individual
Level III "Forming of the environment"	Impact on the external environment of the organization	Collective	Collective	Individual
Level IV "Creation and integration at the organizational level"	Creation of conditions to create the common added value in the cluster initiative	Collective	Collective	Collective

Source: Author, 2018

Four levels of cluster cooperation are identified on the basis of similarity of operations implemented under the cluster initiatives. The terms applied to define such levels as well as the way applied to define the objectives which have been assigned to them indicate the key type of activities undertaken by cluster entities. The table below presents some selected citations from the interviews which reflect objectives at each level of cooperation that has been distinguished (see: Table 2).

Table 2: **Objectives – selected citations**

Level of cooperation	*Objectives*	*Selected citations*
I.	Creation of a base network of relationships between cluster partners	"A cluster is a factory of relations"
II.	Facilitation of the access to the increased pool of resources	"A cluster is a form of intermediation, a platform for exchanging mutual needs. I connect companies to let them have mutual benefits."
	Increase the quality of products and services and / or reduce costs	"This is a metal sector. We buy large amounts of steel and other metallurgical materials, that is: we can buy together because the more you buy, the cheaper price you pay. Everyone wants to buy goods for the cheapest price for their companies."
III.	Impact on the external environment of the organization	"We function in favour of environment. A very important role of a cluster is that it can transfer certain ideas to a higher level, and a single company does not have such an impact."
IV.	Creation of conditions to create the common added value in the cluster initiative	"A natural cluster is a cluster in which companies complement each other in the chain of values."

Source: Author, 2018

At the level I, the superior aim of a cluster is to form a basic network of relations, hence the operations of the cluster should be focused on the development of social proximity between the partners which will form a foundation for the future cooperation in the cluster. At the level II, there are two main developmental objectives of the cluster distinguished, namely: facilitation of the access to

the increased pool of resources (provided by the cluster coordinator or exchanged between the cluster partners) for the cluster enterprises, an increase in the quality of products and services and a decrease in the costs of business operation (as a result of process similarities). The level III is focused on development of favourable conditions for business operations run by the cluster enterprises. Hence, at this stage, the main aim of the cluster operation is to gain a possibility of affecting the external environment of the organisation. The aim of the cluster operation at the cooperation level IV is to develop conditions which are indispensable for creating the common added value through the combination of the resources owned by the cluster enterprises.

The category of "distinctive features" makes it possible to systematise the distinguished levels according to the level of cooperation advancement in the cluster initiatives. In this way, a hierarchical system consisting of four levels of cooperation has been created (however, in practice, levels II, III and IV can be implemented simultaneously). The table below presents the selected citations from the interviews which allow us to understand the distinctive features better, along with the way of their assignment to each level of cooperation defined above (see: Table 3).

Table 3: **Distinctive features – selected citations**

Level of cooperation	*Distinctive features*		
	Character of operations	*Aims of institutional members*	*Interests of institutional members*
I.	Individual	Individual	Individual
	"The cluster organised a trip to a fair. It was supposed to be a joint trip, but still it was more like an individual one. The cluster paid for the admission to the fair but everyone walked around by themselves."	"Joining the cluser is easy, but it becomes worse later on. There is this question: what will the company have for its membership in the cluster? What will it get for the time spent on various meetings? It is not easy because each company has its own purpose."	"We have to get as much information as possible to transform it into something useful for us, as entrepreneurs, in our quiet office rooms inside our company."
II.	Collective	Individual	Individual
	"The cluster was formed for closer cooperation between sectoral companies [...] to, let's say, allow companies to cooperate, supplementing each other with equipment, competences and workforce."	"In a task group, there was an idea that the group would select one company to perform calibration of the equipment. Obviously, it was intended for cost saving and the reason for which the company joined the cluster. In this case, if there were one operator working for the cluster, the price for the cluster companies would be more attractive, and the whole cooperation would prove profitable."	"In the cluster, it would be easier to assume some standards and to implement them in similar companies. Such a common initiative could bring some measurable benefits for each of those companies. Better quality means more orders placed at a particular firm."
III.	Collective	Collective	Individual
	"Competitors meet to stimulate development of the sector and to implement some	"Having a training centre for welders here is a very good target for the sector; it is an important aim."	"If we have intelligent specialisation, and we have to choose horizontal projects, that is: projects with additional points,

Level of cooperation	*Distinctive features*		
	Character of operations	*Aims of institutional members*	*Interests of institutional members*
	common projects. So, we try to work on some bigger things together."		these projects are not assigned to the cluster but to some particular companies. The company says that such a project will be horizontal for the cluster, which means that the company increases the chance to implement its own business strategy."
IV.	Collective	Collective	Collective
	"Implementation of common projects by the participants in the construction consortia within the cluster – this is good practice in the cluster."	"In line with the assumptions of the cluster, which we like very much, in a decade or so, we would like to form a zone of specialist services or specialist production where everyone around will contribute to it. A perfect aim for a cluster."	"A typical cluster means that companies resign from their leadership in favour of the one who sells products, which have been commonly manufactured, on behalf of the cluster."

Source: Author, 2018

Three distinctive features which have been identified, namely: the character of operations, the aims of institutional members and the interests of institutional members, indicate the specificity of cooperative relations at a particular developmental stage of an initiative. It is possible to arrange them in a logical way: activities undertaken by business entities should allow them to achieve their aims; the aims should allow them to achieve their interests. The first feature (the character of operations) refers to a tendency, which can be observed among entities forming cluster initiatives, towards focusing on the operations implemented independently (of an individual character) or operations which require cooperation with cluster partners (of a collective character). The second feature (the aims of institutional members) refers to the targeting of direct intentions declared by cluster companies – they can be related only to the operation of their own company (individual aims), or they can refer to some selected cluster partners and entities coming from the outside of the cluster initiative (collective aims). The third feature (the interests of institutional members) refers to developmental trajectories which are the imperative for each enterprise. They are to be followed by particular business entities – individual ones (intercepting values by a particular enterprise) or collective ones (when each entity involved into a cluster is committed to the operations resulting in some measurable effects)[3] (Author, 2018).

The concept is underlain by an assumption about the dynamic nature of cluster cooperation. In any cluster initiative, there might be any number of cooperation levels observed at the same time, because entities which belong to the same cluster initiative may function at various cooperation levels. Furthermore, cooperation levels in an initiative may undergo some changes over time – cooperation within a cluster initiative may be developed (and raised to higher levels), or it may be weakened

[3] However, it does not mean that at the "collective" level (described with the discussed distincitve features) there are not any cases which can indicate an individual approach and vice versa. This is only a clue to observe certain tendencies which are manifested in the operation of cluster enterprises.

(which means falling to lower levels). The results of the research studies carried out by the Author indicate that moving an initiative to higher levels of cooperation advancement is largely decided by proximity established between the members (in various dimensions) (Author, 2018).

The article is focused only on two dimensions of proximity – geographical and competence proximity. It has been observed that at each level of cooperation a slightly different level of proximity is required in the analysed dimensions. The Author's observations on the significance of the above-mentioned proximity dimensions at all four cooperation levels in cluster initiatives have been comprised in eight hypotheses (see: Table 4).

Table 4**: Research hypotheses**

Level of cooperation	*Hypotheses regarding geographical proximity (H1)*	*Hypotheses regarding competence proximity (H2)*
I.	H1.I: Geographical proximity is a particularly significant development factor at the first level of cooperation (level I), because it facilitates building a network of relationships between cluster partners.	H2.I: Competence proximity is a significant development factor at the first level of cooperation (level I), because it facilitates building a network of relationships between cluster partners.
II.	H1.II: Geographical proximity is not a significant development factor at the second level of cooperation (level II), as co-location of partners is not necessary to achieve the objectives defined here.	H2.II: Competence proximity is a particularly significant development factor at the second level of cooperation (level II), because in order to achieve the objectives defined here, cluster members should represent the same or very similar range of competences (homogeneity).
III.	H1.III: Geographical proximity is a significant development factor on the third level of cooperation (level III), because it facilitates the impact on the external environment.	H2.III: Competence proximity is a significant development factor on the third level of cooperation (level III), because it facilitates the impact on the external environment.
IV.	H1.IV: Geographical proximity is not a significant development factor at the fourth level of cooperation (level IV), as co-location of partners is not necessary to achieve the objectives defined here.	H2.IV: Competence proximity is a particularly significant development factor at the fourth level of cooperation (level IV), however, in order to achieve the objectives defined here, cluster members should represent a different or extremely different range of competences (heterogeneity).

Source: own elaboration based on Author, 2018

The hypotheses presented above were formulated as a result of the conducted research, not on the basis of literature. Such an inductive approach is in fact typical for the Grounded Theory methodology. According to Glaser and Strauss, conceptual categories and relations between them (described in the form of research hypotheses) are supposed to "grow out" from the collected and analyzed data (Glaser&Strauss, 1967; Glaser, 1978). The table below presents some selected citations from the interviews which reflect the relationships described in the form of the H1.I-H1.IV and H2.I-H2.IV hypotheses (see: Table 5).

Table 5**: Research hypotheses – selected citations**

Level of cooperation	*Hypotheses regarding geographical proximity (H1)*	*Hypotheses regarding competence proximity (H2)*
Level I	H1.I "The fact that we are a bit far away from each other is very troublesome. The intensity of the contact has been weakened. Personal contact is the most important thing, and in this way, it is more difficult here."	H2.I "Similarly to a chamber of commerce, integration of the whole industry should take place in a cluster. Conferences, periodicals, visitors, firm presentations […]. Common topics and common problems bring us closer together."
Level II	H1.II No references to geographical proximity during the discussion of the aims defined at Level II	H2.II "We are a kind of metal industry, but it is broadly understood – aluminum, forges. We provide things for various sectors – for construction, heating boilers, a wide range, really. Wires, industrial diamonds, handles, stoves. When we asked cluster companies what they needed, each of them gave us a different answer."
Level III	H1.III "We have decided to do something for the region in terms of cooperation with the companies, some common lobbies and some of these regional initiatives have come off […]. We are supervisors in our region."	H2.III "This is an industry cluster, so since the beginning it has been very clear that this cluster is to solve certain problems in the sector in our region. The core motivation for the people who have been working here until the present moment is an opportunity to develop something different, to have influence, to learn from other people, to discuss problems in a constructive way which would not be harmful for any of us – and additionally, to establish relationships with some other entities, such as scientific institutions and university."
Level IV	H1.IV "We cooperate within some projects with the partners from various countries […] We have already worked with them on some projects, so we trust that they will be successful this time too."	H2.IV "Can a multi-industry approach generate problems? Here, another question should be answered: is a cluster a lobbing institution for a sector, or is it a place where innovation is created? We want it to be a space for innovation. This is why we foster an interdisciplinary approach."

Source: own elaboration based on Author, 2018

In accordance with the assumptions described in the form of the above-mentioned research hypotheses, geographical proximity is the most crucial element at the level I of cluster cooperation, because it facilitates the development of relations inside the cluster initiative through the elimination of distance barriers and regularity of face-to-face meetings. Such relations come as a foundation for the development of the subsequent cooperation levels (H1.I). Geographical proximity is also desirable with regard to the implementation of the objective defined for the cooperation level III, because the convergence of the objectives (resulting from common location) can motivate the cluster members to undertake joint efforts focused on the development of the particular region (H1.III). The specificity of cluster cooperation at the level II and IV does not require geographical proximity to be maintained. The objectives defined at both these levels can be also achieved when there is some geographical

distance between the partners (H1.II and H1.IV). It particularly refers to the cooperation level IV, where the most mature forms of cooperation between the cluster members can be observed, such as for example: implementation of common projects, development of common products/services, joint business operation.

Competence proximity becomes important at each level of cooperation, however, for the development of three first levels, it is advantageous for the cluster members to have similar competences. At the cooperation level I, competence proximity provides a common ground for understanding (facing common opportunities and threats characteristic for a particular industry, common knowledge basis, using the same jargon) which considerably facilitates establishing contacts and developing relations between the cluster members (H2.I). At the cooperation level II, based on the cluster members' homogenous competences, competence proximity allows the cluster initiative to adjust its offer to their requirements (H2.II). At the level III the convergence of objectives (resulting from competence proximity) may stimulate the cluster members to undertake common efforts towards the development of a particular industry and the development of favourable conditions for business operation of the entities functioning in that industry (e.g. through lobbing activities) (H2.III). At the level IV, it is more proper to discuss competence distance rather than proximity, because the forms of cooperation at this level require the partners to have diversified or even completely different competences in order to develop their cooperation based on mutual complementation of competences (H2.IV). Hence, at the discussed level the multi-branch strategy is highly advisable as it involves cooperation of enterprises representing various sectors of economy.

2.2 Operationalisation

Three variables are used for testing the research hypotheses: objectives [O], geographical proximity [GP] and competence proximity [CP]. The first variable refers to the degree of achievement of objectives assigned to each level of cooperation in cluster initiatives. Considering two subsequent variables in the research, namely: geographical and competence proximity, at first their conceptual definitions have been developed (see: Introduction) to determine the most important dimensions of each variable (see: Table 6).

Table 6**: List of variables**

Latent variables	*Observable variables*
Objectives [O]	Creation of a base network of relationships between cluster partners (level 1) [O1]
	Facilitation of the access to the increased pool of resources (level 2) [O2]
	Increase the quality of products and services and / or reduce costs (level 2) [O3]
	Impact on the external environment of the organization (level 3) [O4]
	Creation of conditions to create the common added value in the cluster initiative (level 4) [O5]
Geographical proximity [GP]	Geographical distance from the cluster initiative's headquarters (coordinator) [GP1]
	Time distance from the cluster initiative's headquarters (coordinator) [GP2]
	Geographical distance from the headquarters of most cluster companies [GP3]
Competence proximity [CP]	Cooperation of cluster companies with the same or very similar range of competences (the same industry, similar business profile) [CP1]
	Cooperation of cluster companies with a different range of competences (the same industry, complementary competences) [CP2]
	Cooperation of cluster companies with a completely different range of competences (different industry) [CP3]

Source: Author, 2018

In the case of geographical proximity, the geographic distance and the temporal distance are the observable variables. Considering the fact that the majority of meetings within cluster initiatives have been held at the coordinators' headquarters, the questions refer, first of all, to the distance of the cluster companies from the headquarters. The list of the variables describing geographical proximity has been enlarged by one more variable referring to the distance with regard to other cluster companies (due to such an operation, additional verification of the knowledge within the companies about the location of other initiative members has been provided).

The observable variables related to the competence proximity have been designed to differentiate cooperation in the cluster according to the range of competences of the cluster partners. The variables describing competence proximity have been defined in the categories of cooperation between cluster enterprises (hence, they have been based on the respondents' knowledge about their partners' competences). The aim of such an operation has been to focus only on the cooperation acts observed in the analysed cluster initiatives (however, it should be considered as some kind of simplification and viewed as research limitation).

The measurement tools have been based on the respondents' subjective assessment (see: Appendix 1). The aim of the research has been to identify attitudes of the individuals and an approach of the enterprises towards the analysed problems – not to obtain any specific data. Hence, the presented statements (similarly to the designed variables) contain some vague formulations on purpose, in order to facilitate answers to the questions and, in a paradoxical way, to increase credibility of these answers ("located *quite* close", "it doesn't take *a lot of* time", "located *near most of* the other companies", "*completely* different competences", etc.).

3 METHODS

In order to verify the research hypotheses presented above, the quantitative research was carried out at some selected cluster initiatives operating in Poland (June-July 2017). The selection of the cluster initiatives was based on the logic of extreme case sampling, and the main criterion for distinguishing the cluster initiatives was based on the sector of cluster initiative operation. In accordance with the above-mentioned logic, the research was carried out at four intentionally selected cluster initiatives: two initiatives operating in the ICT sector (Mazovia Cluster ICT and Interizon: Pomeranian Region ICT Cluster) and two initiatives functioning in the metal industry (Metal Working Eastern Cluster and Metal Cluster of Lubuskie Province). The analysed cluster initiatives are located in various regions of Poland, they differ in the number of their members (the ICT initiatives are considerably more numerous than metal initiatives), however they were established in the same period of time (all of them were registered at the end of the last decade, so they have been operating for over 8 years), and the majority of their members are small and middle-sized enterprises (see: Table 7). The research sample included 132 enterprises – the members of the above-mentioned cluster initiatives. The respondents were mainly the executives of the enterprises and people delegated to represent their enterprises in the cluster initiative.

Table 7: **Characteristics of the studied cluster initiatives**

Cluster initiative name	*Voivodeship*	*Creation date*	*Number of cluster members*
Metal Cluster of Lubuskie Province	Lubusz	2008	35
Metal Working Eastern Cluster	Lublin	2009	78
Mazovia Cluster ICT	Masovian	2007	200
Interizon: Pomeranian Region ICT Cluster	Pomeranian	2009	130

Source: own elaboration

The main research strategy involved non-experimental models (surveys), and the basic method of data collection was an online questionnaire (see: Appendix 1). In order to measure each operationalized variable, that is namely: geographical proximity [GP], competence proximity [CP], objectives [O] a 5-degree Likert scale was applied to analyse the basis of the units and an approach assumed by the enterprises towards the particular areas. For the above-mentioned variables an analysis of the applied scale reliability was performed – the values of the α-Cronbach coefficient ranged from 0,67 to 0,83 (O=0,83, I&K=0,91, GP=0,83, CP=0,67), which was within the accepted limits assumed for that coefficient.

The statistical analysis of data involved descriptive statistics (see: Appendix 2) and the analysis of interdependency of the variables. The results of the analysis of interdependencies observed between geographical proximity and the objectives [GP-O] were used to test the research hypotheses H1.I-H1.IV, while the results obtained for the variables: competence proximity and the objectives [CP-O] were used to test the hypotheses H2.I-H2.IV. Considering the fact that the variables applied in the research were of order nature, Kendall's tau-b coefficient was applied. Kendall's tau-b coefficient is a symmetrical coefficient which may take the value ranging from –1 to +1, hence, in this case, it

was possible to determine the direction of the dependency (directly or inversely proportional). It was also assumed that the particular dependency between the variables would be considered as statistically significant in the case where $p \leq 0,05$.

4 RESULTS

4.1 The significance of geographical proximity at different levels of cooperation in cluster initiatives

Cluster initiatives differed in the level of geographical proximity (see: Table 8). However, in all initiatives the distance between the company's headquarters and the coordinator's office was smaller than the distance between cluster enterprises.

Table 8: **Geographical proximity – results for each cluster initiative**

Cluster initiative name	*Number of respondents*	*No.*			*[%]*		
		GP1	*GP2*	*GP3*	*GP1*	*GP2*	*GP3*
Metal Cluster of Lubuskie Province	13	12	12	6	92%	92%	46%
Metal Working Eastern Cluster	38	22	21	7	58%	55%	18%
Mazovia Cluster ICT	45	20	20	6	44%	44%	13%
Interizon: Pomeranian Region ICT Cluster	36	31	30	14	86%	83%	39%

Source: own elaboration

The results for [GP1] and [GP2] variables were twice or even three times higher than for [GP3] (weaker results for [GP3] may also result from the lack of respondents' knowledge about the location of other cluster entities). The level of geographical proximity did not depend on the sector – the largest proximity occured in one of the metal initiatives (Metal Cluster of Lubuskie Province), and the smallest in one of the ICT initiatives (Mazovia Cluster ICT).

The analysis of interdependencies between geographical proximity [GP] and the defined developmental objectives of the cluster initiative [O] indicated a positive correlation only at two levels of cooperation – with the O1 variable and with the O4 variable (see: Table 9).

Table 9: **Results of analysis of variable interdependencies [GP]–[O]**

Geographical proximity	*Levels*	*I*	*II*	*II*	*III*	*IV*
	Objectives	*O1*	*O2*	*O3*	*O4*	*O5*
GP1	Correlation coefficient	,196**	,085	-,015	,109	,089
	Sig. (2-tailed)	,006	,245	,838	,134	,224
GP2	Correlation coefficient	,130	,093	-,044	,086	,081
	Sig. (2-tailed)	,071	,204	,548	,237	,266
GP3	Correlation coefficient	,195**	,080	,030	,190**	-,011
	Sig. (2-tailed)	,007	,276	,684	,009	,886

Source: own elaboration

However, the results indicated that geographical proximity was correlated in direct proportion to the O1 variable only in relation to the geographical distance from the coordinator's headquarters [GP1] and the majority of the cluster enterprises [GP3], whereas there were not any dependencies observed in relation to the temporal distance from the coordinator's headquarters [GP2]. Furthermore, considering the fact that both analysed pairs of the variables indicated weak correlation (GP1-O1: 0,196, GP3-O1: 0,195, $p<0,01$), the hypothesis H1.I can be only partially accepted. The objective O4 defined at the cooperation level III was (weakly) positively correlated only to one variable which described geographical proximity – GP3 (0,190, $p<0,01$), therefore also the hypothesis H1.III can be only partially accepted. It would be worth emphasizing that the dependencies between the GP variable and O1 were confirmed only for the ICT initiatives (GP1-O1: 0,276, GP3-O1: 0,252, $p<0,01$), whereas the correlations between GP and O3 were observed only in the metal initiatives (GP3-O3: 0,241, $p<0,05$); this fact means that both these hypotheses should be accepted with caution (H1.I and H1.III).

In the case of other variables, namely: O2 and O3 (attributed to the cooperation level II) and O5 (defined at the cooperation level IV) there was no correlation with geographical proximity observed (also in the analysis performed separately for the initiatives from both sectors: ICT and metal), which complied with the assumptions of the theoretical concept developed by the Author, and at the same time, it confirmed the hypotheses H1.II and H1.IV.

4.2 The significance of competence proximity at different levels of cooperation in cluster initiatives

The results of the study showed that, similarly as in the case of geographical proximity, the level of competence proximity was not dependent on the economic sector (see: Table 10).

Table 10: **Competence proximity – results for each cluster initiative**

Cluster initiative name	*Number of respondents*	*No.*			*[%]*		
		CP1	*CP2*	*CP3*	*CP1*	*CP2*	*CP3*
Metal Cluster of Lubuskie Province	13	4	7	4	31%	54%	31%
Metal Working Eastern Cluster	38	18	8	2	47%	21%	5%
Mazovia Cluster ICT	45	18	11	11	40%	24%	24%
Interizon: Pomeranian Region ICT Cluster	36	13	13	5	36%	36%	14%

Source: own elaboration

Cooperation in the studied cluster initiatives was more frequent between companies with similar (ie the same or complementary competences: [CP1] or [CP2]), and less often between entities with a completely different range of competences ([CP3]). This may be related to the selection criteria of members used by cluster initiatives (because these are industry-specific organizations – they focus primarily on enterprises from a given industry).

Performed for competence proximity [CP] and the objectives attributed to the particular cluster cooperation levels [O], the analysis of interdependencies indicated that the proportion of the obtained values of the correlation coefficient changed with the subsequent levels of cooperation (see: Table 11).

Table 11: **Results of analysis of variable interdependencies [CP]–[O]**

Competence proximity	*Levels*	*I*	*II*	*II*	*III*	*IV*
	Objectives	*O1*	*O2*	*O3*	*O4*	*O5*
CP1	Correlationcoefficient	,301**	,187**	,107	,163*	,159*
	Sig. (2-tailed)	,000	,010	,144	,024	,027
CP2	Correlation coefficient	,243**	,209**	,111	,127	,178*
	Sig. (2-tailed)	,001	,004	,130	,076	,014
CP3	Correlation coefficient	,156*	,172*	,141	,187**	,170*
	Sig. (2-tailed)	,030	,019	,056	,010	,019

Source: own elaboration

At the cooperation level I, the strongest (positive) dependencies for the attributed O1 variable were observed with the CP1 variable which refers to the cooperation based on the same (or very similar) set of competences represented by the cluster partners. The strength of dependencies between the analysed variables becomes lower with an increase in the differences in the competences (CP1-O1: 0,301, CP2-O1: 0,243, $p<0,01$, CP3-O1: 0,156, $p<0,05$). It confirms the assumptions made for the theoretical concept, according to which competence proximity facilitates the achievement of the objectives set at the initial stage of the cluster initiative functioning – a common platform of understanding is formed, as it helps to establish and develop relations inside the initiatives. Hence, the hypothesis H2.I can be accepted.

In accordance with the assumptions of the developed theoretical concept, competence proximity plays a particularly important role at the cluster cooperation level II. The objectives related to the access to an increased pool of resources provided to the cluster enterprises [O2], the increased quality of products and services and/or a decrease in the costs of running business operations (as a result of becoming similar) [O3] become easier to achieve when the cooperating cluster companies operate in the same industry, and they have the same (or similar) or complementary sets of competences. Considering the set of competences represented by the cluster members [CP] and the level of the implementation of the objectives at the cooperation level II, positive correlation was observed only for the objective O2, whereas there were not any dependencies observed for the other objective defined here, O3 (which may result from the weak activity of the members of the analysed initiatives in the discussed field). Considering the dependencies between CP and O2, there were directly proportional dependencies observed simultaneously for all three CP variables (regardless of the partners' competences). The relatively strongest correlation appeared in a situation where the partners represented different (but complementary) competences (CP2-O2: 0,209, $p<0,01$), whereas the weakest correlation was observed in a situation where the partners represented a completely different range of competences (CP3-O2: 0,172, $p<0,05$). Hence, the results of the analysis of interdependencies obtained for the cooperation level II confirm the hypothesis H2.II only in a partial way.

Subsequently, at two highest cooperation levels (III and IV) the strength of the correlation between competence proximity CP1 (cooperation based on the partners' homogenous competences) and the objectives which were defined there (O4 and O5) was weaker in comparison to the lower

levels (I and II) (CP1-O4: 0,163, CP1-O5: 0,159, p<0,05, for comparison: CP1-O1: 0,301, p<0,01). The inverse proportions were obtained in the analysis of interdependencies between CP3 (cooperation based on heterogeneous competences) – the correlation coefficient reached the higher values for O4 and O5 (0,187 and 0,170, p<0,05, for comparison: CP3-O1: 0,156, p<0,05). Hence, it suggests that the importance of competence proximity (however, the differences in the obtained results are not significant) is decreased with the development of cluster cooperation (and with the achievement of the highest levels). It confirms the assumptions made for the cooperation level IV (and, at the same time, it positively verifies the hypothesis H2.IV), however it throws into question the assumptions made for the cooperation level III (reflected in the hypothesis H2.III). It has been assumed that at the level III cooperation takes place, first of all, between the cluster members who operate in the same economic sectors – competence proximity and a similar profile of business unites entities around their common problems, and it indicates a common direction for the activities of the member enterprises. Nevertheless, in the research the inverse proportions were obtained (CP1-O4: 0,163, CP2-O4: no correlation, CP3-O4: 0,187, p<0,05).

As presented above, the dependencies between competence proximity [CP] and the objectives attributed to the particular cluster cooperation levels [O] were repeated only in the ICT initiatives, whereas in metal initiatives there were not any correlations observed between the analysed variables. Furthermore, in the ICT initiatives the expected correlations between the CP2 and O2 variables were confirmed – the strongest dependencies were observed when the cluster enterprises were characterised by the same (or very similar) – and subsequently – complementary range of competences (0,325 and 0,250, p<0,01); the lowest value of the correlation coefficient appeared with a set of entirely different competences (0,226, p<0,05).

5 DISCUSSION

The analysis of interdependencies allowed the Author to test the research hypotheses formulated in the study. Considering the hypotheses which refer to geographical proximity, those which emphasized the role of geographical proximity at the cooperation level I and III were partially accepted (H1.I and H1.III). There were also two subsequent hypothesis accepted, namely: those which marginalised the role of geographical proximity at the level II and IV (H1.II and H1.IV) (see: Table 12).

Table 12: **Verification of research hypotheses**

Hypotheses regarding geographical proximity (H1)			*Hypotheses regarding competence proximity (H2)*		
H1.I		Partial acceptance	H2.I		Acceptance
H1.II		Acceptance	H2.II		Partial acceptance
H1.III		Partial acceptance	H2.III		Rejection
H1.IV		Acceptance	H2.IV		Acceptance

Source: own elaboration

Considering the obtained results, it is hence possible to state that geographical proximity is a more important developmental factor at the initial stages in the development of a cluster initiative (at the level I and III which – in accordance with the developed concept referring to the developmental trajectory of cooperative relations in cluster initiatives – can be implemented simultaneously with the level II and IV). The importance of the common location factor is decreased when higher levels of cooperation (II and IV) are achieved.

Competence proximity comes as a more complex type of proximity – in accordance with the developed concept, depending on a particular cooperation level, the cluster partners are expected to represent a slightly different set of competences. The research results confirmed two formulated hypotheses (H2.I and H2.IV), one was partially confirmed (H2.II), and one was rejected (H2.III). Hence, based on the obtained results, it is possible to state that at the initial cooperation level I, the cluster members should be related by their broadly understood affiliation with the same industry, and the partners should represent a similar set of competences, which allows them to develop mutual understanding (H2.I). At the last level IV, the range of competences should be extended to the point where the cluster members are able to develop some more mature forms of their cooperation, based on complementation of the missing resources. Common implementation of projects or cooperation in the chain of values (which involves sharing the particular stages in the process of manufacturing products or providing services) requires the partners to represent a complementary (and in some cases even an entirely different) set of competences which would allow them to complement the missing resources and to delegate tasks with regard to each cooperator's specialisation (H2.IV). At the cooperation level II, the lack of explicit presumptions (a partial acceptance of H2.II because of the obtained results in the field of interdependencies between the CP-O2 variables and the lack of correlation between CP-OC3) makes it impossible to indicate the cluster partners' most optimal set of competences. Subsequently, the rejection of the hypothesis H2.III allows us to draw a conclusion that the convergence of the objectives (fostering cluster cooperation at the level III) can be considered not only through the prism of common industry affiliation, but also through the prism of cooperation based on the differences in the partners' competences (it refers to cooperation within the chain of values, for example). In the latter case, common objectives and efforts (made to implement them) can be focused on providing proper conditions that would foster the development of the established cooperation between the partners.

6 CONCLUSIONS

The most important argument resulting from the implemented research study is the ascertainment of the fact that it is impossible to indicate any optimal level of proximity in the cluster initiative, both in its geographical and competence dimensions. The research results indicate that it largely depends on the level of cooperation development in the cluster initiative.

At the initial stages of the cluster initiative development (both geographical and competence) proximity may become an element which integrates the group and stimulates the cluster members to implement common operations. The spatial dimension of proximity can be particularly considered to be crucial for the mechanisms that initiate cooperation in cluster initiatives. Geographical proximity may facilitate personal commitment to activities undertaken within the cluster, contributing to the development of social proximity, which – in turn – can lead to the development of some more mature forms of relations between the partners. Hence, it is right to agree with the view presented by the representatives of the stream which emphasizes the importance of geographical proximity in the functioning of enterprises (Weterings 2006; Boschma&Wal 2007; Suire& Vicente 2009; Hoekman et al. 2010, Boschma et al. 2014), stating that despite pervasive globalisation processes, most relations take the form of direct interaction between entities which are located close to each other.

However, in more mature forms of cooperation, the factors of common location and industry affiliation do not play such a significant role. At the higher cooperation levels, geographical proximity may be partially replaced by other dimensions of proximity developed between some members of the group: social, cognitive or organisational proximity. Considering competence proximity, in some forms of cooperation (e.g. implementation of common projects, cooperation in a supply chain) it is recommended to maintain some competence distance between the partners.

The discussed research is not free from limitations. The first limitation involves the static character of the data. The research was carried out at a particular moment in time, hence it presents each analysed initiative at a particular stage of its development, whereas proximity is of dynamic nature – its dimensions change when a cluster initiative reaches higher levels of cooperation. The second limitation refers to the measurement instruments. In the research the original measurement tools have been designed, as there have not been any adequate constructs found in expert literature, although the defined variables prove to be reliable. The third limitation refers to subjectivism, because the research has been based on the respondents' subjective opinions, expressed with the use of the designed measurement tools. The fourth limitation comes with a small and relatively weakly differentiated research sample, however it complies with the initial assumptions. The fifth limitation refers to the technique applied to the analysis of the data. The formulated sets of hypotheses H1.I-H1.IV and H2.I-H2.IV assume (to a certain extent) the influence of one variable on another variable, whereas the tests have been carried out with the use of the correlation coefficient which does not inform about the direction of the relation. The direction of the relation has been determined on the basis of logical relation between the analysed variables: it has been silently assumed that proximity (in its geographical or competence dimension) affects efficiency in the achievement of the defined aims, not the vice versa.

Nevertheless, the above-mentioned limitations do not question the cognitive value of the study; they rather come as a starting point for further empirical research. It is advisable to repeat the research

with the use of the same measurement instruments on a larger, random sample with consideration of some other economic sectors (higher representativeness of the research) and to set at least two moments of measurement. It would allow us to analyse the dynamics of proximity in a more adequate way and to increase representativeness of the research. It would also allow us to confirm the theoretical constructs; if the obtained results prove to be convergent with the already achieved outcomes, the universality of the observed dependencies can be demonstrated. Furthermore, a more solid base to assume or to reject the research hypotheses which have been formulated is structural equation modeling that – contrary to the analysis referring to interdependencies of the variables – allows us to establish the direction of the relation between the variables.

Considering practical implications, introducing the category of proximity into the developed concept of developmental trajectory of cooperative relations in cluster initiatives facilitates understanding the mechanisms which control development of cooperation in such organisations. Knowledge about the significance of proximity in its geographical and competence dimensions at various levels of cluster cooperation allows interested parties to manage the initiative in a more efficient way, improving competitiveness of cluster enterprises. As it has been observed, the achievement of certain developmental aims is related to a particular level of proximity (considering the analysed dimensions). It justifies the necessity to establish entrance barriers for cluster initiatives which refer to the geographical range, the "width" and "depth" of particular initiatives.

Appendix 1: **Questions in the questionnaire**

Objectives [O]
Please specify which of these objectives have been achieved during your membership in the cluster. Please select the answer which best reflects your opinion (only one) for each of the following objectives (by putting an "x" in the appropriate square). (1) Ease of building a network of relationships with other companies (cluster members). (2) Access to a wide pool of resources (both tangible and intangible), provided both by the cluster and by the cluster companies. (3) Improvements in the quality of products and services and/or reduction of business costs (eg through a shared group purchases, promotion system, distribution channels, etc.). (4) Exertion of greater influence on public authorities and other institutions (eg educational institutions), by pooling together forces within the cluster. (5) Development of cooperation with other cluster entities - implementation of joint projects, development of common products/services, setting up joint business, etc.
Geographical proximity [GP]
Below is a list of statements related to the location of your business. Please select the answer which best reflects your opinion (only one) for each of the following statements (by putting an "x" in the appropriate square). (1) Our company is located quite close to the cluster coordinator. (2) Usually, it doesn't take me a lot of time to get to my cluster coordinator. (3) Our company is located near most of the other companies in the cluster.
Competence proximity [CP]
Below is a list of statements related to the scope of competences of cluster companies (understood as the scope of knowledge and skills) in the context of cluster cooperation. Please select the answer which best reflects your opinion (only one) for each of the following statements (by putting an "x" in the appropriate square). (1) Our company works with cluster companies that have the same or very similar competence (belong to the same industry, have a similar business profile). (2) Our company works with cluster companies that are different from our field of expertise (they belong to the

same industry and their competencies are complementary to ours).
(3) Our company works with cluster companies that have a completely different competences (they belong to other industries).

Scale: 1 (definitely not), 2 (rather not), 3 (hard to say), 5 (rather yes), 5 (definitely yes)

Source: own elaboration

Appendix 2: **Results of statistical analysis**

Variable	*Symbol*	*Average*	*Median*	*Dominant*	*Standard deviation*	*Cronbach's alpha*
Geographical proximity [GP]	GP1	3,48	4	4	1,34	0,83
	GP2	3,45	4	4	1,32	
	GP3	2,98	3	3	0,99	
Competence proximity [CP]	CP1	2,80	3	4	1,36	0,67
	CP2	2,60	3	1,00[a]	1,24	
	CP3	2,27	2	1	1,16	
Objectives [O]	O1	2,82	3	1	1,49	0,83
	O2	2,14	2	1	1,23	
	O3	2,02	2	1	1,14	
	O4	2,31	2	1	1,38	
	O5	2,17	2	1	1,30	

Source: own elaboration

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