

## Knowledge Flows in Cluster Organizations

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**Abstract.** *This paper aims to identify knowledge flows in cluster organizations (COs). On the basis of a literature analysis on knowledge flows and cluster organizations, the following research question was formulated: What kind of knowledge flows can be identified in cluster organizations and what are their main characteristics? The paper is based on a literature analysis and Grounded Theory methodology, examining four purposefully selected cluster organizations in Poland. To answer the research question, in total 35 in-depth individual interviews were conducted with cluster entities. The results of the study show that there are two major types of knowledge flows in cluster organizations that can be identified, namely: internal transfer understood as transmission of knowledge and information inside COs (among cluster entities) and acquiring knowledge and information from outside COs/ transmission outside COs. As far as the characteristics of the identified knowledge flows are concerned, they can be defined with regard to the type of information and knowledge in the analyzed knowledge flows as well as the commitment (key activities) in cluster cooperation. The study demonstrates that in some knowledge flows only selected, the most engaged cluster members take part. Depending on the form of commitment, they can participate in one-way or two-way flows of knowledge and information. The paper contributes to a better understanding of the potential knowledge flows in cluster organizations and their characteristics. The novelty of the paper resides in the fact that so far the topic of knowledge flows among cluster organizations has been examined in a fragmented way and there is a scarcity of research in this area. However, research results are limited to four cluster organizations, all located in Poland. As such, they cannot illustrate the whole picture of cluster entities from other countries. The subjectivity of qualitative research also does not allow generalizing results on the entire population of cluster organizations in Poland. Propositions formulated on the basis of qualitative research should be tested on a larger sample, on the basis of quantitative research.*

**Keywords:** *knowledge management; knowledge flow; cluster organization.*

### Introduction

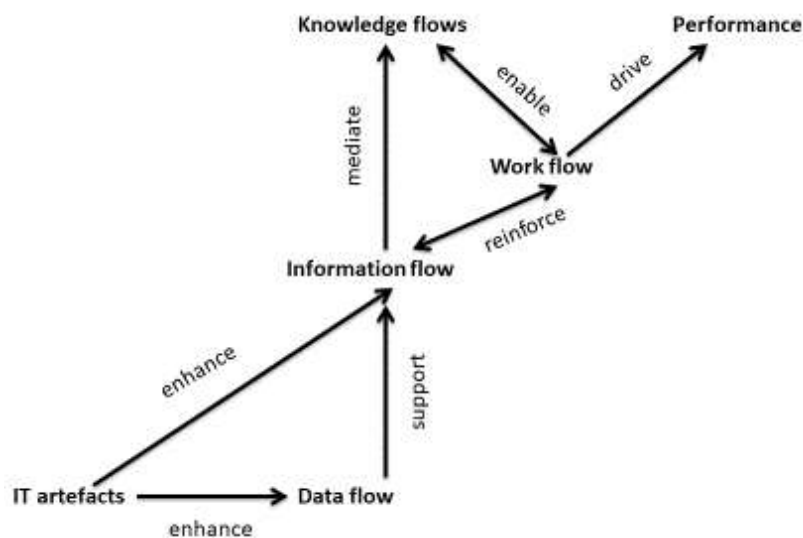
Knowledge is considered to be a strategic asset for organizations in the knowledge-based economy (Bollinger & Smith, 2001). It is the knowledge that can be the source of competitive advantage and help organizations in conducting their operations (Omerzel & Gulev, 2011). Keeping that in mind, it can be assumed that knowledge flows inside organizations and between organizations and the environment deserve a special kind of attention from the researchers. This is particularly true for clusters (Porter, 1998, 2000), which significance for the innovativeness and the whole economy has been already established (Karlsson, 2008; Novelli, Schmitz, & Spencer, 2006). At the same time, little is still known about knowledge flows inside and outside cluster organizations which can be understood as cluster initiatives undertaking “organized efforts to increase the growth and competitiveness of clusters within a region, involving cluster firms, government and/or the research community” (Lindqvist, Ketels, & Sölvell, 2013, p. 1; Sölvell, Lindqvist, & Ketels, 2003, p.9). This paper aims to fill this research gap by presenting an exploratory study conducted among selected cluster organizations from Poland.

The paper articulated as follows. In the next section selected issues devoted to cluster organizations and knowledge flows are presented. In the third section, the methodology and sample are described. The fourth

section illustrates the results of the conducted study, while the next section discusses the main outputs. The last section concludes with the key points and some study limitations.

### Cluster organizations and knowledge flows

Before being able to analyze the phenomenon of knowledge flows in cluster organizations, it is necessary to define both terms, i.e. knowledge flows and cluster organizations. Knowledge flows are a category still undefined in the literature. Although this concept is quite commonly used in many scientific studies (e.g. Alcacer & Gittelman, 2006; Huggins, Johnston, & Thompson, 2012; Nissen, 2005; Sammarra & Biggiero, 2008), there is hardly any definition of a knowledge flow provided. The explanation provided by Nissen (2006) highlights the relation between knowledge flows and data and information flows. First of all, it should be pointed out that knowledge differs from information and data in terms of enabling competitive advantage for organizations. The transfer of information and data through computers, networks, reports, and messages does not create a flow of knowledge, at least not directly (Nissen, 2006, p.12). As stated by Nissen (2005), knowledge flows are closely related to information and data flows: data flows support information flows, and these in turn partially determine the flow of knowledge. At the same time, the flow of knowledge does not directly translate into the organization's results (they are hard to measure and noticeable), but by supporting workflows they contribute to improving the achieved results. This approach is depicted in Figure 1.



**Figure 1.** The relation between knowledge flow, information flow, data flow and workflow (Nissen, 2006, p.255)

To conclude, knowledge flows are closely related to data flows, information flows, and also workflows in organizations. According to the authors of this paper, knowledge flows can be defined as the transfer (one way or two ways) of knowledge between people and/or organizations. That is the understanding of knowledge flows applied in this paper.

Knowledge flows understood in this way can be of different types and characteristics. First of all, they can be divided into internal and external ones, where internal flows take place inside the organization and external ones happen between the inside and the outside of an organization. Secondly, the type of knowledge being the subject of the flow can be the base for the next differentiation of knowledge flows. Here we can distinguish the flows of tacit knowledge and the flows of explicit knowledge. Tacit knowledge is usually a better source of competitive advantage than explicit knowledge (von Hippel, 1999) mostly due to the fact that it is less transferable and more 'sticky' to the person who is in its possession. Knowledge itself has also an additional value – it influences the possibility to use the remaining resources of organizations, both material and non-material ones (Omerzel & Gulev, 2011). The significance of knowledge flows for the success of organizations seems to be unquestionable (Gupta & Govindarajan, 2000; Liebeskind, 1996) and it is definitely worth to examine this phenomenon in organizations.

Cluster organizations can be defined as “the legal entities that support the strengthening of collaboration, networking and learning in innovation clusters and act as innovation support providers by providing or channeling specialized and customized business support services to stimulate innovation activities, especially in SMEs” (EU, 2019). They play a pivotal role in the deepening and strengthening of relations between firms of different sizes and between other entities within the cluster, such as research institutes, capital, and governmental agencies or educational institutions (Furman, Porter, & Stern, 2002). Cluster organization is based on three main pillars: 1) networking, information spread and cluster identity, 2) helping in innovation initiatives undertaken by cluster actors, and 3) supporting business development projects realized by cluster actors (Sölvell, 2015).

Knowledge in clusters seems to be of high importance, as there are studies devoted to various aspects related to knowledge in clusters (Gertler & Wolfe, 2006; Kesidou & Snijders, 2012; Malmberg & Power, 2006). In a study by Malmberg and Power (2006) the authors have postulated that knowledge creation in the cluster can be the result of a) inter-organizational collaborative interaction on a local level; b) intensified rivalry and competition; c) spillover resulting from the mobility and sociability of persons engaged in cluster organizations. There are also some studies available devoted to knowledge flows on regional and non-regional levels (Weterings & Ponds, 2009) or the issues of redundant knowledge associated with geographic networks of organizations (Molina-Morales & Expósito-Langa, 2013). However, so far there are no studies devoted to knowledge flows among particular cluster organizations and their cluster entities. At the same time, in the case of cluster organizations, it is expected that different types of knowledge flows will be identified there and that there will be certain features influencing the existence of particular types of flows. Therefore, the aim of this study is to answer the following research question: What kind of knowledge flows can be identified in cluster organizations and what is their main characteristics?

### Methodology and sample

To answer the above research question, we conducted an exploratory, qualitative study. The study is part of a larger study devoted to the development of a trajectory concept for the development of cooperative relationships in cluster initiatives (Author, 2018). The study was based on the methodology of grounded theory (Glaser, 2008; Glaser & Strauss, 2017). The basic technique of data collection was partially structured, in-depth direct interviews, while the analysis and interpretation of data were carried out using the coding technique. The selection of the research sample was based on extreme cases logic. The research was carried out in the first half of 2016 in four targeted cluster organizations operating in Poland – two from the metal industry and two from the ICT industry. As part of the study, a total of 35 individual in-depth interviews were conducted with the coordinators and selected cluster members. Methodological triangulation was also used in the study. Additional secondary data were analyzed (websites, materials made available by COs).

The coding procedure consisted of three stages: open coding, axial coding, and selective coding. At the stage of the open coding, common topics emerged based on the research carried out. At the stage of the axial coding, the individual topics were classified with the type of knowledge flows (category 1), the type of information and knowledge (category 2), and the type of commitment (category 3) (Table 1).

**Table 1.** *The axial coding*

No.	Category	Peculiarities
1.	Type of knowledge flows	<ul style="list-style-type: none"> <li>– Internal transfer within CO</li> <li>– Acquiring from outside CO/transmission outside Co</li> </ul>
2.	Type of information and knowledge	<ul style="list-style-type: none"> <li>– General information</li> <li>– Significant information about the socio-economic environment</li> <li>– Detailed information</li> <li>– Confidential information</li> <li>– New knowledge</li> </ul>
3.	Type of involvement (key activities)	<ul style="list-style-type: none"> <li>– Meetings</li> <li>– Events</li> <li>– Meeting with entities from an outside cluster</li> <li>– Lobbying</li> <li>– Task groups</li> <li>– Projects</li> </ul>

At the stage of the selective coding, the categories were grouped fall into one of the two identified knowledge flows analyzed in the research (Table 2).

**Table 2.** *The selective coding*

Category 1. Type of knowledge flows [KF]	Category 2. Type of information and knowledge [I&K]	Category 3. Type of commitment [C]
Internal transfer (within CO)	General information	Meetings Events
	Detailed information	Task groups
	Confidential information and knowledge	Projects
Acquiring from outside CO/transmission outside CO	Significant information about the socio-economic environment	Meeting with entities from outside CO Lobbying

## Results

As a result of the research, it was possible to identify two main information and knowledge flows in cluster organizations. The first of them – internal transfer of information – should be understood as a transmission of knowledge inside a cluster organization. Depending on the form of engagement, cluster members gain access to various information and knowledge resources. The most basic type of information obtained within internal transfer is general information, first of all about other members, and secondly – about the immediate environment in which the CO and the affiliated entities operate. This information is very diverse, and at the same time at a fairly high level of generality. Barriers to access this type of information are quite low. All members of cluster organizations have access to them, taking part in meetings initiated within the framework of CO (formal meetings, networking, discussions, etc.) or events organized by or through the cluster (fairs, training, study visits, economic missions, etc.) (Table 3, q.1-2).

The subsequently distinguished information – detailed information – is suitably selected and personalized, and therefore better suited to the profile and needs of cluster entities. They enable these entities to better identify the origins of resources, which allows them – when making additional efforts – to fill the missing resources with the resources of partner companies. Detailed information is obtainable within the framework of CO in the case when cooperation between the cluster entities involves cooperation outside of participation in meetings and events. The most often observed forms of engagement that allow access to this kind of information are meetings of working groups (task groups), aimed at solving common problems of a selected group of entities (Table 3, q. 3-4).

The research shows that the last two types of resources are available only for selected cluster members who participate in project groups and consortia. The trust relationships developed during the project collaboration allow for greater openness and sharing of confidential information reserved for the most trusted partners. During the joint implementation of projects, there is also an exchange of knowledge held by individual consortium members. New knowledge is also created in the projects, which is shared between the participants (in accordance with the contractual terms and conditions) (Table 3, q. 5-6).

**Table 3.** *Internal transfer of knowledge and information within-cluster organizations*

[I&K]	[C]	Selected quotations
General information	Meetings Events	(1) „That is why companies come to meetings of business clubs, clusters, to exchange this general information, to know what is being planned there.” (A7) (2) „I assume that if there is a conference, discussions, meetings, and by the way, we exchange views there, it gives a lot. There must be information flow in the cluster, even such gossip meetings, it also brings us to action, or indicates the directions in which we can work together.” (B10)
Detailed information	Task groups	(3) „To supplement and expand my capabilities, I got to know the local market intensively and, among other things, the cluster allowed me to do so. And then we know exactly what company, has which machine, and we can take advantage of that because we know each other quite enough”. (A6)

[I&K]	[C]	Selected quotations
		(4) „This industry is so extensive; knowledge is so vast that it cannot be fully understood. Therefore, it is imperative to choose the appropriate thematic threads and someone has to do it for someone to cede. It is best for companies that hope to develop their business in specific directions and will dig.” (D10)
Confidential information and knowledge	Projects	(5) „We like each other and we trust each other because we have completed one project together. We have one, two partners, now the third one is joining, with whom we are able to cooperate. [...] Thanks to that we are able to trust each other, exchange information, talk about new possibilities”. (D9) (6) „Knowledge arises in projects. Some of the documents are open to everyone, part only for people who have carried out these projects.” (D5)

Note: A, B, C, D states for cluster A, B, C, D, respectively, while 1, 2...n denotes a particular interviewee

The second identified flow refers to acquiring knowledge from the outside of CO and to the transmission of knowledge from the outside of CO, including identification of knowledge sources, acquisition and selection of information. According to the research, in comparison with the internal flow, the main focus is on acquiring knowledge and information from the closer and further surroundings of the cluster (Table 4, q. 1-2). Cluster organizations, acting on behalf and in the interest of their members, are a partner for public authorities and other institutions (including non-governmental institutions, R & D institutions, etc.). They can also appear in various types of decision-making bodies, influencing the process of shaping and development of policy (e.g. in the area of innovation, education, labor market, etc.) (Table 4, q.3-4). Thanks to the above actions, cluster members may have priority in obtaining relevant information, building their competitive advantage on the market. All cluster entities get access to such information, although the greatest benefits are due to those members who are directly involved in activities undertaken in a given area.

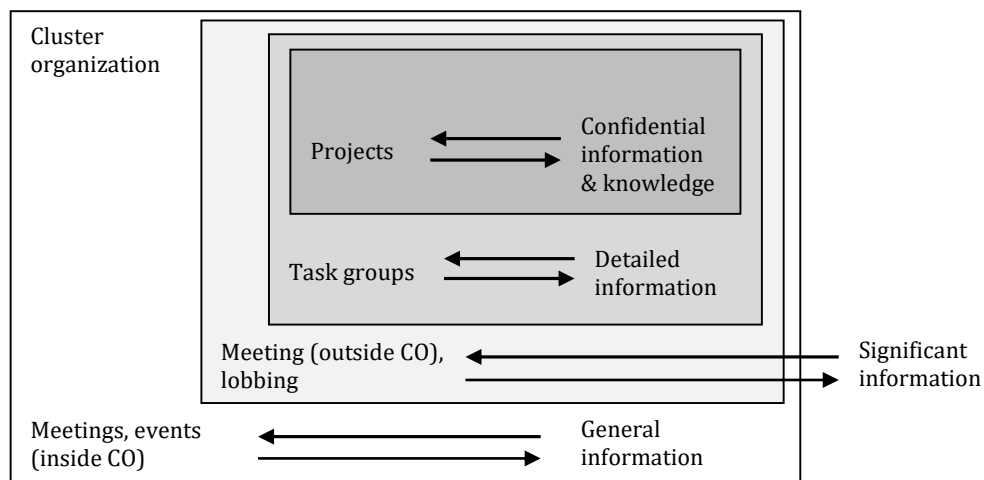
**Table 4.** *Acquiring from outside CO and transmission outside cluster organizations*

[I&K]	[C]	Selected quotations
Significant information about the socio-economic environment	Meeting with entities from outside CO Lobbying	Acquiring from outside CO (1) „However, the cluster is a big institution and thanks to that it can receive first-hand materials, and not everyone has access to them, e.g. from the meetings of the EU institutions.” (C6) (2) „The involved cluster members first learn about the created, emerging consortia for projects from the European Commission, from large grants.” (D1)
		Transmission outside CO (3) „A cluster is an entity whose voice is taken into account when creating strategic action plans (at the regional, industry level). We consult reports of local government institutions.” (D2) (4) „But there is also something in which the coordinator would like to get involved, that is, the cluster should fit into the creation of law. This is good because you can influence different things.” (C6)

Note: A, B, C, D states for cluster A, B, C, D, respectively, while 1, 2...n denotes a particular interviewee

## Discussion

The conducted research shows that all entities grouped in a given cluster organization can participate in both types of identified knowledge flows. However, it has been observed that with the transition to the higher levels of cluster cooperation development, the group of entities taking part in knowledge and information flows decreases. This is related to the form of cluster members' involvement in activities implemented within-cluster organizations, which in turn translates into access to a specific pool of knowledge and information. The largest share of cluster entities has access to general information, while other types of resources are reserved for selected subgroups, made up of more active members. This means that access to confidential information and knowledge is available only to the most involved cluster members (Figure 2).



**Figure 2.** Information and knowledge flows in cluster organizations

The research results also show that each of the distinguished types of resources obtained in CO can be transmitted on the basis of both one-way (unidirectional) and two-way (bidirectional) flow of information and knowledge. In the case of unidirectional flow, the main source (sender/transmitter) is the coordinator (or other persons from the CO Management Board), and the recipients – cluster members. Unidirectional flow is reflected in lower levels of engagement, especially in the context of the socio-economic environment (which does not mean that there is no bidirectional flow). On the other hand, in the bidirectional flow of information and knowledge, all cluster entities can act as both the sender and the recipient. Bidirectional flow occurs with detailed information, confidential information, and knowledge, so when there are direct interactions between the involved entities not requiring intermediation from the coordinator.

## Conclusions

Cluster organizations are important in the economy due to their influence on the innovativeness of cluster members (Novelli et al., 2006). This innovativeness can be supported by knowledge and various processes related to knowledge (Kesidou & Snijders, 2012; Leiponen, 2005). Cluster organizations are considered to be an important tool of innovation policy (Karlsson, 2008), and their role is to support innovative activity, including knowledge flows between cluster members. The findings of the research indicate that there are two major types of knowledge flows that cluster entities need to concentrate on: internal and external ones. What is important is to keep in mind by the cluster members that only by their direct engagement in the activities of the cluster organization (e.g. participation in projects, team working, task groups, etc.), they can get access to the most valuable information and knowledge. The information and knowledge freely available within the cluster organization is of potential little effect on the competitive advantage of firms, and therefore, it is the least valuable. If a cluster member wants to obtain the most valuable knowledge and has the benefit of accessing it as one of the first recipients, it must involve in the common projects and team working. Only then there is a chance for getting the knowledge at first.

The results of the conducted research also offer practical implications. Knowledge about knowledge transfer mechanisms and information inside and outside CO allows for more effective actions aimed at providing cluster members with a diverse pool of knowledge and information resources. It is particularly important to initiate activities conducive to the exchange of knowledge and to involve in them as many cluster entities as possible.

The present study is not free from limitations. First of all, the presented material constitutes only a part of a larger study and does not offer full insight. This limitation is going to be overcome in an extended version of this paper submitted to a journal. Second, it offers insights into Polish cluster organizations and as such, it cannot serve as a universal guide. Finally, the paper is of exploratory character and some further, quantitative studies are planned to extend the knowledge on the examined topic.

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