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## **CLUSTERS AND KNOWLEDGE TRANSFER**

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***Abstract:** In the report they are presented some basic statements related to clusters as a form of collaboration in various spheres of economic activity and their relationship with the transfer of knowledge as a key process for business and social development, based on network cooperation and the possibilities for intensifying the dissemination and use of transferred knowledge among cluster participants and relevant stakeholders. The main resulting aspects are presented in a synthesized way – successful transformation into working business and socially focused solutions, multi-directional effects and benefits for the participants in the clusters and the main stakeholders.*

***Keywords:** Clusters, Knowledge transfer, Effects and Benefits.*

### **INTRODUCTION**

In the modern highly competitive world of blurred national borders and highly risky parameters of the environment, the desire to survive and maintain competitiveness, for growth and development puts pressure on individual economic and social players to seek cooperation in various forms (alliances, clusters, entrepreneurial chains, etc.) and of a specific nature (formal or informal). As one of these forms, clusters arise due to market-driven regularities, processes and trends. They represent “a group of firms, related economic actors, and institutions that are located near each other and have reached a sufficient scale to develop specialized expertise, services, resources, suppliers and skills”. (Communication from the Commission, 17.10.2008, 5). As one of the forms of collaboration, they increasingly find a practical manifestation in the functioning of economies and are shaped as a favourable environment for the realization of multidirectional effects and benefits, both for the participants themselves and for the stakeholders interested in the activity of the cluster. The possibility to create and share existing and newly created knowledge in a more favourable (“mutually beneficial”) environment in the general cluster context, as well as to realize additional synergistic effects of cooperation in a coordinated parallel, contributes to the growth of the role and importance of clusters in the modern dynamic world.

As a result of dedicated cluster policies in Member States, notably since the end of the 1990s, there are an increasing number of cases where forward-looking public policies, business initiatives or top-class universities and research institutes“ have been instrumental in the emergence of strong clusters by acting as a catalyst and helping to unleash the economic and scientific potential of particular regions“ and this leads to the acceleration of the formation of

strong clusters, acting as a catalyst and helping to reveal the “economic and scientific potential of certain regions” (Communication from the Commission, 17.10.2008, 5). In parallel, the heads of state or government in the EU, affirming the need for subsequent better coordination of the framework conditions for innovation, “including through improved science-industry linkages and world-class innovation clusters and the development of regional clusters and networks” (Presidency Conclusions, 13-14 March 2008) draw attention to clusters and their role in knowledge transfer. On this fundaments, taking into account the importance of cluster collaboration for the creation and dissemination of knowledge among multiple directly or indirectly related market and social players, the aim of this report is to explore and synthesize some important propositions related to clusters as a form of collaboration in the various spheres of economic and social activity, and the transfer of knowledge as a key process for business and social development, on the basis of which to outline the main resulting aspects for the cluster and for the relevant stakeholders – multidirectional effects and benefits of the accelerated and more effective transformation of knowledge in working successful business and socially oriented solutions.

## **EXPOSITION**

### **Literature review**

As an objective-subjective category and a phenomenon with multiple projections in the real business and social environment, clusters are the subject of increasing research interest. The measurement of cluster performance in the context of knowledge transfer (Gundelach, H., & Nielsen, B.B., 2023), the type of ownership in clusters (family or non-family firms) and its impact on knowledge transfer (Ghini, S., De Vita, R., Steiner, B., & Sinatra, A., 2024, pp. 87-103), the technological component involved in the transfer of knowledge in relational practices (architectural knowledge) arising from the location of companies within the cluster (Leszczyńska, D., & Pruchnicki, E., 2016), etc. Hendry, C., Brown, J., Ganter, H.-D., & Hilland, S. (2001, pp. 33-41) examine the role of industrial clusters in technology transfer and innovation. They analyse the characteristics of individual industries at the national and regional level, and the influence of policy on the development of individual sectors, constructing a general model to represent the contribution of a localized cluster to innovation, especially for young firms, and at the same time find that later stage, the mature innovator can also benefit from knowledge transfer within the cluster, as it helps to solve the problem of absorbing “tacit knowledge” resulting from “distributed research and development”.

Based on an analysis of 38,873 cross-border green investment decisions across value chain activities and industries in 71 global cities over the period 2008-2016, R. Belderbos, D. Castellani, H.S. Du & G.H. Lee (2024) found that in the presence of a large local cluster, when the different activities along the value chain are co-located, there is a greater risk of knowledge spillover to competing firms, which should be taken into account, along with the number of positives. Moreover, they argue that the international connectivity of a location reduces the importance of the local agglomeration as a driver of investment location decisions, as connectivity allows more agglomeration benefits to be extracted from a distance through the (temporary) transfer of people and knowledge. Connectivity changes the trade-offs between inner and outer agglomeration, as it improves the spatial scope of the inner agglomeration much more than the outer agglomeration. It is confirmed that there is greater connectivity in the activities of the value chain in the sphere of services than in the activities in the sphere of production, which has a significant impact on the specifics of knowledge transfer.

According to R. Baptista (2001), externalities promoting the adoption of new technologies are stronger at the regional level and depend positively on the proximity of early adopters. His research findings confirm the importance of geography and inter-firm network in the process of knowledge transfer and diffusion, offering new approaches to technology transfer and technology policy. For B. Krieger (2024), the financing of additional clusters for/with high achievements, focused on internationally competitive research within a given region of the labour market,

increases the probability of a more intensive transfer of knowledge to regional firms and, accordingly, the probability of introduction of innovation, especially if there are a large number of clusters for/with high performance in the relevant labour market region. Krieger's finding of interest is that no statistically significant effect could be determined in the presence of a small number of clusters of excellence if funding graduate schools focused on the training of scholars or university strategies promoting the overall long-term plan of the university.

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J. Sizer (2001) examines the pressure on universities to change their priorities and cultures as a result of the recognition by governments that they are at the heart of efforts to build competitive knowledge economies. It articulates key implications for universities and research groups, including: globalization and knowledge-based competition; the transfer of economic development powers from nation states to regions and cities; the need for clusters for interactive learning and knowledge transfer; the development of high-tech spinoffs and start-ups and the commercialization of intellectual property, all of which help to strengthen the discussion about the dynamic nature of knowledge transfer and the importance of the changing collaboration between universities and corporate enterprises. S. Ghinoi, R. De Vita, B. Steiner, & A. Sinatra (2024) identify different network strategies associated with cluster firms by outlining three types of knowledge exchange: technological, market and managerial, with the nature of ownership leading to differences in knowledge sharing.

The manifestation of cluster cooperation is strictly specific, but in all cases its successful implementation is related to the transfer of knowledge, such as from the foresight of management, the collective understanding of the importance of knowledge, its timely sharing and use in the best way, etc., depends on the extent to which knowledge transfer will contribute to positive results, and the cluster will benefit from them.

### **Methodology**

The theoretical research is based on an office theoretical research among articles, abstracts and keywords (Article title, Abstracts, Keywords) of publications in Scopus using search criteria: "clusters" and "technology transfer" (clusters AND knowledge AND transfer). The initial selection of documents started from 2,277 publications in five thematic areas (Computer Science - 697; Engineering - 426; Biochemistry, Genetics and Molecular Biology - 342; Business, Management and Accounting - 313, and Social Sciences - 312) of the main types of developments (Articles – 1,504; Conference Papers – 137; Book Chapters - 52), of which 514 were published in the USA; China – 501; Germany – 215; Great Britain – 194; and France – 111, with 2,217 of all publications in English. This can be seen as a kind of proof of a significant interest in the studied problematic.

Limiting the researched set of documents to only unique articles in the field of "Business, Management and Accounting" was done based on the following criteria:

TITLE-ABS-KEY (clusters AND knowledge AND transfer ) AND (LIMIT-TO (SUBJAREA, „BUSI“)) AND (LIMIT-TO (DOCTYPE, „ar“)) AND (LIMIT-TO (LANGUAGE, „English“))

For the period 1984-2024, 204 documents have been identified, of which 194 are unique articles in English. Their structural distribution by subfields is: Decision-making sciences – 48; Engineering – 36; Informatics – 30; Economics, econometrics and finance – 29; Social sciences – 29, and by keywords: Knowledge transfer – 43; Technology transfer – 43; Knowledge Management – 39; Innovations – 34; and Cluster Analysis – 23 articles. The documents are published in editions distributed as follows: USA – 33; Great Britain – 24; Italy – 21; China – 18; Germany – 17; etc.

In the documents studied, the relationship between clusters and knowledge transfer was sought, emphasizing positive outcomes such as effects and benefits for cluster participants and key stakeholders.

**Results and discussion**

The defining characteristics of the cluster presuppose a number of advantages that bring benefits and create effects for the participants in the cluster, for the cluster as a whole and for the parties interested in its activity. The normal functioning of clusters is related to the presence of common interests, a certain level of similarity, horizontal and/or vertical connectivity between the economic activities of its participants, the possibility of sharing resources and efforts, diversification of risk, optimization of time and economic parameters of the final results achieved, etc. Clusters should be perceived as a certain type of “evolutionary system”, the result of the functioning of which is the formation of a greater capacity than if the individual actors could achieve acting alone (Zaccarelli, S.B., Telles, R., Siqueira, J.P.L., Boaventura, J. M. G., & Donaire, D., 2008). Such characteristics create a favourable positive environment for the realization of additional benefits and positive effects, taking into account the potential of knowledge transfer to subsequently improve the results and the opportunities of the cluster itself and its participants to provide additional contributions (realize additional effects) from the active role of the cluster in the process of knowledge transfer, some of which are presented in Figure 1.

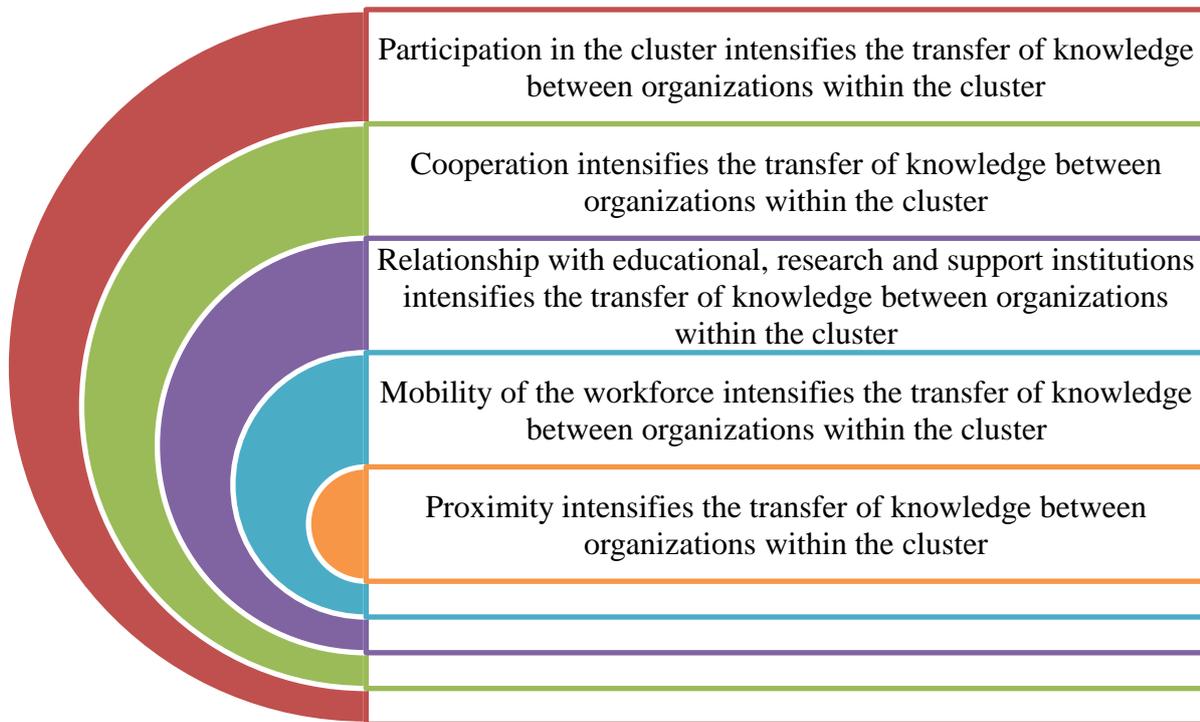


Fig. 1. Cluster effects and positives of knowledge transfer

Source: Adapted from (Fioravanti, V.L.S., Stocker, F., & Macau, F., June 2021, p. 7.)

Key points for discussion and future focus are positive options in the following areas:

- Functioning in a good knowledge-sharing environment due to the presence of cluster-specific social, organizational, cultural, institutional, technological and physical distances between it and new companies (including its local partners) (Boschma, R.A., 2005; Knobon, J., & Oerlemans, L.A.G., 2006), with a high level of motivation playing a highly positive role in achieving optimal knowledge transfer (Leszczynska, D., & Pruchnicki, E., 2017).
- Gaining access to scarce and extremely valuable tacit knowledge. (Leszczyńska, D., & Pruchnicki, E., 2016). Effective transfer of architectural and specific knowledge should, however, involve prior sharing of a certain amount of this knowledge.

- Taking advantage of a number of advantages by the cooperating firms in the cluster, especially gaining easier access to local know-how. The latter depends significantly on the quality of inter-organizational knowledge exchange (Vestal, A., & Danneels, E., 2018).

- A growing positive relationship of collaboration with local public research organizations and firm inventive performance, with a high inventive concentration of local public research organizations, individual firms and the cluster as a whole derive more knowledge (Vestal, A., & Danneels, E., 2018). Stronger regional externalities positively dependent on user proximity that encourage adoption of new technologies (Baptista, R. B., January 2001).

- Sharing of resources, especially information and new knowledge, leading to optimization of investment processes and accelerated implementation of innovation activities.

- Coordinated and more effective use of knowledge for the implementation of preliminary social-market activity; more focused and coordinated transformation of this knowledge into workable business and social solutions; more coherent follow-up and a higher degree of alignment with the interests and needs of stakeholders.

## CONCLUSION

Clusters are a special form of geographically focused cooperation with a heterogeneous composition of participants, which is essential and plays an important role in knowledge transfer.

The benefits and effects of the geographical proximity of units in mutually beneficial relationships and joint activities are reflected in multifaceted directions covering economic, technological, innovation, economic and social positive aspects, which favour the formation of gradual, continuously improving results and presuppose a trail for positive subsequent economic-social trends that should be further explored (given the dynamics and turbulence in all aspects of the functioning of economic/innovation/social systems).

Future efforts aimed at the possibilities of intensifying the transfer and extracting additional benefits and effects should be aimed at complex synchronized measures and interactions, enabling the realization of synergy and the achievement of positive results, ahead of competitors or offering positives for the interested parties in an accelerated period. The benefits and effects should be decomposed by individual phases of the cluster's development, specific phases of the implementation of knowledge transfer, by individual types of participants in the cluster/cluster as a whole/ stakeholder groups, taking into account the systemic nature of the cluster's functioning, the systematicity of knowledge dissemination and the need for continuity and consistency in their multi-directional and multi-element exchange within and beyond the boundaries of the cluster.

It should be noted that no matter how positive and intensive processes of cooperation and exchange of knowledge are present, no matter how much their subsequent use is agreed and coordinated, without the presence of an adequate regulatory environment and flexible strategic mechanisms of stimulation on the part of regional, and local policy makers, highly visible achievements cannot be expected.

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