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THE ROLE OF RELATIONAL CAPITAL IN CLUSTER-BASED KNOWLEDGE MANAGEMENT

Summary

Purpose | This paper examines the role of relational capital in knowledge management (KM) at the cluster level, focusing specifically on the human resources dimension.

Research method | Literature review, desk research and theoretical analysis.

Results | The study identifies five major challenges arising from low relational capital in cluster-level KM: the incompatibility of organisational cultures, the formation of technological subcultures, the creation of knowledge silos, the low level of tacit knowledge transfer, and the “not invented here”.

Originality/value/implications/recommendations | The research provides a novel theoretical framework for understanding the relationship between relational capital and KM in cluster environments, bridging the gap between organisational-level and cluster-level knowledge management. The study recommends that building relational capital should precede or accompany KM system implementation in clusters, and it emphasises the need for supra-organisational KM strategies that integrate individual member needs

while maintaining cluster-wide consistency. These findings have important implications for cluster coordinators and policymakers involved in cluster development, suggesting the establishment of dedicated KM institutions and the implementation of modified versions of the proven KM tools adapted to cluster conditions.

Keywords: knowledge management, relational capital, industrial clusters, organisational culture, inter-organisational learning

JEL classification: L2, D8

1. Introduction

In the face of the dynamically changing economic environment, organisations are searching for effective ways to maintain competitiveness and to stimulate innovation. Among numerous concepts and strategies, two phenomena emerge as particularly significant: the creation of inter-organisational relationship networks in the form of clusters and knowledge management (KM).

Undoubtedly, knowledge currently constitutes a key factor ensuring the dynamics of economic development. The ability to generate scientific and technological knowledge and its embodiment in new products, processes, and business strategies represents a crucial instrument of economic growth and development [Conceição et al., 1998]. Empirical research indicates a strong correlation between GDP levels and the income in a given country and the level of scientific knowledge creation [Jack, Lachman, López, 2021] as well as the number of workers involved in “knowledge production” [Zapp, 2022]. In the light of this, effective KM constitutes an essential element in achieving market success for enterprises. Research indicates that effective KM practices support innovation and accelerate problem-solving processes in organisations [Le Dinh, Ho Van, Moreau, 2014]. Studies also show that enterprises with robust KM systems achieve better financial results [Sivaramakrishnan et al., 2010]. Moreover, knowledge per se increasingly represents an enterprise resource with measurable economic value.

A cluster, according to the classical definition, is a geographic concentration of interconnected companies, specialised suppliers, service providers, firms

operating in related industries, and associated institutions in particular fields, competing with each other but also cooperating [Porter, 2008]. Unlike typical business networks, clusters focus on external expansion rather than solely internal objectives [Citkowski, 2016]. Literature emphasises that clusters facilitate companies' market entry and development by providing shared access to resources such as skilled workforce, infrastructure, specialised suppliers, and advanced technologies [Frenken, Cefis, Stam, 2015], promote knowledge integration and transfer between firms [Morosini, 2004], provide mechanisms to facilitate knowledge development, diffusion and accumulation through collaborative platforms [Götz, Jankowska, 2017] and offer active cooperation within joint projects and innovative initiatives [Thompson, Chaudhry, 2005]. Through this, clusters, by facilitating cooptation between firms, significantly help to build innovative potential and, consequently, competitive advantage.

Recent studies emphasise the growing role of virtual clusters and digitally transformed cluster ecosystems in enhancing innovation performance. Research shows that virtual clustering can facilitate connected knowledge spill-overs, strengthen inter-organisational learning, and reduce geographical constraints [Kang et al, 2022; Xu et al., 2022]. Moreover, the digital transformation of enterprise clusters has been found to significantly improve collaborative innovation capacity, particularly through advanced data integration and digital platforms supporting knowledge exchange [Zeng and Bao, 2025].

It appears that both phenomena are inextricably intertwined. One of the motives for joining clusters is indeed knowledge exchange [Connell, Kriz, Thorpe, 2014]. However, despite the undoubted benefits of combining these two concepts, the implementation of effective KM practices within cluster structures encounters several challenges that have not yet been the subject of any broader scientific discussion.

This article aims to identify the role of relational capital in KM at the cluster level. The authors conceptualise KM as a two-dimensional process – the human resources dimension (KM-HR) and the information communications technology dimension (KM-ICT). The analysis conducted here concerns exclusively the KM-HR dimension. Through identifying and exploring problems arising from the low levels of relational capital, the authors seek to better understand KM

processes in inter-organisational networks. The article provides a theoretical framework for qualitative research that the authors are conducting as part of a broader research project.

To delineate the knowledge base for this article, the authors conducted a structured narrative review supported by desk research (not a full systematic review) and an abduction-oriented theoretical analysis. Searches were performed in Scopus and Web of Science and Google Scholar, covering 2000–2025 in English and Polish. The inclusion criteria comprised peer-reviewed empirical or review papers and reputable scholarly book chapters directly relevant to KM/clusters/relational capital, while exclusions covered purely technical work without a KM lens, non-scholarly sources (except for targeted institutional reports), and duplicates.

2. Knowledge management in organisations – conceptualisation of the concept

The foundation of KM in organisations is the knowledge accumulated in employees' minds. Historically, there have been two approaches to defining knowledge as an object of management: Western (American) and Eastern (Japanese) approaches [Jelavic, Ogilvie, 2010]. In the Western approach, human knowledge encompasses organised – and to some extent evaluated – data and information about things, facts, and phenomena that exist in the surrounding reality [Poskrobko, 2015], as well as knowledge embodied in the broader organisational culture: customs, practices, procedures, internal and external contacts, and specific norms and principles operating within the organisation [Lambe, 2007]. The Japanese approach extends the concept of knowledge to include so-called tacit knowledge [Nonaka, Takeuchi, 1995], primarily associated with unconscious cognitive processes. This type of knowledge is synthesised in the mind non-volitionally (though in response to the consciousness needs), based on all accumulated information, under the influence of attitude (emotional state, creative tension) and internalised ideals and recognized values [Poskrobko, 2017]. Peter Drucker appears to have been the first to draw attention to the necessity of managing knowledge resources contained in employees' minds when he proposed the term "knowledge worker" in the early 1960s [Drucker, 1964].

The subject of KM in organisations extends beyond the knowledge in the employees' minds. Davenport and Marchand [Davenport, Marchand, 2000] note that knowledge and information are inextricably linked. Therefore, KM must also encompass the codified and classified information resources available to the organisation [Ricceri, Guthrie, 2009], which constitute an essential basis for creating knowledge in the mind.

Since then, many approaches and attempts to define KM have emerged. For example, Girard & Girard collected over 100 definitions [Girard, Girard, 2015]. However, in general terms, it can be considered as a process encompassing many unique but interconnected aspects of creating, organising, sharing, and utilising organisational information resources to generate explicit and tacit employee knowledge and use it to achieve organisational objectives.

The authors maintain that KM should be distinguished into two dimensions, which they define as: the KM-HR dimension (knowledge management – human resources) and the KM-ICT dimension (knowledge management – information and communication technology).

The KM-HR dimension focuses on knowledge contained in people's minds and creating favorable conditions for: creation, sharing, and utilisation of knowledge to achieve organisational goals. In this approach, KM relies on human resource management tools (e.g., mentoring, retrospective meetings, best practice reports, reward and motivation systems for knowledge sharing, etc.).

The KM-ICT dimension stems from the fact that knowledge is expressed and transmitted most obviously through information. This means that information and data management is a critical aspect of KM [Lambe, 2007]. Consequently, the KM-ICT dimension focuses on utilising tools offered by information and communication technologies for codification, organisation, automatic processing, and providing information in the appropriate form to appropriate people at appropriate times.

This aligns with the knowledge governance approach (KGA) [Foss, 2005, 2007], which assumes the integration of human and technological factors in KM through creating structures that support effective flow, creation, and utilisation

of knowledge in organisations. The division into KM-HR (knowledge and human resource management) and KM-ICT (knowledge and information-communication technology management) planes reflects KGA's key elements, as it emphasises the importance of the synergy between people, organisational culture, and technological infrastructure in KM processes. This approach treats knowledge as a strategic resource requiring appropriate motivational and technological mechanisms to support its effective creation, transfer, and application in achieving organisational objectives.

In recent years, digital transformation has become a critical driver of changes in KM systems, reshaping both the KM-HR and KM-ICT dimensions. Advances in artificial intelligence, big data analytics, and cloud computing are enabling new ways of capturing, codifying, and disseminating knowledge, as well as supporting real-time collaboration across organisational and geographical boundaries [Jarrahi et al., 2023; Di Vaio et al., 2021]. Digital transformation not only requires the adaptation of technological infrastructures but also demands the reconfiguration of organisational processes and cultures to ensure effective integration of human and digital capabilities in KM practices [Kraus et al., 2021].

3. Knowledge management in clusters

Knowledge plays a crucial role in industrial clusters and is one of the primary motivations for creating such structures. Access to knowledge resources of other entities positively influences organisational functioning [Gulati, Lavie, Madhavan, 2011]. Theoretically, this is explained by the concept of leveraged growth strategy, which demonstrates how a company can accelerate knowledge accumulation and employee skill development by utilising external resources that complement the organisation's own resources [Prahalad, Hamel, 1993]. Decisions to enter into partnerships, including within clusters, are dictated by the desire to acquire valuable knowledge, increase its value through integration with partners' knowledge and coordinate its use, while protecting one's own competitive advantage derived from one's knowledge-based view (KBV) [Sulimkowska-Romowicz, 2018]. As demonstrated by research [Lai et al., 2014] conducted on 210 companies from three main types

of industrial parks in Taiwan (science parks, export processing zones, and industrial zones), industrial clusters, through their unique character of co-operation and knowledge integration, enable companies to utilise resources more effectively, resulting in reduced operational costs and increased competitiveness. A systematic literature review prepared by Tavares et al. [2021] showed that clusters facilitate knowledge creation and transfer. The review's authors emphasised the importance of social networks and inter-organisational relationships in clusters, which are crucial for effective knowledge transfer and innovation. Their analysis revealed that clusters can stimulate collaboration and creative thinking, leading to more innovative solutions and products. The case study of the Evoluma Industrial Cluster [Citkowski, 2024] confirms that the key to effective sharing of tacit knowledge and the realisation of relational rents lies in inter-organisational relationships based on trust, developed routines of cooperation and efficient management by the cluster coordinator.

However, there is a tension among enterprises between the need to share knowledge and the need to protect it. The core of the problem lies in what Bogers [Bogers, 2011] terms the paradox of open innovation. This paradox stems from the necessity of both sharing and protecting knowledge within research and development collaboration. While knowledge sharing is essential for accelerating innovation, intellectual property protection is crucial for maintaining competitive advantage. Furthermore, in strategic alliances, a dilemma may arise where open knowledge sharing can lead to exploitation by partners who might use this openness to maximise their individual benefits at the expense of collective knowledge development. In such cases, partnership transforms into a kind of learning race [Larsson et al., 1998]. This approach creates an environment where joint learning becomes increasingly difficult and knowledge sharing problematic.

This dualism means that KM at the cluster level encounters specific challenges that do not exist (or are significantly less important) in intra-organisational management. Transferring and adapting KM mechanisms from the enterprise level to the cluster level faces challenges related to maintaining balance between cooperation and protecting organisational interests. In the KM-ICT dimension, these primarily concern the creation of inter-organisational data

governance (DG) policy and harmonisation of individual organisational policies. In the KM-HR dimension, which is the subject of discussion in this article, these challenges are more closely related to the necessity of appropriately shaping human relations between employees of different organisations associated within the cluster, in a way that optimises inter-organisational knowledge exchange, which can be defined as building relational capital.

4. Relational capital as a critical factor in cluster-based knowledge management

The concept of relational capital was developed by Janine Nahapiet and Sumantra Ghoshal in 1998 [Nahapiet, Ghoshal, 1998] as part of a broader concept – social capital – within which they identified three dimensions: structural, cognitive, and relational. The relational dimension of social capital has a significant impact on the level of knowledge exchange through the nature and quality of relationships that develop within human interactions inside organisations and with their environment (including customers, suppliers, partners, investors, public sector, and community). According to researchers, relational capital is based on:

- Trust, understood as confidence in the reliability, competence, and goodwill of the other party, which increases the propensity for cooperation, willingness to exchange knowledge, and openness to new information and ideas;
- Cooperation norms, understood as shared and accepted principles and expectations regarding behavior in a group or organisation, creating transparent conditions for knowledge exchange;
- Obligations, understood as a sense of duty or responsibility towards other individuals or groups, resulting from previous interactions or received assistance;
- Expectations, understood as predictions about future behaviors or actions of others, based on past experiences and mutual relationships;
- Group identification, understood as a process in which individuals perceive themselves as part of a larger group or organisation, increasing engagement.

Well-managed relationships can lead to so-called relational rents, which are benefits extending beyond those obtainable from individual organisational resources [Cucculelli, Peruzzi, Zazzaro, 2019]. Research [García-Villaverde, Parra-Requena, Molina-Morales, 2018] indicates that effective knowledge exchange in clusters depends as much on its size (knowledge resources accumulated within the cluster) as on the level of relational capital. This suggestion is confirmed by the studies conducted in two clusters of small enterprises in southwestern Nigeria [Ogundipe, 2012]. They demonstrated that relationships with suppliers, customers, and internal networks are significantly associated with their financial results – relational capital accounts for 63% of the variation in the results among the studied firms.

In recent years, Europe has observed dynamic cluster development. In the EU, there are approximately 1,500 clusters, such as Silicon Saxony in Germany, one of the strongest microelectronics clusters in Europe, or the Aviation Cluster in Silesia, Poland, which help to transform regional economies towards higher value-added activities. Leading politicians regard these clusters as an important tool to reinforce trans-European value chains. According to Politico's Playbook, Belgian Prime Minister Alexander De Croo has said: "We need to support industry, since energy costs in Europe are way higher than in the U.S. and China, but it should happen at the European level, based on industrial clusters" [Science Business, 2024].

The development and evolution of clusters – according to cluster lifecycle theory – proceeds through four stages: emergence, growth, maturity, and decline or renewal [Menzel, Fornahl, 2010; Ostapenko, Africano, Meneses, 2024]. As Ostapenko et al. [Ostapenko et al., 2024] indicate, in the first two stages, the network of connections between firms is unstable and inefficient, as mutual partner identification, evaluation, and development of informal and formal cooperation institutions are just beginning. This suggests that the emerging and early-stage clusters may struggle with low levels of relational capital. This assumption is confirmed by cluster benchmarking results in Poland [Piotrowski et al., 2023] - a significant portion of clusters established after 2015 showed low activity in cooperation development, while the highest-rated cluster was established before 2010.

Low levels of relational capital may generate several problems in KM at the cluster level. Concerning the KM-HR dimension, the Authors identified five such problems:

- Incompatibility of organisational cultures,
- Formation of technological subcultures,
- Creation of knowledge silos,
- Low level of tacit knowledge transfer,
- “Not invented here” syndrome.

4.1. Incompatibility of organisational cultures

Organisational culture is a set of shared values, beliefs, behaviors and practices within an organisation that promote and support knowledge exchange between units and individuals [Glaser, Zamanou, Hacker, 1987]. When properly shaped, it creates an environment where employees feel encouraged to share information, insights, and experiences [Bhojaraju, 2005] and forms the foundation upon which KM strategies and tools are built. Research indicates that organisations that have developed a knowledge-sharing culture have a higher likelihood of implementing effective KM strategies [Azeem et al., 2021; Kaur, Kahlon, Randhawa, 2012] and are better positioned to leverage their intellectual capital to gain competitive advantage [Bhojaraju, 2005; Wang, Su, Yang, 2011].

In the complex environment of cluster enterprises, different organisational cultures may exist, resulting in varying values and norms. Some cultures may be more open to knowledge sharing, while others may treat knowledge as a competitive advantage, which can lead to asymmetry in information exchange and frustration for one of the parties. Differences in behaviors and practices can also pose challenges. For example, the use of different jargon or industry terminology can result in misinterpretation of the transmitted information. Consequently, these misunderstandings can impede or discourage knowledge sharing.

4.2. The emergence of technological subcultures

Internal sources of building enterprise knowledge capital increasingly rely on advanced information and communication tools, among which broadly

understood artificial intelligence (AI) technologies are gaining increasing significance. These technologies are transforming the way organisations function. The implementation of AI systems leads to significant changes in the methods of collecting, processing, and distributing knowledge within organisations [Chen et al., 2022]. The key aspects of this transformation include: automation of documentation and knowledge categorisation processes, development of AI-based decision support systems, and changes in knowledge transfer dynamics between employees. Artificial intelligence necessitates the redefinition of traditional collaboration models by introducing: hybrid work models combining human competencies with AI capabilities, new organisational structures adapted to human-machine collaboration, and modified decision-making processes that incorporate AI recommendations.

From the perspective of the KM-HR interface, the introduction of AI tools necessitates continuous enhancement of digital competencies and adaptability to new technologies. This applies not only to ICT personnel (for whom such development is somewhat natural) but also to those for whom a high level of such competencies was not previously required. Differences in digital competency levels can lead to the emergence of technological subcultures [Malewska et al., 2024]. Employees with lower competencies may experience exclusion and stress related to keeping pace with changes, which can lead to team tensions and negatively impact relational capital levels.

In clusters, where different enterprises collaborate within a shared ecosystem, the introduction of advanced technologies such as artificial intelligence can lead to similar phenomena as in individual organisations. Companies characterised by higher levels of technological adaptation and advanced digital competencies may dominate decision-making and innovation processes in the cluster, potentially resulting in the emergence of technological subcultures at the organisational level.

Technological subcultures in clusters may develop based on differences in access to technology, financial resources, employee competencies, and readiness for innovation adoption. Enterprises with higher levels of digitalisation and greater capability to implement AI solutions may become change leaders, creating their own standards and setting the pace of development for oth-

ers. Conversely, less technologically advanced organisations may experience marginalisation within cluster structures, potentially leading to exclusion from main collaboration streams and limited access to new business opportunities.

4.3. The formation of knowledge silos

Another phenomenon resulting from low relational capital can be the formation of so-called knowledge silos. This concept derives from the metaphor of agricultural silos, which store resources in isolated structures, preventing their mixing. In an organisational context, this term is used to describe the phenomenon of isolation and compartmentalisation of knowledge across different units or departments of an organisation [Potrich et al., 2022; Aaker, 2008; Lessard, Zaheer, 1996]. However, in the context of clusters, this concept takes on a broader meaning. In clusters, knowledge silos can manifest as barriers to knowledge exchange and collaboration between different firms or units. Each enterprise within a cluster possesses its unique resources of data, information, and knowledge, which are inherently inaccessible to other firms. Reluctance or inability to share these resources can lead to isolation and compartmentalisation of knowledge, not at an intra-organisational level but between organisations. Silos can lead to uneven access to key knowledge resources, which in turn may discourage firms from coopetition. Furthermore, silos can increase transaction costs associated with negotiations, coordination, and implementation of activities between firms within the cluster.

Therefore, in the process of managing cluster relationships, a key role is played by the coordinator, who is responsible for matching business partners by systematically building greater openness to cooperation between cluster members and raising awareness of the benefits of cooperation in a network of inter-organisational relationships [Citkowski, 2024].

4.4. The “not invented here” syndrome

The knowledge silos problem is connected to the “not invented here” syndrome [Ismail et al., 2023; Katz, Allen, 1982]. This problem occurs when the organisation employees undervalue the significance of knowledge originating from outside its boundaries – both from customers, suppliers, competitors,

etc., and in a broader sense, from market trends. Silo mentality can lead to the resistance toward integrating external information. This state of affairs is often reinforced by attachment to the status quo and resistance to change [Samuelson, Zeckhauser, 1988], which may be perceived as a threat to the established methods of operation. Consequently, this leads to market isolation, delays in innovation, and loss of market position.

In clusters, this problem can manifest at two levels. The first concerns mutual trivialisation of knowledge between cluster members, while the second level involves trivialising knowledge from outside. Paradoxically, strongly developed research and development activities within the entire cluster can create a misguided belief in self-sufficiency and innovation independence, in which successes and progress in research conducted within the cluster seem to preclude the need to seek and incorporate new perspectives, technologies, or knowledge from external sources.

4.5. Low level of tacit knowledge transfer

Another challenge in KM within clusters stems from the nature of tacit knowledge. Such knowledge is deeply embedded in the employees' experience and skills, and often remains unconscious even to them. Being difficult to verbally express, document, or codify, it is primarily transferred through direct human interactions – for example, through observational learning [Nonaka, Takeuchi, 1995]. This means that at the cluster level, particularly in clusters at early life cycle stages, tacit knowledge transfer is severely limited – by nature, the amount of direct interactions between employees of different firms is restricted (compared to intra-organisational interactions).

One of the most effective approaches to managing tacit knowledge within an enterprise is implementing the SECI model (Socialisation, Externalisation, Combination, Internalisation), which not only enables the transformation of tacit knowledge into explicit knowledge for exchange purposes but also facilitates direct knowledge transfer between employees [Young, 2012]. Furthermore, there are various management instruments, such as mentoring [Luecke, Ibarra, 2004], coaching, storytelling [Swap et al., 2004], and the creation of communities of practice [Alzoubi, Alrowwad, Masa'deh, 2022], which support the

exchange of this type of knowledge. However, all these methods rely on direct human interactions, and their effective implementation requires sufficiently high levels of trust and openness to collaboration among employees, as well as transparent cooperation norms and principles. Applying these instruments at the cluster level is challenging and requires their adaptation to the conditions of low relational capital.

5. Conclusions

Based on the conducted theoretical analysis, it can be concluded that relational capital plays a fundamental role in the effective implementation of KM at the cluster level. Empirical research indicates that effective knowledge exchange in cluster structures strongly depends not only on the volume of accumulated knowledge resources but primarily on the level of relational capital. Key elements of relational capital, such as trust between partners, jointly developed cooperation norms, mutual obligations, clearly defined expectations, and group identification, create foundations for knowledge exchange processes between member organisations.

The significance of relational capital is particularly evident in the initial phases of a cluster's life cycle when the network of connections between firms is still unstable and inefficient. During this period, insufficient levels of this capital may lead to several problems, such as organisational culture incompatibility, the emergence of knowledge silos, the "not invented here" syndrome, or limited transfer of tacit knowledge, which significantly hinder the implementation of effective KM practices at the cluster level. This indicates that building relational capital should precede or at least accompany the implementation of KM systems in cluster structures.

The theoretical analysis indicates that in the context of the KM-HR dimension, the key challenge lies in harmonising organisational cultures of entities forming the cluster. The development of a common approach to values associated with knowledge sharing, which requires overcoming the tendency to treat knowledge exclusively as a source of competitive advantage, is particularly important. The process of harmonising organisational cultures should consider

both the formal aspects (such as the common terminology or communication standards) and the informal ones (such as the values and behavioral norms), leading to the development of a coherent cluster culture conducive to KM processes and inter-organisational cluster routines.

The effective KM in cluster structures requires the implementation of appropriately adapted tools and techniques that will counteract the identified barriers to knowledge flow between organisations. The proper adaptation of proven KM instruments to the specifics of the inter-organisational environment is the crucial aspect. Supporting the transfer of tacit knowledge, which inherently requires intensive human interactions and high levels of trust, is a particular challenge. The SECI model, which proves effective in intra-organisational conditions, requires modifications considering: firstly, limited possibilities for direct interactions between employees of different firms, and secondly, the lower level of relational capital characteristic of the initial phases of cluster development. The implementation of these tools should be a systematic and long-term process, taking into account the gradual development of trust and openness to cooperation between cluster members.

The effective implementation of KM practices in a cluster environment requires adopting a supra-organisational perspective, with the key element being the development of a common KM strategy. This strategy should not only be formally accepted by all cluster members but, more importantly, reflect their actual needs and capabilities regarding knowledge exchange. Research indicates that the success of KM initiatives strongly depends on the degree of their integration with the organisational strategies of individual entities. In the cluster context, this necessitates developing mechanisms allowing for the effective incorporation of the supra-organisational KM strategy into individual strategies of member firms. This process should consider the specifics of individual organisations, of their organisational cultures, and of the available resources while ensuring consistency of actions at the level of the entire cluster. It is particularly important that this strategy defines not only goals and directions of actions but also specific implementation mechanisms, motivational systems, and indicators for evaluating the effectiveness of the undertaken initiatives. Such an approach allows for harmonious combination of the cluster perspective with the needs and capabilities of individual

member organisations, especially in the initial phases of cluster development when cooperation mechanisms are still poorly developed and the level of the relational capital is low.

The effective implementation of KM processes in a cluster structure requires an institution that would serve as an integrator and facilitator of the activities in this area. The key tasks of such an institution include not only overseeing the implementation of the common KM strategy but also actively supporting trust-building between partners, initiating and moderating knowledge exchange platforms, as well as monitoring and evaluating the effectiveness of the implemented solutions. This means that such an institution should possess appropriate competencies, resources, and means for effective management of the organisational learning processes at the level of the entire cluster.

The role of such an institution can be assumed by the cluster coordinator. Their position as a neutral entity, possessing formal authorisation to manage the cluster and experience in building inter-organisational relations, makes them a natural candidate for this role. The comprehensiveness of the coordinator's competencies is of key importance here, combining management functions at both strategic and operational levels with knowledge of industry specifics and cluster members' needs. Moreover, the cluster coordinator typically has already developed communication mechanisms, cooperation platforms and proven mechanisms for managing inter-organisational relationships that can be adapted for KM processes. Their role in building the cluster's relational capital through systematic networking activities and facilitation of the cooperation between members is also significant. The organisational and financial stability of the coordinator, along with the trust they receive from cluster members, provide additional arguments for entrusting them with the function of KM institution. It is also worth emphasising that the cluster coordinator, through their activity in innovation development, can effectively support the process of acquiring and transferring knowledge from the cluster's environment, thereby counteracting the phenomenon of knowledge silos and the "not invented here" syndrome.

The analysis highlights several practical implications for cluster-based knowledge management. (1) The cluster coordinator should assume the leading

role in developing a supra-organisational KM strategy, acting as a relationship facilitator, generator, and accelerator of relational capital. (2) Systematic assessment of cluster members' needs is essential, particularly in relation to tacit knowledge and the mechanisms enabling its effective transfer. (3) Participatory approach to designing the KM system, co-created with cluster members, can integrate diverse organisational cultures, foster shared values, and strengthen trust, while transforming knowledge silos into interconnected networks.

The effective application of proven KM instruments, including the adapted SECI model processes, should reflect the relational capital conditions specific to clusters and their stage of development. Future research should therefore concentrate on identifying and analysing good practices in KM mechanisms within clusters in Poland and internationally, in order to refine the theoretical framework proposed in this study and to provide empirical evidence within the broader qualitative research.

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