

## **AN INTERDISCIPLINARY PERSPECTIVE ON MANAGING KNOWLEDGE IN MULTINATIONAL COMPANIES: REVIEW AND THEORETICAL ANALYSIS**

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### **ABSTRACT**

*This article offers a summary of the foundations of the knowledge management literature referring to subsidiaries of multinational companies. We look at the way in which the literature on managing knowledge has evolved, and investigate how the streams have built upon each other. We also examine the literature in the light of different management fields, revealing similarities and differences between the distinct research areas. Based on 98 reviewed articles, we build a theoretical framework for a better organization and understanding of MNC related knowledge management literature. Finally, using this framework, we look into the potential future research directions of the field.*

**KEYWORDS:** *Absorptive capacity, Disseminative capacity, External integration, Knowledge management, Knowledge sharing, Manufacturing network, Internal integration.*

**JEL CLASSIFICATION:** *M11, M16*

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### **1. INTRODUCTION**

Over the last few decades most of the multinational companies (MNC) have recognized that an international manufacturing network (IMN) with dispersed production plants in the world can provide competitive advantages (Ferdows, 2006; Kogut and Zander, 1993). Firms have the ability to accumulate knowledge in the network, and convert this intellectual capital into performance (Grant, 1996). The literature distinguishes between a large set of knowledge assets, but all the scholars agree that unused knowledge has no value, because it has no impact on performance (Cohen & Levinthal, 1990; Szulanski, 1996; Zaltman et al., 1973). To be valuable it needs to be transferred within the network (internal knowledge transfer), outside of it (Tsai, 2001; Van Wijk et al., 2008), and it also needs to be used in order to create value for the company (Cheng et al., 2011).

“The MNC’s very existence is closely related to taking advantages of differences in knowledge and expertise around the world in terms of both exploiting existing repositories of knowledge and combining these to create new knowledge” (Michailova & Minbaeva, 2012:59). Yet, MNCs constitute a challenging context in terms of knowledge sharing as they tend to span large geographical, cultural, and organizational distances. Therefore we consider that future research possibilities can be identified only if we have an interdisciplinary perspective. Argote et al. (2003:580) claim that “in spite of the diversity of disciplines, methods and contexts, there is an impressive degree of integration across research traditions”, which have not changed in time, but the literature got more sophisticated. Reviewing the literature we focus on empirically proved common findings in different management fields.

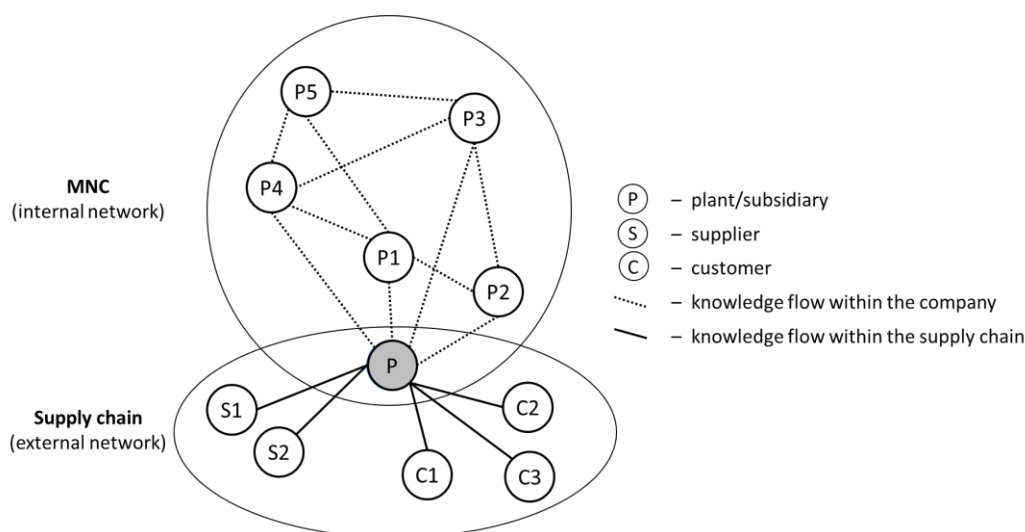
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The transfer of knowledge is common even in small companies with no subsidiaries, or domestic firms (Beijerse, 2000), but in those cases the transfer can happen just externally towards and from the suppliers, clients and governmental institutions (external knowledge transfer). Consequently we focus on MNCs because recent research emphasized that the ability to create and transfer internal knowledge is one of the main competitive advantages of MNCs compared to domestic firms (Minbaeva et al., 2003), and internal knowledge can be transferred in a more efficient way than the knowledge located outside the network (Demeter et al., 2015; Gupta & Govindarajan, 2000; Kogut & Zander, 1993; Van Wijk et al., 2008). According to Bartlett and Ghoshal (1989) the MNC is a 'differentiated network', where knowledge is created in various parts of the MNC and transferred to several inter-related units. The conceptualization of the MNC as a differentiated network started a stream of research on the role of subsidiaries (Holm & Pedersen, 2000). Therefore the success of an MNC depends highly on the performance of its subsidiaries. On the other hand the subsidiary's performance is highly correlated with the knowledge transferred into the local unit (Cheng et al., 2011; Feldmann & Olhager, 2013; Fusco & Spring, 2003). As Ferdows (1997) conceptualized and Vereecke et al. (2006) demonstrated the plant's (subsidiaries') strategic role is positively correlated with the amount of knowledge transferred and absorbed. Consequently the improvement of the subsidiaries' strategy is essential for the whole network but it needs to consider the possibilities (ex: learning from the other subsidiaries) and constraints (eg: network level strategy) which come from the fact that these units are part of an international network composed from more subsidiaries with different roles and strategies (Ferdows, 1997).

Knowledge management is researched in various fields (operations management, strategic management, international business, and human resource management). The literature has two main streams: internal knowledge transfer (KT) and external knowledge transfer, which should not be confused with the subsidiary and company level approach of MNCs. The present paper reviews the knowledge management (KM) literature on a subsidiary level, with focusing on internal KT (Figure 1). KT is realized on subsidiary level both internal and external, because the subsidiary operates as part of two networks (Demeter et al., 2015; Rudberg & Olhager, 2003). In Figure 1 we represented the possible knowledge flows between internal and external partners, but it is important to mention that knowledge flows can have different directions. In the internal network we distinguish between forward (HQ to subsidiary), reverse (subsidiary to HQ) and lateral (subsidiary to subsidiary) knowledge transfer directions. As the external knowledge transfer happens in the supply chain network, we focused our research on the internal knowledge management issues.



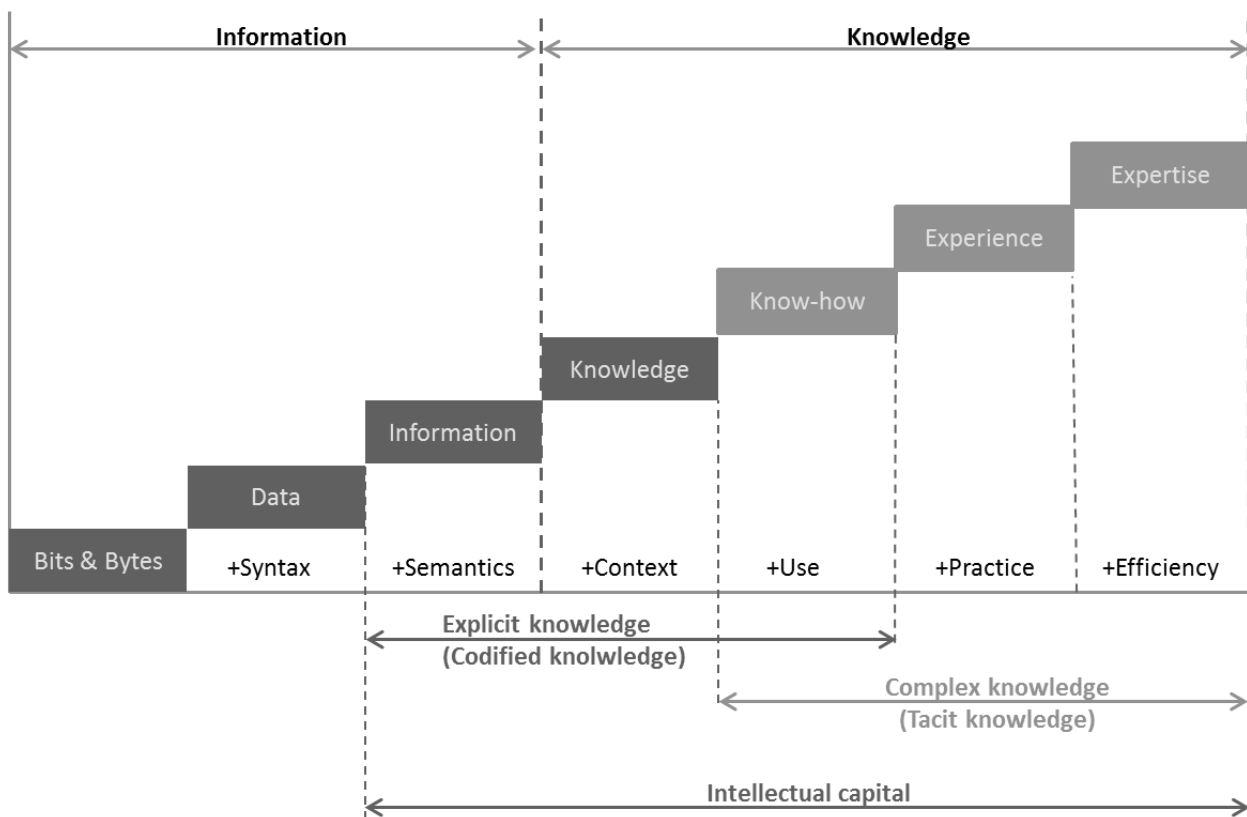
**Figure 1. Integration of a plant in the internal and external network**

*Source:* adapted from Demeter et al. (2015), p. 8

Taking these into account, we elaborate a theoretical framework on reviewing knowledge management literature, and we formulate future research possibilities.

## 2. WHAT WE HAVE LEARNED THIS FAR

Despite the fact that many scholars from different fields have researched knowledge management, all of them agree on two basic rules: knowledge has value if it is used to accomplish a target (Pritchard et al., 2010; Szulanski, 1996; Zaltman et al., 1973), and it can be used if it is absorbed by the receiver (Cohen & Levinthal, 1990; Mahnke et al., 2005; Zahra & George, 2002). It is also agreed between scholars how knowledge is put together (Figure 2). Although “organizational research relies heavily on borrowed concepts and theories from neighboring disciplines such as psychology and sociology” (Whetten et al., 2009:537), there are some differences in how some concepts are termed in different management fields, but their meaning in most cases corresponds. To be consequent, we will use the international business terminology of different concepts, showing the other appellations in parenthesis.



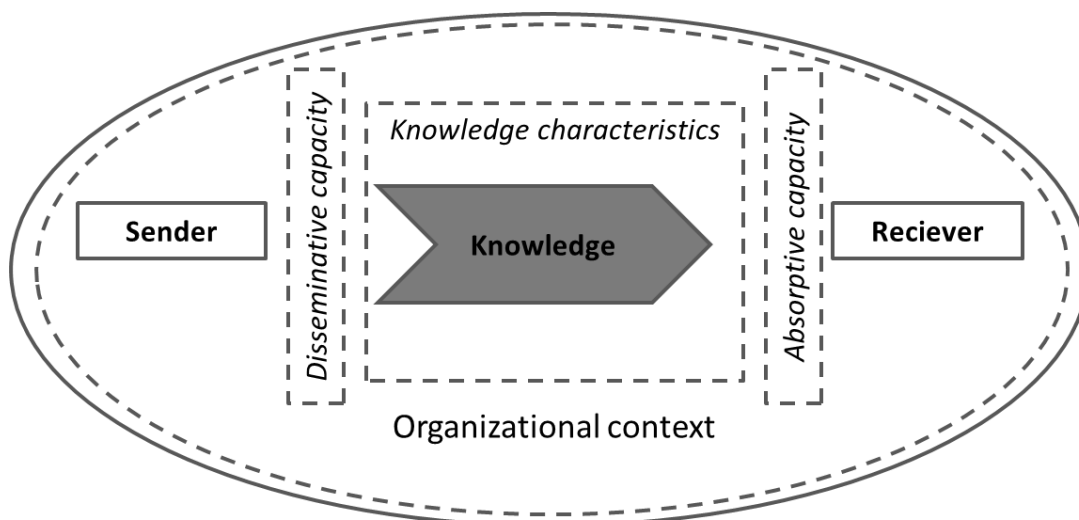
**Figure 2. Differences between information and knowledge**

*Source:* Own editing based on structured literature review

### 2.1. Knowledge management in MNCs

Organizational knowledge has become the most strategically significant resource of the organization (Minbaeva, 2006). Organizational competitiveness is enhanced not by knowledge per se but by organizational ability to exploit that knowledge. Szulanski (1996) claimed that little systematic attention has been paid to ‘internal stickiness of knowledge transfer’, and he developed a model showing the best practices of transferring knowledge. Based on Teece’s (1976) findings, Szulanski (1996) showed the sequence of events that lead to the decision of knowledge transfer. The four sequences are: (i) initiation, (ii) implementation, (iii) ramp-up, and (iv) integration. His

findings are one of the starting points of knowledge transfer literature from an organizational point of view. Gupta and Govindarajan (2000) complemented Szulanski's (1996) theory, pursuing a nodal level of analysis. Building on communication theory, they have argued that a complete mapping of the knowledge transfer process requires attention to all of the following five major elements: (i) value of the knowledge possessed by the source unit, (ii) motivational disposition of the source unit regarding the sharing of his knowledge, (iii) the existence, quality, and cost of transmission channels, (iv) motivational disposition of the target unit regarding acceptance of incoming knowledge, (v) and the target unit's absorptive capacity for the incoming knowledge. Minbaeva (2007) argues that two metaphors have guided knowledge transfer research. The first sees knowledge transfer as a process of communication, while the second views transfer primarily in terms of cost and benefit: the higher the cost of transfer, the slower the transfer will occur. Tying these together, her paper adopts similar approach and specifies the basic elements of a transfer: (i) source, (ii) message, (iii) recipient and (iv) context. She also builds into her model the barriers associated with each of the named elements: (i) the characteristics of knowledge, (ii) characteristics of knowledge receivers (absorptive capacity), characteristics of knowledge senders (disseminative capacity), and (iv) the characteristics of the relationship between senders and receivers as shown on Figure 3. Minbaeva's (2007) model of knowledge transfer process is easy to understand, and captures the main research areas in the field. Starting from this model, we developed an updated theoretical framework on organizational learning and knowledge management.



**In Bold** – elements of knowledge transfer

*In italics* – barriers/determinants associated with the four elements of knowledge transfer

**Figure 3. Knowledge Transfer Process**

Source: adapted from Minbaeva (2007), p. 569

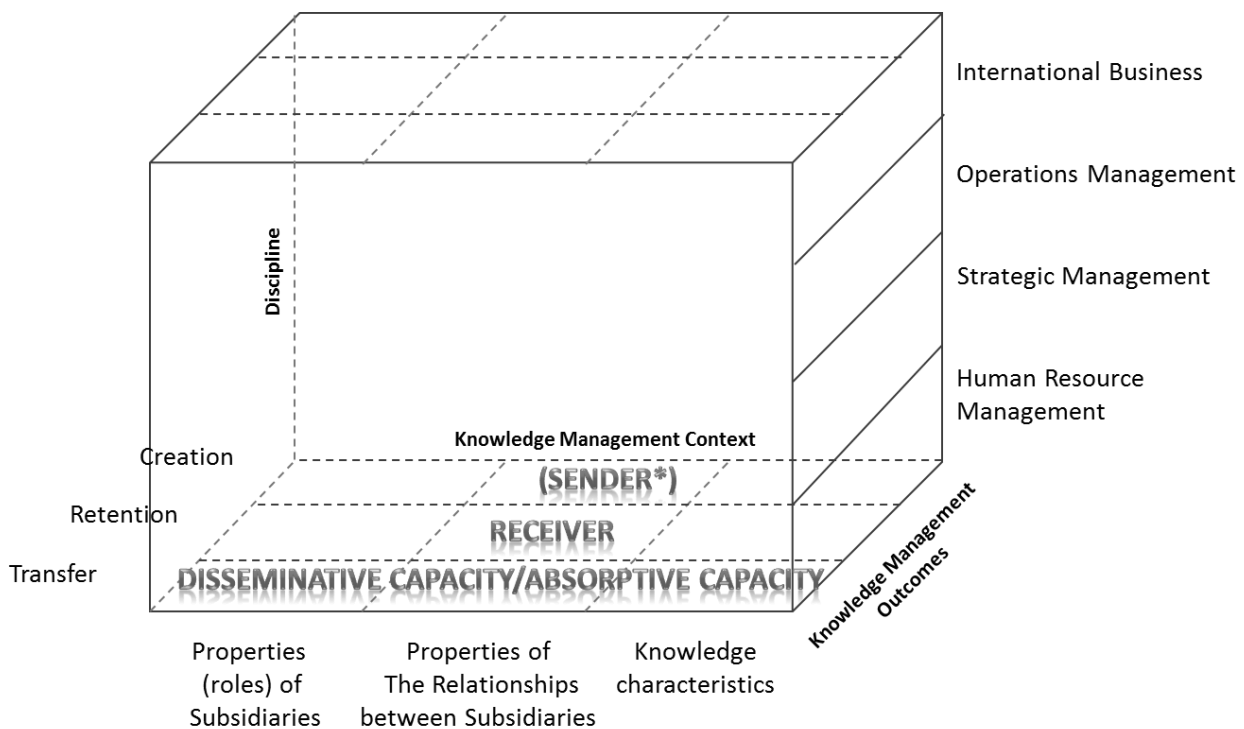
## 2.2. Literature reviewing method

We have identified a few keywords in order to search for knowledge management literature: knowledge management, knowledge transfer, internal integration (internal embeddedness), external integration (external embeddedness), knowledge sharing, absorptive capacity, disseminative capacity. We used google scholar and other academic search engines (Anelis) in order to classify relevant literature in our researched topic. For the mentioned keywords we found more than 500 articles. After filtering the found articles by excluding gray literature, we were able to identify the most relevant 130 journal papers. After carefully examining the references of these papers not to omit an important finding in the field, we have reached a number of 143 articles. Like in all fields of science, knowledge management literature has its own contradictory results. In order to exclude

the contradictory results we relied on Van Wijk et al.'s (2008) meta-analytical paper, reaching a number of 98 verified journal articles (as seen in Appendix 1).

### 3. THE NEED OF GREATER CONTEXTUALISATION

In order to organize our findings we further developed Argote et al.'s (2003) two dimensional theoretical framework on organizational learning and knowledge management. They claimed that research on this topic can be organized on two axes: Knowledge Management Outcomes (Creation, Retention, and Transfer) and Knowledge Management Context (Properties of Units, Properties of The Relationships between the Units and Properties of Knowledge). Since the knowledge management literature had an exponential development in the past few years, we considered that the model would be more accurate if we added one more axis. As we wanted to show the common and proved findings in different fields, we added the 'discipline' axis (Figure 4). One of the reasons of organizing literature is to identify blind spots, and to find further research possibilities. Most of the scholars research relationships between two or four knowledge management elements, ignoring the rest of the relationships. There are a few well researched relationships (external integration and performance, subsidiary role and knowledge transfer ability, etc.), but there also are blind spots and 'black boxes'. We organized the selected articles and inserted them into our three dimensional box. When we conceptualized our theoretical framework, we used Minbaeva's (2007) framework as well (the basis of the 3D model) to be more accurate. We filled the virtual box with the selected articles and drew our conclusions.



\*Not always the sender creates the knowledge, it can be also retransferred.

**Figure 4. 3D Theoretical framework on organizational learning and knowledge management from an interdisciplinary perspective**

*Source:* own editing, developed model of Argote et al. (2003) and Minbaeva (2007)

It is important to distinguish between different fields, because not only the terminology can differ, but also the meaning of some concepts. International business scholars research knowledge

management in multinational companies, while operations management scholars research the same concepts in international manufacturing networks (which are also MNCs, but not all the MNCs are IMNs). Using the same concepts Strategic management and international business papers focus on knowledge management issues also within international joint ventures (Lyles & Salk, 1996; Inkpen, 2008), but the findings are not always applicable in the MNC context. In our theoretical framework we show the common denominators from different fields to identify the future research possibilities. Correctly distinguishing between the mentioned fields is relevant to support our findings, so the definitions of the disciplines are essential for the accuracy of our findings.

We defined *International Business* as the exchange of goods and services among individuals and businesses in multiple countries. Articles in which the main focus was on the exchange of goods and services between multiple countries were categorized in the international business field. The most of these articles were published in *International Business Journal* (as seen in Appendix 1).

*Operations Management* focuses on the design, execution, and control of operations that convert resources into desired goods and services, and implement a company's business strategy, while *Strategic Management* focuses on the systematic analysis of the factors associated with customers and competitors (the external environment) and the organization itself (the internal environment) to provide the basis for maintaining optimum management practices. The objective of strategic management is to achieve better alignment of corporate policies and strategic priorities. *Human Resource Management (HRM)* researches the creation of business value through the strategic management of the workforce, focusing on the management of the human capital of a company. As showed, there are no strict barriers between these research areas, but through the terminology, thinking logic and the journals where these were published, we could categorize the reviewed papers into the different research fields.

For a better understanding of our theoretical framework it is also important to define the Knowledge Management Context and the Knowledge Management Outcomes.

#### *Properties of Subsidiaries*

Over the past few decades the management of multinational subsidiaries has gradually emerged as a distinct field of research from within the fields of International and Strategic Management (Paterson & Brock, 2002). As we mentioned earlier understanding KM literature can be complicated, because of the terminology problem. In Argote et al.'s (2003) original two dimensional model subsidiaries were called units. The foundations of subsidiary role stream were laid in Ferdows' (1997) article (Paterson & Brock, 2002), where he uses the 'plant' terminology, focusing on production plants. In his article he distinguishes six plant roles considering the strategic role and the competences of the plants. High competence plants are the source, lead and the contributor, and low competence plants are the offshore, outpost and server plants. Many explanations of effective knowledge management focus on properties (roles) of a particular subsidiary. Argote et al. (2003:573) claim that "the key driver of effective knowledge management is some characteristic of the unit itself". The subsidiary's roles are highlighted because they illustrate a convergence of findings across disciplines. Knowledge created in a high competence subsidiary (high status subsidiary, institution) is more likely to be used (or licensed) than knowledge created by a low competence subsidiary (Sine et al., 2003; Argote et al. 2003). Apart from this, universal KM literature claims that knowledge transfer has some triggers, which can be correlated with the plant competences, through the disseminative and absorptive capacity of different plants (Minbaeva, 2007).

#### *Properties of the Relationships between Subsidiaries*

In all the investigated fields of management scholars research the properties of the relationships between subsidiaries. While knowledge is essential for the competitiveness of the MNC, from a subsidiary perspective knowledge is perceived in a slightly different manner (Demeter et al., 2015). On one hand, subsidiaries cooperate with other units in the network to share and develop new

knowledge in a collaborative manner. On the other hand, they also compete for intra-network knowledge (Luo, 2005), as this knowledge can be used to upgrade the competences of the subsidiary, increase performance and thereby secure its future within the network (Cheng et al., 2011; Feldmann & Olhager, 2013). Argote et al. (2003) claim that how units are connected to each other is characterized by two main approaches. One approach focuses on the dyadic relationship between social units (intensity of connection, communication frequency, social similarity), as operations management and international business research confirmed the relationship between these variables and KT. The second approach emphasizes the pattern of connections between multiple units. For instance, knowledge flow is eased when the individuals are embedded in a dense network of third-party connections (Reagans & MacEvily, 2003) The structural effect is not limited to interpersonal connections, but these connections have a great impact on the quantity of knowledge transferred, as HRM scholars proved this in many articles. Common findings are that the more embedded a subsidiary in the network is, the more the quantity of knowledge transferred (Lane & Lubatkin, 1998; Minbaeva, 2007; Schmid & Schurig, 2003).

#### *Knowledge characteristics*

Various types of knowledge can be found within an MNC (King & Zeithaml, 2003). Gupta and Govindarajan (2000) provide examples for procedural (e.g. product design, production know-how) versus declarative (e.g. financial information) knowledge. Schmid and Schurig (2003) claim that organizational knowledge also varies according to functional activities. As we mentioned earlier, knowledge management is effective if it is able to create value, therefore differentiating knowledge assets is essential. Haas and Hansen (2005) argued that the performance perspective draws attention to the need to examine the net effects of knowledge sharing on task performance outcomes under particular contextual conditions, rather than assuming that more knowledge sharing is always better. In their paper they observed that sharing explicit (codified) knowledge in the form of electronic documents saved time during the task, but did not improve work quality or signal competence to the clients, but sharing personal advice improved work quality and signaled competence, however it did not save time. Winter (1987) differentiated between favorable and unfavorable knowledge assets (Table 1). The taxonomic dimensions of knowledge assets only show us how complex would be to transfer that knowledge, not the possibility of transferring it. In knowledge management the differentiation of knowledge is important because managers always should consider what are the benefits and costs of transferring knowledge.

**Table 1. 3D Taxonomic dimensions of knowledge assets**

<b>Unfavorable dimensions of knowledge assets</b>	<b>Favorable dimensions of knowledge assets</b>
Complex	Explicit
Non teachable	Teachable
Not articulated	Articulated
Not observable in use	Simple
An element of a system	Independent

*Source:* adapted from Winter (1987), p. 163

#### *Creation, retention and transfer of knowledge*

Creation of knowledge is often associated with the sender, which is not always right. On one hand, to be transferred, knowledge must be created, and the creator must send this knowledge. On the other hand, if it is retained and understood, it can be retransferred to a third party. Nevertheless, the existences of the two participants are not sufficient condition for the success of the knowledge transfer process. As Minbaeva (2007) argued, knowledge transfer has a lot of barriers (Figure 3), like knowledge characteristics, the existence of absorptive and disseminative capacity (ACAP and

DCAP), and the organizational context. In previous chapters we discussed the characteristics of knowledge and the organizational context, now we focus on the ACAP and DCAP.

Absorptive capacity is the characteristic of the receiver, as Cohen and Levinthal (1990:128) formulated, it is the "firm's ability to recognize value of new external information, assimilate it, and apply it to commercial ends". Szulanski (1996) complemented the findings with the role of recipient's motivation (which we will discuss in the next subsection). In 1998 Lane and Lubatkin in their article entitled "Relative absorptive capacity and interorganizational learning" introduced the notion of relative absorptive capacity, which argues that one firm's ability to learn from another firm depends on the similarity of both firms' (or subsidiary's) (i) knowledge bases, (ii) organizational structures and compensation policies, and (iii) dominant logics. Even though the sample of their empirical research was drawn from a population of R&D alliances between pharmaceutical and biotechnology companies, the findings are also considered valid for internal knowledge transfer within MNCs. ACAP within MNCs was researched in detail by Zahra and George (2002) in their paper entitled "Absorptive capacity: A review, reconceptualization, and extension." They argued that organizational mechanisms associated with combinative capabilities drive a unit's potential and realized absorptive capacity in different ways. While potential ACAP depends on organizational mechanisms associated with coordination capabilities (ex. job rotation), the realized ACAP depends on organizational mechanisms associated with socialization capabilities (ex. connectedness, socialization tactics). Minbaeva et al. (2003) divided ACAP into employees' ability, and employees' motivation to acquire knowledge. It is also crucial for plant managers to distinguish between acquisition and assimilation of knowledge (which correlates with potential ACAP), and transformation and exploration of knowledge (which correlates with realized ACAP). As we highlighted in the previous chapters transformation and exploration of knowledge creates value for the subsidiary and for the whole company. Because of these relationships knowledge transfer is a dynamic process, the sender can transform into a receiver and vice versa (Zahra & George, 2002). In the same article the authors claim that the potential and realized ACAP depends on country, industry and organizational specific aspects. Nokata (1994) and Minbaeva et al. (2003) argue that KT and ACAP depends highly also on individuals.

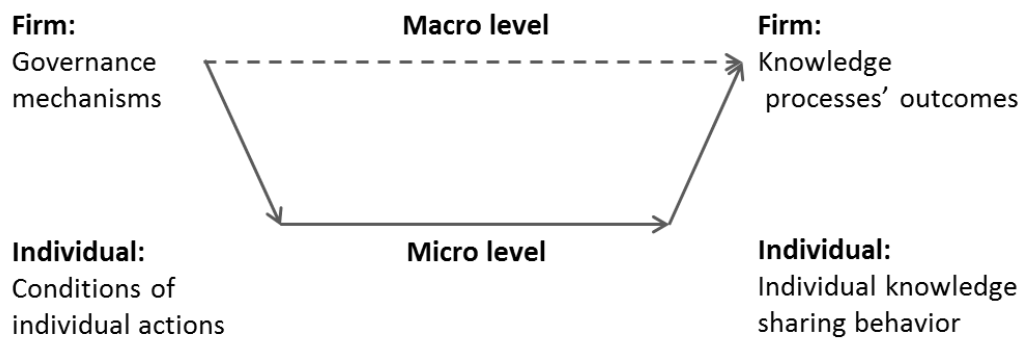
Disseminative capacity could also be a barrier in knowledge sharing. Husted and Michailova (2002) claim that the behavior of knowledge senders could be expressed by her/his willingness to share knowledge with other organizational members on request. There are some reasons for "not to share" behavior like (i) protection of individual competitive advantages, (ii) reluctance to spend time on knowledge sharing, (iii) fear of hosting "knowledge parasites", (iv) avoidance of exposure, (v) uncertainty regarding how the knowledge receiver will perceive and interpret shared knowledge, or (vi) high respect for hierarchy and formal power (Husted & Michailova, 2002). It is observable that both ACAP and DCAP which are major elements of knowledge transfer depend on human behavior, researched mostly by HRM scholars.

### **3.1 Knowledge based view of the MNCs, and the knowledge governance approach**

All the findings presented above are from a resource based perspective of the firm: knowledge is interpreted as a resource. Grant (1996) in his paper entitled "Toward a knowledge-based theory of the firm" argues that although economists use the term 'theory of the firm' in its singular form, there is no single, multipurpose theory of the firm. In his paper he also claims that strategic management has always drawn its theories from both economics and organization theory, thus its area of interest is different from both, this is why the resource based view has its limitations. Grant (1996:113) claims that "firms exist as institutions for producing goods and services because they can create conditions under which multiple individuals can integrate their specialist knowledge". The KBV focuses on individuals, who are the firm's social capital. As a concept social capital may be viewed as a specification of KBV notions (Nahapiet & Ghoshal, 1998), and it is defined by Coleman (1990, 1994) as it is collectively-owned, and it is rooted in the social relations between



individuals. “The development of social capital represents a significant investment (Nahapiet & Ghoshal, 1998:260), and hence like all investments it should be managed. Gooderham et al. (2011) argue that understanding of relations between governance mechanisms and knowledge processes implies theorizing individuals, individual heterogeneity, and individual interaction. We take the position that the explanation of firm-level (macro) phenomena must be grounded in mechanisms that involve an individual level (cf. Elster, 1989). Figure 5 shows how the knowledge management process should be interpreted on a micro and macro level.



**Figure 5. Knowledge Governance Approach**  
*Source:* adapted from Foss & Minbaeva (2009)

### 3.2. Organizing the knowledge management literature

We developed Argote et al.’s (2003) theoretical framework (Figure 4) to identify where research findings about knowledge management converge and where gaps exist. Because our three dimensional model consists of 36 parts, it would be complicated to virtually fill in the boxes. For a transparent representation, we broke down the model cutting it into four planes along the ‘x’ axis. The broken down model’s horizontal axis highlights the fact that “different theories of knowledge management give casual priority to different contextual proprieties” (Argote et al., 2003:572), as proprieties of the subsidiaries themselves (such as ACAP), or properties of knowledge (such as tacitness). On the vertical axis there the knowledge management outcomes are represented. As explained above, knowledge creation occurs when new knowledge is generated, knowledge retention involves embedding knowledge, and knowledge transfer is when experience acquired in one unit affects another (Argote et al., 2003). Despite the complexity of research on knowledge management, theoretical explanations can be organized in our model (Figure 6). We represented on the model how many of the 98 selected and reviewed articles fit in the different categories. For example we found 28 Operations Management papers, which research the relationship between knowledge transfer and the properties of the relationships between subsidiaries.

What we found organizing the literature is that there are some deeply researched relations between the mentioned components among different management fields, and there are also some major differences between research areas interests. While in all the analyzed management fields scholars researched the connection between the ‘properties of the relationships between subsidiaries’ and knowledge transfer, just international business papers focus on the relationship between the ‘properties of subsidiaries’ and the knowledge creation process. Starting from our theoretical framework, while focusing also on micro and macro level construct, we drew our conclusions.

Knowledge Management Outcomes	<b>International Business (17 art.)</b>			<b>Operations Management (35 art.)</b>			
	Creation	✓ 8 art.	✓ 12 art.		✓ 13 art.		
	Retention	✓ 9 art.	✓ 13 art.		✓ 18 art.		
	Transfer	✓ 10 art.	✓ 13 art.		✓ 28 art.	✓ 8 art.	
	<b>Strategic management (19 art.)</b>			<b>Human Resource Management (6 art.)</b>			
	Creation					✓ 11 art.	
	Retention				✓ 4 art.		
	Transfer	✓ 6 art.	✓ 14 art.	✓ 17 art.	✓ 4 art.		
		Properties of Subsidiaries	Properties of the Relationships between Subsidiaries	Knowledge characteristics	Properties of Subsidiaries	Properties of the Relationships between Subsidiaries	Knowledge characteristics
	<b>Knowledge Management Context</b>						

**Figure 6. Representation of the theoretical framework on organizational learning and knowledge management from an interdisciplinary perspective**

*Source: own editing, developed model of Argote et al. (2003)*

#### 4. DISCUSSION AND CONCLUSION

Research on organizational knowledge management is burgeoning. Although conceptual and qualitative reviews of the literature on organizational knowledge transfer have been done (e.g. Easterby-Smith et al., 2000), no study has attempted to summarize the findings of the field from an interdisciplinary perspective. We contributed to prior literatures on organizational knowledge transfer by creating a new theoretical framework (reviewing 98 articles) that showed us which are, from an interdisciplinary perspective, the most and the less researched topics. Moreover, we consolidated existing research excluding contradictory results based on the meta-analysis of Van Wijk et al. (2008). Based on this, we also identified the most relevant future research topics in the field. We also standardized the terminology by using the international business forms, and showing the other appellations in parenthesis.

From a managerial perspective we contributed by an explanatory study for understanding the basis of knowledge management literature from a birds-eye view.

#### 4.1. Limitations and further research directions

Several limitations of this study merit discussion. Firstly, because of the interdisciplinary perspective, we met contradictory results in different papers. The decision of excluding papers was mainly based on Van Wijk et al.'s (2008) meta-analytic paper. Because there was no more recent meta-analytic research in the field, newer papers' findings could not be filtered with the same method. The further research directions are connected to the limitations of this paper, as a new meta-analytic testing should empirically prove the findings of the different fields, using our theoretical framework. Secondly, we focused mainly on internal knowledge management processes, partially omitting the external knowledge transfer. Although internal knowledge transfer has a greater impact on subsidiary performance, recent studies show that the two concepts should be researched together (Demeter et al., 2015). Another direction would be the joint researching of the impact of internal and external knowledge transfer on subsidiary performance. It is also interesting that although all the scholars agree that KT has to have an impact on performance, there are (beside of a few operations management articles) relatively few papers focusing on performance implications, which could also be a future research direction.

With the use of our model we also identified that there is a need for a multi-level logic, as there is a limited theorization of the nature and the impact of the organizational mechanisms that connect different levels (micro and macro levels).

Although many scholars claim that the knowledge transfer process depends highly on individuals (Husted & Michailova, 2002; Minbaeva et al., 2003; Nokata 1994), from our theoretical framework it can be observed that there are just 4 human resource management articles which focus on knowledge retention and the properties of the relationships between subsidiaries, while the same relation from an operations management perspective is analyzed in 18 papers. Further research should also focus on the individual level of KT.

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**APPENDIX 1 – Reviewed articles for the theoretical framework**

No.	Paper refrence short	Discipline	Knowledge Management Outcomes			Knowledge Management Context			Cited in paper	
			Knowledge transfer	Knowledge creation	Knowledge retention	Properties of Subsidiaries	Properties of The Relationships between Subsidiaries	Knowledge Characteristics		
1	Ferdows (1997)	International business	1	1	1	1	1	1	0	yes
2	Vereecke & van Dierdonck (2002)	Operations management	1	0	1	0	0	1	0	yes
3	Vereecke et al. (2006)	Strategic management	1	1	1	1	1	1	1	yes
4	Rudberg & Olhager (2003)	Operations management	1	0	1	0	0	1	0	yes
5	Meijboom, Vos (1997)	Operations management	1	1	0	0	0	1	0	no
6	Cheng et al. (2011)	Operations management	0	1	0	0	0	0	0	no
7	Feldmann et al. (2013)	Operations management	0	1	0	0	0	0	0	no
8	Maritian et al. (2004)	Operations management	1	0	1	0	0	1	0	no
9	Feldmann & Olhager (2013)	Operations management	1	0	1	0	0	0	0	yes
10	Birkinshaw & Morrison (1995)	International business	0	1	0	0	0	0	0	no
11	Meijboom & Vos (2004)	Operations management	1	1	0	0	0	0	0	no
12	Shi & Gregory (1998)	Operations management	1	1	0	0	0	1	0	no
13	Birkinshaw (1996)	International business	0	1	1	1	0	0	0	no
14	Forst et al. (2002)	Strategic management	1	0	0	0	0	0	1	no
15	Cantwell & Mudambi (2005)	Strategic management	1	0	0	1	1	1	1	no
16	Ferdows (2006)	Operations management	1	0	1	0	0	1	0	yes
17	Yang et al. (2008)	Operations management	0	1	0	0	0	0	0	no
18	Meijboom & Voordijk (2003)	Operations management	0	1	0	0	0	0	0	no
19	Fusco & Spring (2003)	International business	1	1	0	0	0	0	0	yes
20	Ambos et al. (2006)	Operations management	0	1	0	0	0	0	0	no
21	Birkinshaw (1998)	Strategic management	1	0	1	0	0	1	1	no
22	Minbaeva et al. (2003)	Human Resource Management	1	0	1	0	0	1	0	yes
23	Mudambi (2008)	Operations management	1	0	1	0	0	1	0	no
24	Paterson & Brock (2002)	International business	1	1	0	1	0	0	0	yes
25	Reiner et al. (2008)	Operations management	1	0	1	0	0	1	0	no
26	Slepinov et al. (2014)	Operations management	1	1	0	0	0	0	1	no
27	Deflorin et al. (2012)	Operations management	1	0	1	0	0	1	0	no
28	Disider & Mayer (2004)	Operations management	1	0	1	0	0	1	0	no
29	Filippov et al. (2011)	Operations management	0	1	0	0	0	1	0	no
30	Talay & Cavusgil (2008)	International business	1	1	1	1	1	1	0	no

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No.	Paper refrence short	Discipline	Knowledge transfer	Knowledge creation	Knowledge retention	Properties of Subsidiaries	Properties of The Relationships between Subsidiaries	Knowledge Characteristics	Cited in paper
31	Rungtusanatham et al. (2005)	Operations management	1	0	1	0	1	0	no
32	Bendoly et al. (2007)	Operations management	1	0	1	0	1	0	no
33	Bessant et al. (2001)	Operations management	1	0	1	0	1	0	no
34	Boyer & Lewis (2002)	Operations management	1	0	1	0	1	0	no
35	Boyer et al. (2002)	Operations management	1	0	1	0	0	0	no
36	Cagliano et al. (2005)	Operations management	1	1	0	0	0	0	no
37	Choe et al. (1997)	Operations management	1	0	1	0	1	0	no
38	Corbett (2008)	Operations management	1	0	0	1	0	1	no
39	Dangayach & Desmukh (2001)	Operations management	1	0	0	1	0	1	no
40	Demeter (2003)	Operations management	0	1	0	0	1	0	no
41	Devaraj et al. (2001)	Operations management	0	1	0	0	1	0	no
42	Droge et al. (1994)	Strategic management	1	0	0	1	1	1	no
43	Ferdows & Meyer (1990)	Operations management	1	1	0	0	1	0	no
44	Fine & Hax (1985)	Operations management	0	1	0	0	1	0	no
45	Flynn & Flynn (2004)	Operations management	1	1	0	0	1	0	no
46	Grant (1991)	Strategic management	1	1	0	0	1	1	yes
47	Grossler (2007)	Operations management	1	1	0	0	1	0	no
48	Hayes & Pisano (1984)	Operations management	0	1	0	0	1	0	no
49	Johansson & Winroth (2010)	Strategic management	0	0	1	0	1	1	no
50	Ketokivi & Scroeder (2004)	Operations management	0	1	0	0	1	0	no
51	Kim & Arnold (1993)	Operations management	1	0	1	0	1	0	no
52	Koufteros et al. (2002)	Strategic management	0	1	1	0	0	1	no
53	Lapre & Scudder (2004)	Operations management	1	0	1	0	0	0	no
54	Leong et al. (1990)	Operations management	1	0	0	1	1	1	no
55	Narisimhan & Jayaram (1998)	Operations management	0	1	0	0	1	0	no
56	Prochno & Correa (1995)	Operations management	1	0	0	1	0	1	no
57	Rosenzweig & Easton (2010)	Operations management	1	0	0	1	1	1	no
58	Rosenzweig & Roth (204)	Operations management	1	0	1	0	1	0	no
59	Safizadeh et al. (2000)	Operations management	1	0	1	0	1	0	no
60	Schmenner & Swink (1998)	Operations management	1	1	0	0	1	0	no

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No.	Paper refrence short	Discipline	Knowledge transfer	Knowledge creation	Knowledge retention	Properties of Subsidiaries	Properties of The Relationships between Subsidiaries	Knowledge Characteristics	Cited in paper
61	Schoenherr & Vastag (2006)	Operations management	0	1	0	0	0	0	no
62	Schoenherr & Narasimhan (2012)	Operations management	0	1	0	0	0	0	no
63	Slack (1994)	Operations management	0	1	0	0	0	0	no
64	Slack & Lewis (2002)	Operations management	0	1	0	0	0	0	no
65	Vickery (1991)	Operations management	0	1	0	0	0	0	no
66	Vickery et al. (1993)	Operations management	0	1	0	0	0	0	no
67	Ward & Duray (2000)	Operations management	0	1	0	1	0	0	no
68	Ward et al. (2007)	Operations management	1	0	1	0	1	0	no
69	Easterby et al. (2000)	International business	1	0	1	1	1	1	yes
70	Holm & Pedersen (2000)	International business	1	1	1	1	1	1	yes
71	Husted & Michailova (2002)	International business	1	1	1	0	1	0	yes
72	Kogut & Zander (1993)	International business	1	1	1	0	1	0	yes
73	Luo (2005)	International business	1	1	1	0	1	0	yes
74	Lyles & Salk (1996)	International business	1	1	1	1	1	0	yes
75	Mahnke et al. (2005)	International business	1	1	1	1	1	0	yes
76	Michailova & Minbaeva (2012)	International business	1	1	1	1	1	0	yes
77	Minbaeva (2007)	International business	1	1	1	1	1	0	yes
78	Van Wijk et al. (2008)	International business	1	1	1	1	1	0	yes
79	Whetten et al. (2009)	International business	1	1	1	0	1	0	yes
80	Argote et al. (2003)	Strategic management	1	1	1	0	1	1	yes
81	Grant (1996)	Strategic management	1	1	1	1	1	1	yes
82	Gupta & Govindarajan (2000)	Strategic management	1	1	1	0	1	1	yes
83	Haas & Hansen (2005)	Strategic management	1	1	1	0	1	1	yes
84	Inkpen (2008)	Strategic management	1	0	1	0	1	1	yes
85	King & Zeithaml (2001)	Strategic management	1	0	1	1	1	1	yes
86	Lane & Lubatkin (1998)	Strategic management	1	0	1	0	1	1	yes
87	Nahapiet & Goshal (1998)	Strategic management	1	1	1	0	1	1	yes
88	Nonaka (1994)	Strategic management	1	1	1	0	0	1	no
89	Uit Beijerse (2000)	Strategic management	1	1	1	0	0	1	yes
90	Zahra & George (2002)	Strategic management	1	1	1	1	1	1	yes



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No.	Paper refrence short	Discipline	Knowledge transfer	Knowledge creation	Knowledge retention	Properties of Subsidiaries	Properties of The Relationships between Subsidiaries	Knowledge Characteristics	Cited in paper
91	Cohen & Levinthal (1990)	Operations management	1	0	1	0	1	0	yes
92	Demeter et al. (2015)	Operations management	1	0	0	1	1	1	yes
93	Reagans & McEvily (2003)	Operations management	1	0	0	1	1	1	yes
94	Foss & Minbaeva (2009)	Human Resource Management	1	0	1	0	1	0	yes
95	Gooderham et al. (2011)	Human Resource Management	0	0	0	0	1	0	yes
96	Delaney & Huselid (1996)	Human Resource Management	0	0	1	0	1	0	no
97	Simonin (1999)	Human Resource Management	1	0	1	0	1	0	no
98	O'Reilly & Chatman (1994)	Human Resource Management	1	0	0	0	1	0	no