TRANSFER OF HETEROGENEOUS KNOWLEDGE ALONG THE DUAL-NETWORK OF MNCS

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Abstract

The literature on knowledge transfer in multinational companies (MNCs) reveals little of to what extent different types of knowledge are exchanged by the subsidiaries in the dual-network of the MNC. The objective of this paper is to fill this gap and to present the kinds of knowledge network of the MNC. This research is based on case study. An MNC is selected which of headquarter is located in Turkey and subsidiaries in 15 different countries including England, China, S. Africa. A wide variety of knowledge can be transferred from subsidiaries to the MNC. The study deals with the knowledge transfer having a potential of usage in product innovation. Using network analysis, the paper reveals that what types of knowledge subsidiaries are willing to search for and transfer through their network ties. The three types of knowledge are distributed and exchanged by subsidiaries along with the dual-network of MNC. Intensity and pervasiveness of knowledge flows display any differences between three types of knowledge. Additionally, knowledge flows' route could be defined. Thus, where knowledge was travelling in an environment could be revealed. This finding is especially important for managers to establish the new knowledge routes.

Keywords

Knowledge Transfer, Subsidiary, Network Analysis, Multinational Company

1. Introduction

Innovation capability of MNCs depends on the capability to gain, integrate and globally produce knowledge (Michailova & Zhan, 2015; Sammarra & Biggiero, 2008; Zhang, Benedetto, & Hoenig, 2009). From this point of view, knowledge plays a central role in the innovation process as both input and output. Furthermore, innovation seldom features a single technology form or a single market objective; it rather consists of a cluster of knowledge brought together meaningfully (Gubbins & Dooley, 2014; Harryson, Dudkowski, & Stern, 2008). MNCs obtain the knowledge required for innovation from various sources (Phene & Almeida, 2008). The knowledge may be created internally (e.g. through R&D investments) or obtained from external sources (e.g. from competitors, other companies in the industry, customers or suppliers) (Andersson, Bjorkman, & Forsgren, 2005). MNCs access the knowledge (especially those outside their network) through their own subsidiaries. Thus, subsidiaries play a strategic partner role in the knowledge transfer.

The importance of subsidiaries' knowledge transfer is entirely related to its capability of affecting the MNC's innovation capacity. As the variety of knowledge transfer increases, the MNC's innovation capability will improve. The presence of the heterogeneous knowledge increases the possibility of new ideas by enriching the probability of new combinations (Almeida & Phene, 2004). Additionally, according to resource-based view of the firm (Barney, 1991) heterogeneous knowledge could be suggested as the source of competitive advantages for an MNC. It is possible for a subsidiary to affect the competitive advantages of an MNC in two ways. First, the subsidiary's availability of heterogeneous knowledge through its host country networks has a positive impact on its competitive advantages in the local market. Thus, this indirectly enhances the competitive advantage of whole network of MNC. Second, transfer of the heterogeneous knowledge obtained by the subsidiary to the headquarters and other units of the multinational network directly enhances the competitive advantage of whole network of MNC (Andersson, Forsgren and Holm, 2002). However, knowledge needs to carry some attributes in

order to be a source of the competitive advantage. According to this, knowledge must be rare, valuable, imperfectly imitable, and non-substitutable (Barney, 1991).

In the international management literature, there is a considerable amount of studies regarding the knowledge transfer that subsidiary obtains through its internal and external network (dual-network of MNC). However, it seems that sufficient attention has not been given to what type of knowledge is transferred by the subsidiaries in this dual-network.

Therefore, in this paper, the main purpose is revealing what extent different types of knowledge the subsidiaries are more willing to look for in the local environment and which of this knowledge they transfer to the MNC. A case study has been carried out on an MNC which has 15 foreign subsidiaries headquartered in Turkey. Network analysis has been used in the study, in which the intensity and direction of knowledge transfer within the network of MNC have also been determined.

The study is organized as following. The following chapter includes the evaluation of the knowledge obtained locally by the subsidiaries. Later on, the method and empirical results are presented. The article is concluded with a discussion of the results.

2. Knowledge Transfer of Subsidiary

Until the 1970s, international business research considerably ignored the value of subsidiary-based innovation and preferred focusing on the management of parent company-subsidiary relationships (Reilly & Scott, 2014). Subsidiaries were considered as simple mediators for accessing local advantages (Cavanagh & Freeman, 2012). Roles of these operational units controlled by the parent company were often restricted to local sales and manufacturing activities. But recently, subsidiaries have begun to be seen as the main providers of innovation and research and development (Cavanagh & Freeman, 2012; Zhang et al., 2009). Additionally, diffusion of the MNC innovations worldwide is vital and foreign subsidiaries are involved in this process as critical actors (Bartlett & Beamish, 2011).

The parent companies' requirement for subsidiaries in terms of innovation, or more specifically product innovation, can be said to be closely associated with the features of products. For example, MNCs may produce products that appeal to a variety of markets, unlike local

products for a single market. These are "transnational" products emphasizing simultaneously the similarities and differences among different countries (Subramaniam & Venkatraman, 2001). These products are neither standardized nor unique to each country; they have modifications differing from country to country based on a standardized "central" platform (Subramaniam, Rosenthal, & Hatten, 1998). These modifications may be valid for not only countries but also the geographies with similar cultures, pleasures, and habits. For the production and modification of new products according to market needs, internally-produced knowledge is not sufficient; conditions of the country where activities are carried out have to be known. And this can be achieved with the subsidiaries' entity. In other words, thanks to the knowledge transfer from the subsidiaries, the parent company decides which features must be standardized for markets and which features must be differentiated (Subramaniam et al., 1998). Thus, the subsidiary acts as a bridge in the knowledge transfer from the external network to the internal network that can be used in product innovation.

Subsidiaries use various resources as suppliers, customers, government and universities to obtain knowledge in their host country (Achcaoucaou, Miravitlles, & Leon-Darder, 2014). This study deals with suppliers and customers which are the local knowledge resources of subsidiaries and is concerned with the transfer of knowledge having a potential of usage in product innovation. Therefore, it is accepted that the subsidiaries can obtain three types of knowledge that can be used in product innovation from their external network (customers and suppliers) and can transfer these types of knowledge to their internal network (headquarters and other subsidiaries). These types of knowledge are market knowledge, technological knowledge and management knowledge as mentioned by Samarra and Biggiero (2008). Management knowledge includes knowledge about management systems and practices (Damanpour & Aravind, 2011). Market knowledge includes knowledge regarding the customers in countries where the subsidiaries are active. Customer knowledge is the internally collected knowledge of MNCs and includes the necessities, cultures, pleasures and buying patterns of host country customers from different geographies (Lee, Chen, Kim, & Johnson, 2008). Especially the advanced knowledge regarding host country customers makes it possible for the MNC to design new products that can satisfy the customers' needs (Lee et al., 2008). Obtaining new knowledge regarding technology also makes the development of new product varieties possible (OECD & EUROSTAT, 2005). It could be suggested that management knowledge has an indirect effect on

product innovation. Knowledge obtained regarding local management and management practices may prompt organizational change and renewal of the organization (Damanpour & Aravind, 2011). New organizational practices can help the headquarters developing its capability to obtain and create new knowledge that may be used in the development of any innovation.

3. Research Design

3.1 Method and Research Context

The approach of this study, from a methodological point of view, investigates an MNC as a case study, and as in Sammarra and Biggiero's (2008) study, the detailed analysis of this case is not qualitative, it is quantitative and formal. In the study, network analysis is preferred as the analysis method. The most important point about network analysis is that the analysis is concerned with the relationships between nodes (actors), rather than the relationship between variables (Hanneman & Riddle, 2005). Three networks were identified: market knowledge network, management knowledge network and technology knowledge network.

In order for the network analysis to be carried out, the obtained data must be converted into matrices. Matrices were prepared for all three knowledge networks. These matrices were analyzed in the UCINET 6 package program developed by Borgatti, Everett, and Freeman (2002). For the graphical display of the relationships between nodes, NetDraw network visualization tool was used within this program.

Research context of this study was determined in two phases. The first phase is the selection of the case, and the second is the determination of the network.

Selecting of the case. An MNC which has 15 subsidiaries from different countries was selected as the case. It operates in the manufacturing of household appliances and consumer electronics and has important foreign direct investments throughout Europe, Asia, and Africa which make it the star brand in the household appliances and consumer electronics with 10 different brands.

Determination of the network. First, all subsidiaries' egocentric networks were identified. Later, the network of these networks was constructed as a dual-network of MNC.

3.2 Data Collection

Case studies generally combine data collection methods such as records, interviews, surveys and observations. The data may be qualitative (e.g. words), quantitative (e.g. numbers) or both (Eisenhardt, 1989). In this study, data were obtained from the questionnaire sent to the subsidiaries. The questionnaire was answered by two subsidiary groups. The first includes subsidiaries carrying out production and sales marketing; the second includes subsidiaries that only deal with sales marketing. The questionnaire was designed to gather relational data. Relational data consisted of information on business relationships each subsidiary established with other nodes (actors) and evaluation of the amount and type of knowledge exchanged through dyadic relationships with actors. The questionnaire was answered by country managers of the subsidiaries. Data were collected between September 2015 and February 2016.

Business relationships. Subsidiaries are simultaneously embedded within the dual-network of MNC (external network and internal network). In order to collect data on external business relationships, subsidiaries asked to cite the 5 most important suppliers and/or customers in their host country. For the internal business relationship, we defined all business relationship between corporate actors depend on inputs and/or outputs flows. Based on all subsidiaries' responses, we computed the relational variable "business relationship" for each pair of actors included in the dual-network. This is a binary variable with value 0 when two actors do not have a business relationship and value 1 when two actors are engaged in business collaboration. This variable was used to design the business networks of subsidiaries. As a result of the steps followed, the MNC business dual-network comprising the headquarters of the MNC, its 15 subsidiaries and a total of 68 customers and suppliers with which they have a relationship could be identified. This is a binary and symmetric graph. In the visual representation of the business network (Figure 1), lines indicate the existence of a business relationship between pairs of actors.
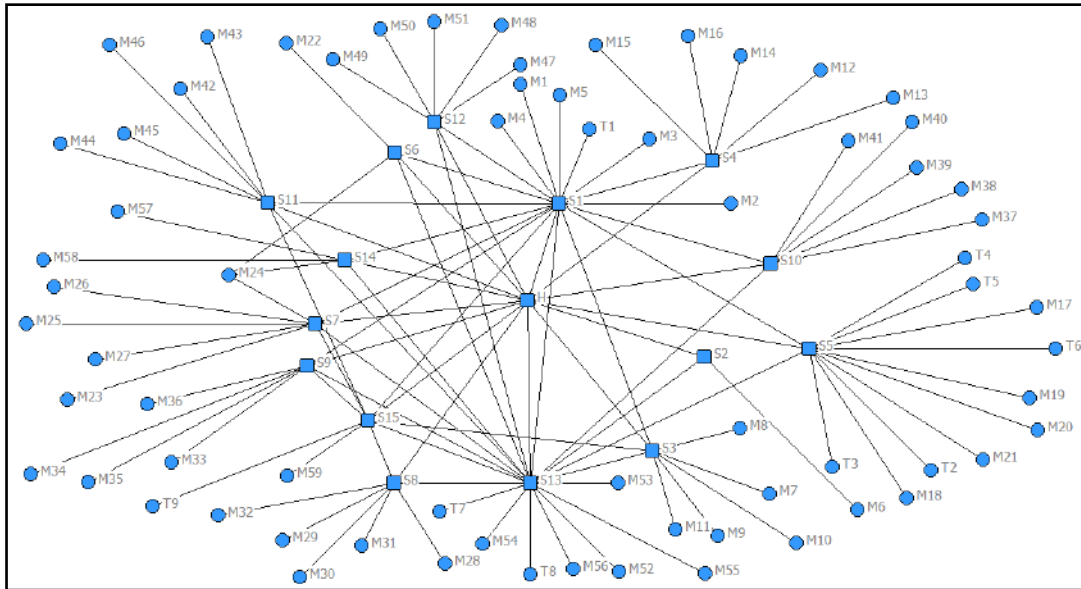
Figure 1: *Business Network of the Multinational Company "X"*

H: Headquarters   **S:** Subsidiary **M:** Customer **T:** Supplier

Knowledge transfer. The questionnaire was also designed to collect perceptual data on knowledge transfer between actors. We conceptualized the knowledge transfer as a one-way flow between customers/suppliers and subsidiaries, and as a two-way flow between subsidiaries and headquarter/other subsidiaries. Thus, while knowledge follows a path from local to subsidiaries, it can be a two-way flow between subsidiaries and headquarters. We asked 6 questions regarding the intensity of knowledge the subsidiary transfers from the above mentioned five most important customers and suppliers. Country managers answered these 6 questions for each customer and, if present, for their suppliers. Thus, we could reveal to what extent and from which local actors the subsidiaries transfer knowledge. Similarly, we asked additional 5 questions to country managers regarding the intensity of knowledge the subsidiaries transfer from and to the rest of the MNC within the internal network. Following the considerations of country managers, we computed the average of the total scores for knowledge transfer between actors.

Knowledge transfer was not considered as either presence or absence. It rather has different intensities. We gained information regarding the intensity of technology, market, and management knowledge exchange between each pair of actors within the MNC network. The

value of each knowledge tie could range on an intensity scale from 0 (no exchange) to 6 (very high).
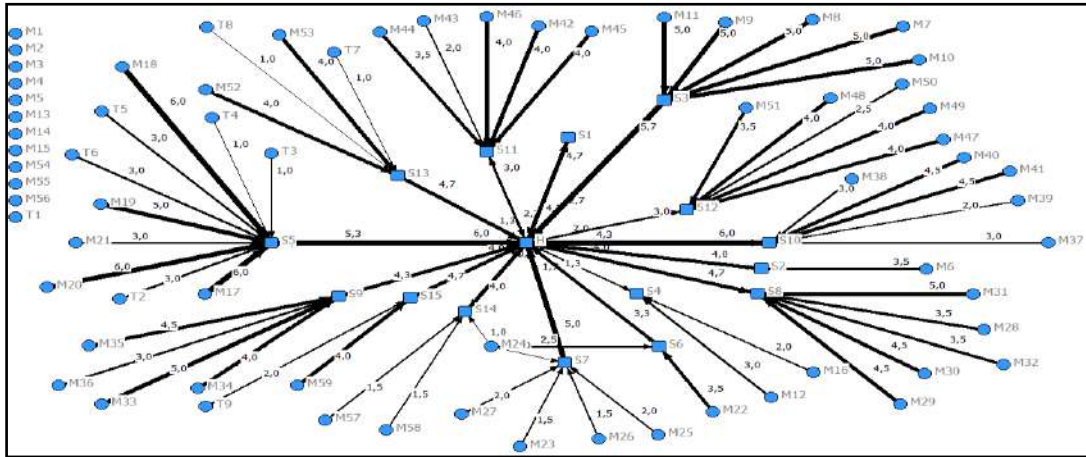

Figure 2: *Valued Market Knowledge Dual-Network of the Multinational Company "X"*

H: Headquarters   **S:** Subsidiary **M:** Customer **T:** Supplier

There are two kinds of knowledge flow for subsidiaries: (i) inflow (from customers, suppliers, and headquarter to subsidiary e.g. for S5 intensity of knowledge inflow from M18: 6, T4: 1, H: 6) (ii) outflow (from subsidiary to headquarter e.g. for S5 intensity of knowledge outflow to H: 5,3).

We calculated three variables according to the answers of all subsidiaries: "technology knowledge transfer", "market knowledge transfer", and "management knowledge transfer". For each knowledge types, knowledge networks are separately identified for all subsidiaries. In the visual representation of these knowledge relationships, the lines demonstrate the intensity of knowledge transfer between the actor (node) pair (Figure 2, Figure 3, and Figure 4). These three networks were valued and oriented. There are isolated actors in all three figures. No knowledge transfer takes place between isolated actors and subsidiaries. Especially, no transfer takes place between focal subsidiary and the other subsidiaries of all three networks.
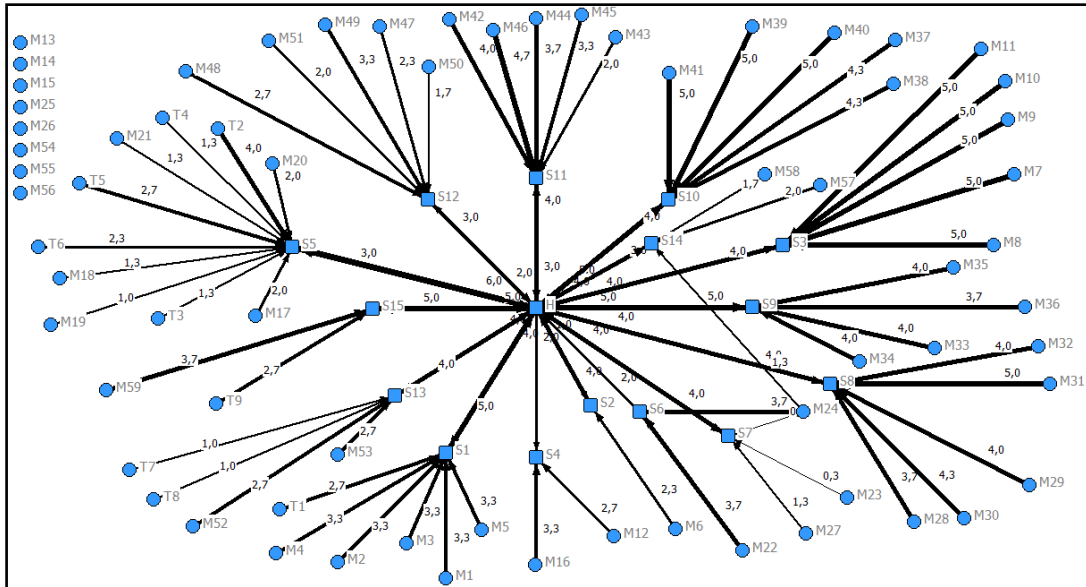
Figure 3: *Valued Management Knowledge Dual-Network of the Multinational Company "X"*

H: Headquarters   **S:** Subsidiary **M:** Customer **T:** Supplier

3.3 Analysis

In this study, we focus on what different kinds of knowledge transfer take place throughout the dual-network of MNC. Descriptive analysis scores are mentioned in Table 1. A measure of the valued ties in knowledge networks helps us to understand the extent to which knowledge is exchanged between nodes. As a result of the calculation, total values of three types of knowledge exchanges are found different (Table 2). The highest value among these is 300.20 for market knowledge, while it decreases to 296.79 for management knowledge and to 278.50 for technology knowledge. This indicator demonstrates that the amount of market knowledge exchanged by the partner along the network of MNC is much higher than the amount of technology knowledge and slightly higher than the amount of management knowledge. In order to decide whether these differences are statistically significant, densities of the networks must first be calculated with network analysis.

Table 1: *Descriptive Analysis for Whole Network*

	Business Network	Business Network	Knowledge Network
	Un-Weighted	Weighted	Weighted
Mean/ Density	0.033	0.116	0,042
Standard variation	0.178	0.735	0,390
Total tie	228	810,4	294,6
Variance	0.032	0.541	0,152
Minimum	0	0	0
Maximum	1	7	6
Observation	6972	6972	6972

Table 2: *Total Knowledge Exchanged (Sum of Valued Ties)*

Knowledge Network Type	Sum of Valued Ties
Market knowledge network	300.20
Management knowledge network	296.79
Technology knowledge network	278.50

The density of a network indicates the degree to which members are connected to all other members (Haytornthwaite, 1996). For a valued network, density is defined as the sum of the ties divided by the number of possible ties (i.e. the ratio of all tie strength that is actually present to the number of possible ties) (Hanneman & Riddle, 2005). Network density measured by using the data in Table 2 provides a further understanding of the prevalence of market, technology and management knowledge networks (Table 2).

Table 3: *Density Levels of Knowledge Networks*

Knowledge Network Type	Knowledge Network Density (Sum of Valued Ties/Total Observation)
Market knowledge network	0.0431
Management knowledge network	0.0426
Technology knowledge network	0.0399

According to Table 3, the prevalence of market knowledge relationship over management and technology relationships is further. The network of market knowledge flow is the densest (0.0431) compared to the management (0.0426) and the technology (0.0399) flows. In order to determine whether the observed differences between network densities are significant, Bootstrap Paired Sample T-Test of Snijders and Borgatti (1999) was carried out.

Table 4: *Significance of Structural Differences between Knowledge Networks*

Density Differences	t-test
Market and management knowledge network	0.0946
Market and technology knowledge network	0.4633
Management and technology knowledge network	0.7519

According to the table 4, the density difference (0.0005) between market knowledge network and management knowledge network (Figure 2 and Figure 3) is not statistically significant (0.0946>p=0.05). The density difference (0.0031) between market knowledge network and technology knowledge network (Figure 2 and Figure 4) is not statistically significant (0.4633>p=0.05). The density difference (0.0026) between management knowledge network and technology knowledge network (Figure 3 and Figure 4) is not statistically significant (0.7519>p=0.05). All these results show that the subsidiaries can absorb market, technology and management knowledge equally from relationships they have created with local actors within their external networks, and also all these knowledge are equally exchanged among the internal network. Additionally, equal network density shows that knowledge flows through similar route within the dual-network of MNC.

When the analysis results above are taken into consideration, knowledge transfer level between nodes within the network is found to show no difference in terms of knowledge types. In other words, when technology, management, and marketing knowledge networks are compared, they show no statistically significant difference in terms of knowledge flow intensity and prevalence. This can be evaluated to show that subsidiaries show a similar behavior for each knowledge type. Additionally, these findings can be interpreted as showing that subsidiaries can access each of the three knowledge types that can be regarded important in product innovation through their network relationships and transfer these knowledge types to the MNC internal network.
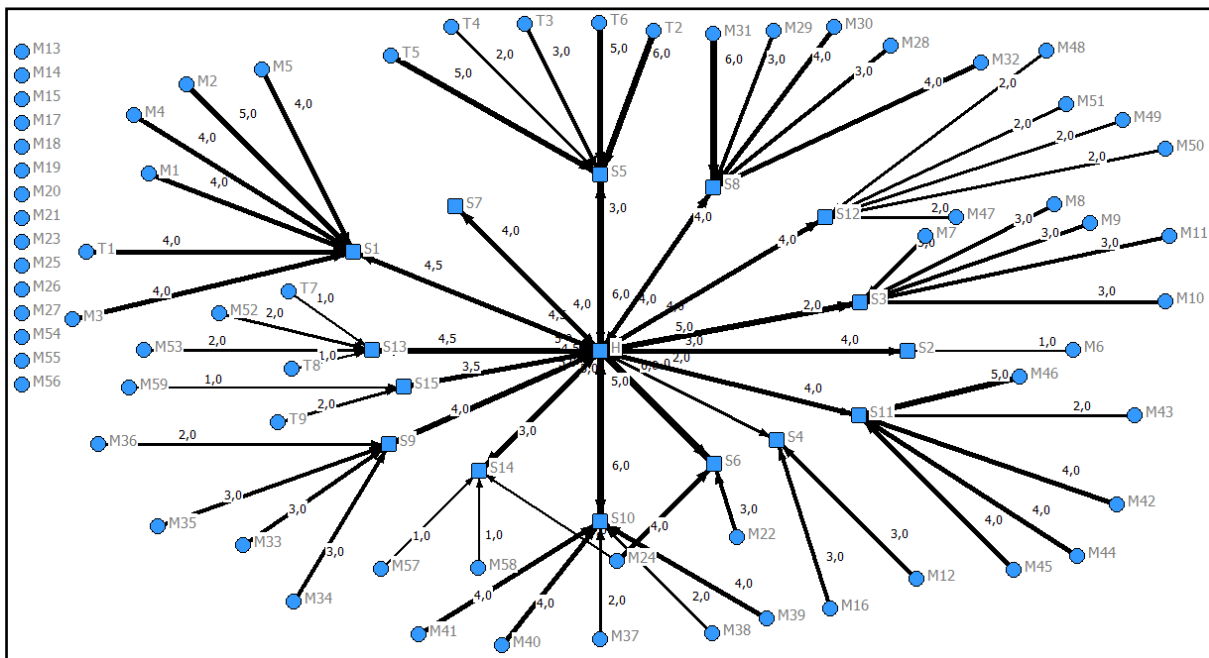

Figure 4: Valued Technology Knowledge Dual-Network of the Multinational Company "X"

H: Headquarters   **S:** Subsidiary **M:** Customer **T:** Supplier

4. Discussion and Conclusion

Since the innovation requires various kinds of knowledge from different geographies, the structure where knowledge flows from headquarters to subsidiaries has been substituted by mutual knowledge transfer within the MNC. A new structure where subsidiaries transfer various kinds of knowledge from local environments to the headquarters and other subsidiaries has begun to emerge. However, there have been few attempts to understand what types of knowledge

subsidiaries exchange through network ties. Various knowledge exchanges occur within the dual-network of MNC. We believe that focusing on the knowledge exchange that has a potential of usage in product innovation between subsidiaries and the other actors of network corresponds to have need of subsidiaries.

According to our findings, three types of knowledge exchange are defined within the dual-network of MNC. These are market, technology and management knowledge. The density of knowledge that is locally obtained by the subsidiaries and exchanged within the internal network was found to show no differences in terms of the three types of knowledge (Table 3). We can argue that the MNC uses its subsidiaries to access a combination of market, technology and management knowledge. It shows that product innovation involves various kinds of knowledge rather than specific one. Our findings are coherent with the thought that innovation is a process requiring accessing and recombining various kinds of knowledge. Samarra and Biggiero (2008) also emphasize in their study that innovation requires for the relationships between the understanding of technological researches, market needs and users' characteristics and redefinition of organizational processes to be strengthened.

Our findings showed that all subsidiaries could use the both suppliers and customers as the source of the three types of knowledge. However, no knowledge transfer takes place between focal subsidiary and the other subsidiaries of all three networks. These results are important from two aspects. First, although suppliers are seen as technology and market knowledge sources for organizations to develop new products and improve the existing products in the innovation literature (Fossas-Olalla, Minguela-Rata, López-Sánchez, & Fernández-Menéndez, 2015), this study showed the importance of suppliers in terms of management knowledge. Second, although widely accepted view on contemporary MNCs has turned into a differentiated network structure consisting of resources flows between actors, there are only product flows between subsidiaries. In other words, subsidiaries have dyadic business relations with each other but these relations do not give rise to knowledge flows. We think these findings need to be examined in the future studies. This study also has been carried in the sector of household appliances and consumer electronics. Further studies in different sectors can provide a deeper understanding of knowledge transfer within the network of MNCs.

This study has an important insight for managers. In this study knowledge flows' route could be defined. Thus, where knowledge was traveling in an environment could be revealed. This finding is especially important for managers to establish the new knowledge routes (Haythornthwaite, 1996). In addition, knowledge flows' route could provide evidence about the degree to which actors can legitimate their knowledge with regards to internal network actors of MNCs who are the receiver of the knowledge. MNCs' managers could also predict the bargaining power of their subsidiaries on resource allocation in the MNC by using knowledge flows' route because, as Mudambi and Navarra (2004) note, the pattern of knowledge flows indicates the current sources of value creation and future sources of value creation. In line with this, subsidiaries' value creation could be pursued on the prevalence of their knowledge within the MNC. The more value the subsidiary creates for an MNC, the greater the bargaining power it has (Chen, Chen, & Ku, 2012; Najafi-Tavani, Giroud, & Andersson, 2014).

As with any research, this study has several limitations that should be acknowledged. First, we work with only one case. Therefore results must be evaluated according to this reality. Second, the operationalization of relational measures of knowledge transfer adopted in this study is based on perceptual data. Therefore, our findings could be to some extent the outcome of subjective bias of respondents.

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