

A case study investigation of a model for effective reverse knowledge transfer

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

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Definitions and Acronyms

Definitions:

- **Absorptive capability:** is the capability to recognize the value of unique knowledge, integrate it and then use it to an appropriate end.
- **Agency theory:** in this case referring to the fact that the firm's (headquarters') objective and the agent's (subsidiary's) objective may not be the same and the agent (subsidiary) will not be willing to act as the headquarters demands.
- **Conventional knowledge transfer:** knowledge transfer from headquarters to subsidiaries is the conventional direction of knowledge transfer.
- **Embeddedness:** refers to the close relationship between parties that reflects the intention of exchanging knowledge and sharing resources.
- **External Network:** a subsidiary's external network consisting of its (subsidiary's) local business players such as competitors, suppliers and local institutions.
- **Innovation:** is a unique mixture of new and/or existing ideas in terms of business operation.
- **Internal Network:** is the first network that the subsidiaries are embedded within the MNC to which they belong and other subunits of the MNC.
- **Knowledge transfer:** a procedure of exchanging knowledge between two parties – sender and receiver. The potentiality of knowledge transfer depends on several factors such as characteristics of the parties and the knowledge itself, and the ability of the parties to absorb the knowledge.
- **Knowledge-based view:** suggests that the firm (headquarters) holds the key to gaining competitive advantage as the significant strategic resources (such as knowledge) stays within their home boundary, and their key role is providing knowledge, with the required support, to their subsidiaries in order to exploit the knowledge in the market.
- **Knowledge spillover:** a phenomenon when a foreign subsidiary unintentionally or intentionally shares confidential or important knowledge with the local (external) network or local competitors.
- **Relevance theory:** suggest that the knowledge is considered relevant when the level of effect is high and the implication of the knowledge is significant.

- **Resource-based view:** the headquarters hold many kinds of strategic resources and should provide many kinds of support in order to influence innovation at subsidiary levels.
- **Reverse knowledge transfer:** knowledge transfer from subsidiaries to headquarters is known as reverse knowledge transfer or bottom-up knowledge transfer.

Acronyms:

- **OECD:** the Organization for Economic Co-operation and Development
- **MNCs:** Multinational Companies
- **R&D:** Research and Development
- **HR:** Human Resource(s)
- **FDI:** Foreign Direct Investment
- **NZ:** New Zealand

Abstract

This study examines the process of transferring knowledge from a foreign subsidiary to its headquarters, in this case a single parent company and its one subsidiary. It also investigates subsidiary knowledge creation capabilities. This study proposes that, in order to facilitate subsidiary knowledge creation, the headquarters will allow the subsidiary to embed within the subsidiary's internal and external networks and the headquarters also will allow the subsidiary's autonomous behaviour. It also proposes that the headquarters will provide the required support to transmit the knowledge. A mixed methods case study research approach was employed to verify these propositions. The key finding of this study is that the support and resources for materializing knowledge can be provided by both sides – the headquarters and also the subsidiaries. This study helps managers to understand several concepts related to knowledge transfer, the significance and negative impact of the factors and also the barriers to transferring knowledge from subsidiaries.

1.0 Introduction

This manuscript reports the process and outcomes of a one-semester research project undertaken for the final fulfilment of the requirements of a Master of Business degree.

In international markets, gaining competitiveness is crucial for multinational companies. In order to gain a competitive advantage in the global market, multinational companies (MNCs) have realized that they require resources that do not reside solely within their home country (Santangelo, 2012). Necessary resources are scattered in foreign countries. Thus, collecting knowledge from every possible location is a vital activity for companies. One of the key foreign knowledge providers for MNCs is their foreign-based subsidiaries. Therefore, the process of collecting knowledge from subsidiaries (which is also known as reverse knowledge transfer) has become a topic of great interest in international business literature.

In prior literature, scholars have tried to explain how the subsidiaries create knowledge and the relationship between the company headquarters and the subsidiaries. They have argued that embeddedness within internal and external networks influences subsidiaries' knowledge creation capability (Ciabuschi, Dellestrand, & Martín, 2011). Moreover, scholars have formed many theories in order to explain these concepts, such as agency theory, which explains the relationship between the headquarters and the subsidiaries (Bjorkman, Barner-Rasmussen, & Li, 2004), and the knowledge-based view for explaining the resource capability of both parties (Mu, Gnyawali, & Hatfield, 2007).

However, these studies are not able to clearly establish an effective reverse knowledge transfer process within an organization. In addition, there are several factors that can hinder the flow of knowledge transfer from subsidiaries to the headquarters. For example, due to the increased likelihood of knowledge spillover (sharing sensitive and confidential knowledge with external networks) headquarters have no intention of sharing significant knowledge with their subsidiaries (Yang, Mudambi, & Meyer, 2008). Moreover, because of this possibility, the headquarters sometimes do not let their subsidiaries embed with external networks, which limits their (the subsidiaries') knowledge creation capability. Previous studies have pointed out several blockages to reverse knowledge transfer, however there are no clear indications of how to avoid these blockages and establish an effective knowledge transfer process throughout organizational networks.

Understanding factors of the knowledge transfer process and trying to fill in any gaps is significant because it may help the headquarters realize the sectors they need to focus on more in order to establish an effective and efficient knowledge transfer process. This study contributes to the knowledge transfer literature through developing a model which addresses the research question of this study:

What organizational policies and processes facilitate or obstruct reverse knowledge transfer?

To meet this end, the study tries to provide a clear idea of the factors that influence reverse knowledge transfer. This study proposes that, in terms of reverse knowledge transfer, the headquarters have to ensure that their subsidiaries are creating knowledge and provide the required resources and support. For example, to ensure subsidiaries' knowledge creation capability, the headquarters have to make sure that they (the subsidiaries) are receiving sufficient freedom and opportunity to embed within their internal and external networks. This study also argues that the headquarters should allow subsidiaries' autonomous behaviour as this helps subsidiaries have the freedom to interact with local players. This interaction positively influences the subsidiaries' knowledge creation capability (Ambos, Asakawa, & Ambos, 2011). In addition, this study also proposes that, in order to gain knowledge from subsidiaries effectively, the headquarters will support the effective factors of reverse knowledge transfer, such as efficient channels or technological support. It has been argued that without sufficient support, the quality and quantity of knowledge may suffer (McGuinness, Demirbag, & Bandara, 2013).

A model for effective reverse knowledge transfer was formed on the basis of the propositions of this study. The model contains four parts, which are: embeddedness, knowledge creation, reverse knowledge transfer and the headquarters. The first part, embeddedness, shows that, with appropriate interaction between the two parties, a strong relationship can be built and, with proper interaction and appropriate organizational control, the headquarters are able to enjoy the benefits of subsidiaries' embeddedness. The second part, knowledge creation, demonstrates that subsidiaries' autonomous behaviour increases subsidiaries' knowledge creation capability, and, with the support of the headquarters, that knowledge can materialize. The third part, reverse knowledge transfer, explains the four factors that influence knowledge transmission and how their absence will hinder the transfer. The final part, the headquarters, is where the knowledge is processed and stored for future use. However, between the third

and final part there are several barriers (such as the willingness of both parties) may take place, and overcoming these barriers can lead to the success of the transmission process.

This study is a mixed methods (collecting and analysing qualitative and quantitative data in a single study) case study. The data were collected using a structured questionnaire with several open-ended questions and a semi-structured telephone interview. However, this study uses a single parent company and a single subsidiary, which is its key limitation. A mixed methods research approach was chosen to overcome this limitation as much as possible.

This study is organized as follows: Chapter 2 contains a brief discussion of the background to knowledge transfer. Related concepts such as types of knowledge transfer and the significance of knowledge transfer are discussed in this chapter. Next, Chapter 3 contains the literature review of factors relating to knowledge transfer. The significance of those factors and the propositions of this study are discussed in this chapter. Chapter 4 contains a brief discussion of the barriers to reverse knowledge transfer. The model and variables used are discussed in Chapter 5. The method used in this study is discussed in Chapter 6, and chapter 7 contains the data analysis and discussion. A brief discussion of the findings is covered in Chapter 8. The final chapter, Chapter 9, covers the conclusion, limitations, managerial implications and opportunities for future study.

2.0 Background: Knowledge Transfer

In international business literature, focus on knowledge transfer in multinational companies has been increasing (Rabbiosi, 2011; Yang et al., 2008) because of the growing need to gain global competitiveness. Knowledge transfer is a process for exchanging knowledge between two parties – sender and receiver – where the potentiality of the knowledge transfer depends on several factors, such as the characteristics of the parties and the knowledge itself, the ability of the parties to absorb the knowledge, and so on (Mudambi, 2002). The popular idea of knowledge transfer is that two parties share knowledge with each other with the aim of supporting their business activities and strengthening their competitiveness. Early research and literature in international business focuses on the headquarters as a key source of knowledge (Santangelo, 2012). In addition, it is expected that the headquarters should transfer potential knowledge to their subsidiaries in order to support them.

Knowledge transfer has become vital for MNCs as knowledge is seen as a crucial resource in the strategic decision-making process (Foss & Pedersen, 2002; Rabbiosi & Santangelo, 2013). However, in earlier research on knowledge transfer, researchers mainly focused on the knowledge-based view in order to explain headquarters' role in knowledge transfer and their ability to create a competitive advantage (McGuinness et al., 2013). The knowledge-based view suggests that the firm (headquarters) holds the key to gaining a competitive advantage as the significant strategic resources (such as knowledge) stay within their home boundary and their key role is to provide knowledge with the required support to their subsidiaries in order to exploit their knowledge (Almeida & Phene, 2004; Najafi-Tavani, Giroud, & Sinkovics, 2012). On the contrary, recent research has identified that headquarters are no longer seen as key source of competitive advantage as that source has moved to the foreign environment (Li, 2005; Santangelo, 2012). Researchers (Li, 2005; McGuinness et al., 2013) explain that foreign subsidiaries hold significant knowledge gathered from their local market or local competitors, which helps the headquarters to make strategic decisions and strengthen their competitive advantage. Therefore, it can be stated that knowledge flows in both directions – from headquarters to subsidiaries and from subsidiaries to headquarters.

Knowledge transfer from headquarters to subsidiaries is the conventional flow of knowledge transfer. Researchers have termed this “conventional flow” or “top-bottom flow” (Yang et al., 2008). MNCs use this flow as a guiding process as through this process headquarters provide significant knowledge to their subsidiaries in order to maintain their (subsidiaries) activities

and exploit the knowledge (that the headquarters provide). In conventional knowledge transfer MNCs gain a competitive advantage through their ability to transfer knowledge efficiently to their subsidiaries. According to Michailova and Mustaffa (2012), one of the key determinates of MNCs' competitive advantage is their ability to exploit knowledge across their subsidiaries. In addition, the knowledge-based view suggests that the key source of knowledge is the firm (headquarters) itself and the firm should distribute this knowledge to its subsidiaries through the social network (Schlegelmilch & Chini, 2003). Yamin and Otto (2004) mention that when a dyadic knowledge transfer is established between two parties (headquarters and subsidiaries), a vertical transmission takes place, which means that knowledge flows from the top of the organizational hierarchy to the bottom. This vertical transmission is vital for the MNCs as it causes the subsidiaries to boost their innovation skills, and with a combination of their local knowledge, subsidiaries are able to modify existing knowledge. In order to modify knowledge subsidiaries are encouraged to develop a relationship with their external network to collect significant and critical knowledge. A subsidiary's external network consists of local business players such as competitors, suppliers and so on (Garcia-Pont, Canales, & Noboa, 2009). Subsidiaries are then willing to share the critical and significant knowledge that they gain from their external network with the headquarters, which lead us to the concept of reverse knowledge transfer.

Knowledge transfer from subsidiaries to headquarters is known as reverse knowledge transfer or bottom-up knowledge transfer (Yang et al., 2008). Several studies have been done on conventional knowledge transfer where reverse knowledge transfer and its significance have attracted researchers' attention (Michailova & Mustaffa, 2012; Minbaeva, Pedersen, Bjorkman, Fey, & Park, 2003; Rabbiosi, 2011). This form of knowledge transfer is also known as the persuasion process, because in this process it is necessary for subsidiaries to persuade or convince the headquarters of the effectiveness of the knowledge that the subsidiaries are willing to provide. In this type of knowledge flow, headquarters act as mediators of knowledge as they collect significant knowledge from their foreign subsidiaries and exploit it throughout their subsidiaries (Mudambi, 2002). Schlegelmilch and Chini (2003) mention that, in order to gain competitiveness in foreign countries, MNCs are required to give importance not only to their ability to create knowledge, but also to efficient ways of collecting knowledge from their foreign subsidiaries and exploiting it through their internal network. The internal network of an organization consists of its own organizational network, which includes its subunits and subsidiaries (Garcia-Pont et al., 2009).

When the headquarters want to maintain effective reverse knowledge transfer within their company infrastructure, there are some important factors that they must have in their organizational agenda. For example:

- Firstly, the headquarters have to ensure that they are providing enough inspiration to their subsidiaries for knowledge creation. To do so, the headquarters should allow their subsidiaries to embed themselves within their internal and external networks (Foss & Pedersen, 2002). In addition, the MNCs need to facilitate their subsidiaries' autonomous behaviour, as this behaviour helps the subsidiaries have a better relationship within their internal and external networks (Garcia-Pont et al., 2009). By developing a strong relationship with the external network, a subsidiary is able to access local knowledge, which in most cases is beneficial for MNCs and helps strengthen their competitiveness.
- Secondly, MNCs need to ensure that the resources required are accessible to their subsidiaries in order for them to create potential knowledge (Almeida & Phene, 2004). To meet this requirement, MNCs need to allow their subsidiaries to access their (MNCs') internal knowledge. In other words, the subsidiaries should be able to access home-based knowledge and also knowledge from other units in the organization. In addition, the headquarters are required to provide all kinds of support (such as technological, operational and managerial) to their subsidiaries.
- Finally, in order to maintain effective reverse knowledge transfer, MNCs need to create a good relationship with their subsidiaries. Researchers (e.g., Almeida & Phene, 2004; Bjorkman et al., 2004; Minbaeva et al., 2003) have found that a good interpersonal relationship between headquarters and subsidiaries positively influences knowledge transfer.

This chapter discusses knowledge transfer and the requirements and stimuli for reverse knowledge transfer. The key theme of this discussion is the process of dyadic interaction between headquarters and subsidiaries that is required to build interpersonal relationships. Using this relationship they can exchange knowledge between themselves from which both parties benefit in several ways.

One of the key benefits is that the knowledge helps them to gain a competitive advantage in their respective markets. This knowledge can be transferred both ways – headquarters to subsidiaries and subsidiaries to headquarters. The headquarters can influence both directions

of knowledge transfer in several ways, such as influencing the subsidiaries' knowledge creation ability. The next chapter contains a literature review of the factors that influence the knowledge transfer process between headquarters and their subsidiaries.

3.0 Literature review and propositions

This chapter contains a discussion of several factors that influence reverse knowledge transfer. The factors are: embeddedness, knowledge creation and reverse knowledge transfer. These factors were selected for the model because of their effectiveness and significance in the knowledge transfer process.

3.1 Embeddedness

A multinational company can become competitive by reducing production costs, improving and investing in research and development (R&D) and showing competence in managerial and operational activities. The headquarters can use home-based knowledge and resources to gain a competitive edge. However, recent research has found that the factors relating to gaining competitiveness have moved from the national borders and now exist in overseas (Santangelo, 2012). Transferring and collecting knowledge from foreign subsidiaries is one of the key factors in MNCs' survival and success (Piscitello & Rabbiosi, 2006). However, Andersson, Forsgren and Holm (2001) state that the competitiveness of an MNC has not moved away completely from the national boundaries. They argue that gaining competitiveness in foreign countries is just another way to achieve a competitive advantage, while the first and most vital way to achieve competitiveness is for the MNC to become competitive itself. In addition, a subsidiary's competence can be transferred to another unit of the organization and also positively influences the competence level of the organization (Yamin & Andersson, 2011). Therefore, it can be stated that when a foreign subsidiary gains any significant knowledge or competence, by transferring it to the headquarters they can influence the MNC's competitiveness. Researchers have pointed out that subsidiaries gain their knowledge through tapping into local knowledge sources and building relationships with them (Ambos, Ambos, & Schlegelmilch, 2006; Andersson, Björkman, & Forsgren, 2005). This idea of building relationships with local knowledge sources has led researchers to the concept of embeddedness.

Polanyi (2001) introduced the concept of embeddedness first in order to explain the economic action of the market. He mentions that embeddedness is a process where economic actions are affected by the related actors' two-way relationship, and also by the relationship of a complete network. However, other researchers found this definition vague and divided it into four components: business relationship, cognitive, cultural and political (Andersson et al.,

2001; Dellestrand, 2011; Foss & Pedersen, 2002). The business relationship dimension is the key focus of this paper. Regarding embeddedness in business relationships, Andersson et al. (2001) state that a close relationship between two parties reflects their intention to exchange knowledge and share resources. In terms of the subsidiary, relational embeddedness is concerned with the business affiliation and activities between the two parties, which is facilitated through long-term interaction and mutual understanding (Dellestrand, 2011).

Subsidiaries' embeddedness is very important in gaining knowledge. Subsidiaries can embed themselves within two networks in order to gain knowledge (Forsgren, Holm, & Johanson, 2005). According to Forsgren et al. (2005), the first network that they are embedded within is the internal network, and the second is called the external network. In the internal network the subsidiaries embed within the MNCs they belong to and other subunits of the MNCs (Garcia-Pont et al., 2009). The external network, on the other hand, is the local business network in which subsidiaries are established or have their business operation within. Every subsidiary has relationships with local business players such as local suppliers, customers, competitors and so on (Li, 2005). A well-established relationship (embeddedness) with local players allows subsidiaries to access local knowledge easily (Mu et al., 2007).

The significance of a strong locally (externally) embedded subsidiary can be seen from several strategic viewpoints, such as:

- Firstly, a close relationship with local customers and suppliers can positively influence the subsidiaries' knowledge absorbing capability (Andersson et al., 2005). Local customers and suppliers are one of the most important sources of significant knowledge regarding local markets and products (Andersson, Forsgren, & Holm, 2002). They play a very significant role in developing new knowledge or products as they are the key players who move around the market and blend with several networks. Thus, they are able to identify the demands of the market and information regarding possible developments of existing products, and can enrich the subsidiaries with these kinds of information. Subsidiaries are able to build and establish a strong relationship with them through trustworthiness, social unity and identity, which allows them to exchange significant and crucial information (Andersson et al., 2002; Forsgren et al., 2005; Santangelo, 2012).
- Secondly, a well-embedded subsidiary can be treated as a strategic resource manipulator (Andersson et al., 2002). A wider opportunity for subsidiaries to gain and

access new knowledge is created when they embed themselves within their external network. In addition, the social network theory suggests that subsidiaries gain opportunities to access locally created resources and create knowledge through embeddedness (Santangelo, 2012). When subsidiaries transfer this locally based knowledge to their headquarters, the headquarters gain many advantages. For example, headquarters can use this knowledge to fine tune and manage their global strategies (Ambos et al., 2006). This knowledge can provide creative ideas which help the headquarters to develop unique products to meet current market demands. Therefore, MNCs can use the locally based knowledge in order to achieve competitiveness in the global market (Buckley & Carter, 2002).

- Thirdly, the capability of foreign subsidiaries to collect knowledge from the environment in which they are located is considered a significant source of competitive advantage for MNCs (Mu et al., 2007). Learning from diverse environments is strategically important to MNCs, as a vast amount of significant knowledge is spread throughout the world. Consequently, foreign subsidiaries play a vital role in obtaining this diverse knowledge. When the headquarters gain a significant amount of knowledge from their subsidiaries, they are able to use this knowledge in order to gain a competitive edge in the global market. For example, with the help of the knowledge provided by foreign subsidiaries, headquarters are able to come up with new ideas to improve their existing products with the addition of unique value. Furthermore, based on this knowledge, the headquarters can develop an idea to produce a unique product (Mu et al., 2007). In line with the significant knowledge supplied by subsidiaries, unique knowledge regarding markets or products can help the headquarters improve their global strategy, which they can then spread throughout their sub-units (Yang et al., 2008). By developing new products, improving existing products, or fine-tuning their global strategies, MNCs can distinguish themselves from other MNCs in the world and become more competitive.
- Finally, embeddedness can be perceived as an influencing factor on subsidiaries' innovation capability. A subsidiary can play various roles in an MNC's network (Almeida & Phene, 2004). According to Yang et al. (2008), MNCs categorise their subsidiaries based on two roles. MNCs consider a subsidiary a "competence-exploiting subsidiary" when the subsidiary generally explores knowledge provided by the headquarters (Yang et al., 2008, p. 886). Competence-exploiting subsidiaries are

mostly expected to manage their (subsidiaries') R&D in order to exploit existing knowledge. The other category is the "competence-creating subsidiary" where subsidiaries are likely to generate unique knowledge that can be beneficial not only for the MNCs but also for their sub-units. Foreign subsidiaries tap into their local environments to collect unique knowledge and manage their R&D to innovate and create new knowledge. According to Dellestrand (2011), an externally well-embedded subsidiary can positively influence an MNC's innovation process. Here, researchers (e.g., Andersson et al., 2005; Dellestrand, 2011; Phene & Almeida, 2008) use innovation to mean not only introducing a new product, but also introducing a new feature of an existing product or developing a new idea which is used as an input to innovate a new product.

Though many articles have explained the importance of subsidiaries' external embeddedness, there are also several articles that emphasize the importance of subsidiaries' internal embeddedness. The subsidiaries of an organization are already linked to each other because they are members of the same organization (Yamin & Andersson, 2011). The business partners know each other at a certain level and then establish relationships with each other. Within the concept of business networks, subsidiaries that are strongly embedded with each other are efficient at learning from each other, upon which an MNCs' innovation capability depends (Ciabuschi et al., 2011). Innovation is considered a vital factor for surviving in the international market. In order to gain a competitive advantage on the international market, MNCs emphasize their innovative capability, which is greatly influenced by the knowledge gained from diverse environments through their subsidiaries. Researchers have argued that a subsidiary's competence-creating ability also plays a vital role in developing the competence of the other sub-units and the headquarters (Andersson et al., 2001; Yamin, 2005; Yamin & Andersson, 2011).

Internal embeddedness helps the subsidiaries to gain competitiveness through improving their absorptive capability. To define absorptive capability, researchers state that it is the capability of recognizing the value of unique knowledge, integrating it and then using it to its fullest (Minbaeva et al., 2003). When a competence-exploiting subsidiary receives unique knowledge from another unit, the headquarters or its external network, it immediately recognizes the value of this newly gained knowledge. This is because, through their embeddedness with other units of the organization, they have become familiar with each other's market environment, and when they receive knowledge they can compare it with

others' business environments, including their own, and identify a suitable or efficient environment or market for that unique knowledge. Hence, their high degree of recognition can create competence for the subsidiaries and the headquarters (Yamin & Andersson, 2011).

Internal embeddedness also helps subsidiaries to distinguish themselves from other sub-units (Garcia-Pont et al., 2009). As internal embeddedness helps subsidiaries improve their innovative and absorptive capabilities, they are able to diffuse unique and distinctive knowledge throughout their internal network. Thus, they are able to attract the headquarters' attention and get priority in the organizational resource distribution process (Yamin & Andersson, 2011). Moreover, the high performance of one subsidiary attracts other sub-units of the organization and provides them with a motivation to learn about the factors that influence competence-creating capabilities (Andersson et al., 2001).

Furthermore, for MNCs, cost reduction is one of the most vital factors in gaining competitive advantage in foreign markets (Ciabuschi et al., 2011). Allowing subsidiaries to embed with internal networks in order to influence their innovation process provides an opportunity for the headquarters to reduce their costs (Almeida & Phene, 2004). For example, when subsidiaries build interpersonal relationships with other sub-units, they eventually get to know about other markets. A competence-creating subsidiary identifies potential knowledge from its external network which may not be useful to itself but may be useful to other subsidiaries. As they know about other subsidiaries' markets they are able to compare and identify the potential market for this significant knowledge. As they are in relationship they can send the knowledge directly to the other subsidiaries while notifying the headquarters instead of sending the knowledge to the headquarters and waiting for them to disseminate it. Therefore, the headquarters are able to reduce the cost of transmitting knowledge.

The level of interaction between two parties has significant impact on the degree of embeddedness (Almeida & Phene, 2004). A higher degree of familiarity or relationship between two parties can be established through good interaction. As the interaction focuses on the dyadic relationship, it helps to develop a better relationship with local parties so that the subsidiary is able to use them as knowledge sources. With good interaction with local business players, a subsidiary is able to create opportunities to gain knowledge from the local environment. A subsidiary's success in identifying unique knowledge in the local environment is dependent on the degree of interaction between the subsidiaries and other parties (Andersson et al., 2005).

What has been discussed above demonstrates the significance of subsidiaries' embeddedness within internal and external networks. Through embeddedness within internal and external networks subsidiaries are able to gain competitiveness among the MNCs' sub-units and improve their absorptive and innovative capabilities. The headquarters also benefit from subsidiaries' embeddedness as it helps them gain a competitive edge in the global market. Therefore, it can be concluded that embeddedness is a vital factor for subsidiaries and headquarters in order to gain competitive advantage. Furthermore, it has been discussed that through good and trusting interaction with each other, subsidiaries are able to build healthy relationships. In other words, they are able to embed themselves within their internal and external networks. According to Ambos et al. (2006), a good relationship is required to gain knowledge from the internal and external networks, and a high level of interaction is required to build that relationship. Hence, it can be proposed that:

Proposition 1a: *The headquarters will allow its subsidiaries to embed within their internal and external networks, and subsidiaries will exchange and pass information to the headquarters or its sub-units.*

Even though subsidiary embeddedness within internal and external networks has many benefits, many studies also highlight the risks of embeddedness. The key risk of embeddedness with an external network is knowledge spillover (Santangelo, 2012). Santangelo states that knowledge spillover is a phenomenon where a foreign subsidiary unintentionally or intentionally shares private or sensitive knowledge within the local (external) network or local competitors. When a subsidiary is embedded with its external network, it means the subsidiary establishes interpersonal relationships with its customers, suppliers and local competitors. It has been discussed earlier that a subsidiary should share their own knowledge with the external players in order to gain knowledge from them. Several researchers have said that in many cases the subsidiary unintentionally or intentionally shares significant and confidential information (such as R&D knowledge) with the external players (Santangelo, 2012). Due to this kind of information leakage, MNCs lose their competitiveness in the foreign market. Due to the likelihood of information leakage, headquarters may not want to share knowledge with their subsidiaries. Nor do they want their subsidiaries to interact with other players in the local business scene.

Researchers have also argued that sometimes subsidiaries may not wish to share knowledge with other sub-units in situations where the headquarters emphasize knowledge sharing

within internal networks (Andersson et al., 2005). Researchers have used agency theory to explain this headquarter-subsidary relationship. Agency theory states that the firm's (headquarters) objectives and the agent's (subsidiary) objectives may not be the same, and when this happens the agent will not willingly act as per the headquarters' demands (Andersson et al., 2005; Bjorkman et al., 2004). For example, sharing knowledge at the subsidiary level is in the company's interest. However, an asymmetry of values and objectives can arise between the headquarters and one of its subsidiaries which cause different organizational interest. In this situation the subsidiary may not share knowledge with other sub-units or subsidiaries of the company.

However, researchers also believe that knowledge spillover and subsidiaries' behaviour are controllable factors (Bjorkman et al., 2004). They posit that, with a proper control mechanism, the headquarters are able to control these factors and use them to their advantage. Andersson et al. (2005) suggest two control mechanisms for the headquarters to control their subsidiaries. The first mechanism is direct control, which means that the headquarters should decide every action for its subsidiaries (Andersson et al., 2005). According to the control mechanism, the headquarters should decide what knowledge is worthy to be shared and what is risky to share. Based on this decision, the subsidiaries should act and share information with their external network. This requires the headquarters to have sound knowledge regarding the local market and competitors (Andersson et al., 2005).

The second mechanism is known as output control, which states that the headquarters should control their subsidiaries based on their performance (Andersson et al., 2005). For example, a subsidiary's performance can be measured by their net profit in a financial year. The highest profit-making subsidiary can get some leverage on their activity and also get the highest support and access to company resources. A subsidiary can also be evaluated by their knowledge development capability or by their patent numbers. These kinds of control mechanisms (output control) encourage the subsidiaries to improve their performance, act according to the headquarters' agenda and share the same values. As based on their performance, they will get more freedom in daily activities and also gain access to company resources. Agency theory suggests that through appropriate (output) control, the firm is able to manipulate an agents' specific behaviour (Bjorkman et al., 2004). For example, if the headquarters evaluate their subsidiaries on the basis of their innovative capabilities, then improving innovative capabilities would be their (subsidiaries) key priority. This type of

control mechanism is effective when the headquarters realize that direct supervision provide to control the subsidiaries is difficult (Andersson et al., 2005).

From the above discussion, it can be concluded that allowing subsidiaries to embed within their external network creates several risks for the headquarters such as knowledge spillover or leakages. However, through direct supervision or other control mechanisms the headquarters are able to control these risks. So it can be proposed that:

Proposition 1b: *The headquarters will take actions to control subsidiary embeddedness within its internal and external networks, and such control will help the networks transmission of information.*

3.2 Knowledge creation

Many researchers have argued that the key to the survival of MNCs and their success in the global market is their capability to create knowledge and transfer it through their sub-units efficiently (Piscitello & Rabbiosi, 2006). In international business literature, knowledge creation or innovation has been considered as strategically significant as it provides the opportunity to create and maintain competitiveness (Ciabuschi et al., 2011). In order to define innovation, Mu et al. (2007) mention that it is a unique mixture of new and/or existing ideas in terms of production. Thus, an innovation can be perceived as a unique idea for developing a new product and/or modifying existing ideas in order to add unique value to the product. People will consider any idea as innovation as long as they perceive that idea or knowledge as new or unique to them. The Organization for Economic Co-operation and Development (OECD) explains innovation as the unique or considerable development of a product (Ciabuschi et al., 2011). In mentioning considerable development of a product, this includes significant developments of existing products. Thus, knowledge creation or innovation refers to identifying a unique product or adding a unique value by modifying an existing product.

From the business network perspective, MNCs are perceived as organizations consisting of headquarters and globally scattered subsidiaries, although in many business network articles researchers consider the headquarters as just one of the players in the network (Ciabuschi et al., 2011). They also maintain that sometimes subsidiaries are considered outsiders – not from the local environment. Thus, the headquarters have very little participation in subsidiary-level knowledge creation as they do not have much knowledge regarding the local environment. However, there is literature available which debates this concept. Researchers have

mentioned that the headquarters' capability to influence the innovation process can be explained through their capability to add value to the knowledge (Dellestrand, 2011).

In accordance with the resource-based view, the headquarters hold all kinds of strategic resources and should provide all kinds of support in order to influence innovation at the subsidiary level (McGuinness et al., 2013). MNCs perceive innovation as significant, as through transferring and exploiting new knowledge to their foreign subsidiaries, they help their subsidiaries survive in local markets, and therefore the MNCs in global markets. Several researchers have argued that not every subsidiary is able to create knowledge but they may identify significant knowledge from their external network which can influence the innovation process (Ciabuschi et al., 2011; Dellestrand, 2011; Phene & Almeida, 2008). The headquarters play a vital role in this process because they are able to access the knowledge residing in one subsidiary and diffuse that knowledge to other units of the internal network in order to influence and promote the innovation process.

Development in innovation or the knowledge creation process is very important for the headquarters as it helps them gain control over their subsidiaries. The headquarters can involve themselves in this process by providing the required knowledge or resources and by guiding the innovation process (Ciabuschi et al., 2011). In order to meet the subsidiaries' requirements in terms of knowledge, MNCs understand the necessity of acquiring the knowledge from every source including other subsidiaries (Yang et al., 2008). Running out of supportive knowledge is not a good option for the headquarters as it increases the risk of not meeting the subsidiaries' expectations. However, by allocating the required resources among the subsidiaries, MNCs become responsible for the outcome of the innovation process (Camisón & Forés, 2011). In addition, the subsidiaries become dependent on the headquarters which allows them to gain control over the subsidiaries' regular activities and decision-making processes.

Innovation or knowledge creation is strategically significant to the headquarters as it allows the MNCs to acquire competency in the global market. Accessing knowledge from diverse locations allows the headquarters to enjoy the benefits of the knowledge and exploit it through their subsidiaries. By diffusing knowledge among its foreign subsidiaries, the headquarters are able to facilitate subsidiaries' improvement processes. For example, the competence-exploiting subsidiaries benefit from the knowledge that the headquarters gain from competence-creating subsidiaries and diffuse it. As they are getting the knowledge in

“ready to use” condition they are not required to spend much on innovation or R&D (Lane & Lubatkin, 1998). The competence-exploiting subsidiaries are influenced by the competence-creating subsidiaries and this inspires them to improve their innovation skills (Camisón & Forés, 2011).

Innovation or knowledge creation can take place not only at the MNC level but also at the subsidiary level. Innovation can affect the subsidiaries’ daily activities and influence their competencies (Minbaeva et al., 2003). A successful innovation at the subsidiary level can change the perception of the headquarters regarding the subsidiary. For example, due to knowledge creation the subsidiary is able to go from being a competence-exploiting subsidiary to a competence-creating subsidiary (Yamin & Andersson, 2011). Hence, they are able to distinguish themselves from other sub-units and gain competitiveness in the MNC network. Moreover, a successful innovation can also positively affect their sales volume. By increasing sales, the subsidiary is able to gain competence in the local market (Ciabuschi et al., 2011). By manufacturing products in a more competent way and minimizing costs, innovation creates improvements in the subsidiaries’ competencies (Minbaeva et al., 2003). In addition, when a subsidiary is considered a competence-creating subsidiary by the headquarters, they are able to gain a better position in negotiations regarding resource distribution (Garcia-Pont et al., 2009).

The discussion above has illustrated that innovation or knowledge creation is significant from both a subsidiary point of view and a headquarters point of view. Thus, it can be said that knowledge creation is one of the most vital factors for subsidiaries and headquarters in surviving in the global market. Facilitating and being involved in subsidiaries’ innovation processes is one of the most important activities for MNCs as the headquarters are able to use the knowledge throughout the rest of the internal network. However, a critical question is: what activities facilitate the innovation process? According to Rabbiosi (2011), allowing subsidiaries access to the available knowledge sources may play a significant role in influencing subsidiaries’ innovation processes. Rabbiosi also mentions that the headquarters should allow their subsidiaries to access knowledge from both internal and external networks.

Being a subsidiary of MNCs enables them (subsidiaries) to enjoy the benefits of accessing knowledge from both networks (Rabbiosi, 2011). As a part of the internal network, the subsidiaries are able to access knowledge from the headquarters as well as other sub-units. However, it has been argued that not all subsidiaries get equal access to knowledge from

headquarters (Almeida & Phene, 2004). According to the resource-based view, the headquarters are the key source for knowledge creation and they diffuse that knowledge throughout the internal network (McGuinness et al., 2013). However, there are many factors that discourage the headquarters from allowing all subsidiaries to access their knowledge. As discussed earlier, knowledge spillover is one of the key factors that discourages headquarters (Santangelo, 2012). Moreover, due to a lack of technological know-how, it is not always possible for subsidiaries to absorb the knowledge that is provided by the headquarters (Almeida & Phene, 2004).

Accessing internal resources or knowledge is a relatively complex process. Exchanging employees provides a great opportunity to access internal knowledge. It has been pointed out that employees from the subsidiary level are sometimes able to provide potential knowledge which may influence the headquarters' competitiveness (Napier, 2006). Subsidiaries are willing to exchange employees or expatriates with the headquarters or other sub-units for training purposes to help them improve their performance (Buckley & Carter, 2002). Moreover, the subsidiaries can also understand the home (MNCs) countries' (or sub-unit countries') culture, values and market through employee exchange programs.

However, there are several factors on which subsidiaries' knowledge creating abilities depend. According to McGuinness et al. (2013), subsidiaries' ability to identify new knowledge, and integrate and exploit the knowledge in the market has the potential to create knowledge. Identifying potential knowledge is vital for the subsidiaries in order to create unique knowledge (Buckley & Carter, 2002). Gaining potential knowledge and learning requires subsidiaries to tap into their internal and external networks. Sometimes subsidiaries can play diverse roles in a MNCs network. For example, in order to meet local demands and preferences, subsidiaries modify the knowledge that is provided by the headquarters (Almeida & Phene, 2004). In order to meet local requirements, the subsidiaries add value to the existing product, which sometimes causes major alterations in the existing knowledge.

As identifying potential knowledge is crucial for knowledge creation at the subsidiary level, autonomous behaviour of subsidiaries becomes significant. Subsidiaries are able to access potentially significant local knowledge through their external network. Thus, the subsidiaries are interested in building relationships in their external network. Freedom to choosing local partners for interacting and building relationships with indicates subsidiaries' autonomous behaviour. Researchers have argued that the level of subsidiaries' embeddedness within their

external networks positively influences their autonomous behaviour (Ambos et al., 2011). To define a subsidiaries' autonomous behaviour, researchers have said that a subsidiary becomes autonomous when it gains freedom in its activities and also in its decision-making process (Birkinshaw & Hood, 1998).

Subsidiaries are likely to seek autonomy as it provides several benefits to them. For example:

- Firstly, they aim for autonomy as they have set their own goals for durable development and success in the local market (Paterson & Brock, 2002). Autonomous behaviour allows the subsidiaries to form strategies based on local responsiveness and knowledge in order to succeed in the local market and create a strong position in MNC networks.
- Secondly, autonomous behaviour influences subsidiaries' knowledge creation abilities (Rabbiosi, 2011). Autonomous behaviour allows the subsidiaries to get favourable social capital, local responsiveness and knowledge which positively influence their knowledge creation abilities.
- Thirdly, autonomy encourages local managers to be innovative and gain advantages through local business players (Young & Tavares, 2004). It is reasonable to assume that local environments can provide subsidiaries with opportunities and freedom to use those opportunities. Autonomy encourages the managers to use those opportunities to become innovative and facilitate their own goals.
- Finally, local relationships built through trust enable the subsidiaries to achieve acceptability within the networks as insiders (Ambos et al., 2011). Building trust among the external players is essential for acquiring local knowledge and resources which positively influence subsidiaries' knowledge creation abilities.

It has been stated that subsidiaries in diverse environments can influence MNCs' competitive advantage. Foreign subsidiaries are able to build relationships with local business players such as suppliers, customers, research centres and other parties (Young & Tavares, 2004). From those networks, subsidiaries are able to access local knowledge which can influence subsidiaries' innovation capabilities and also provide ideas for developing unique products and entering new markets. However, it is noted that for headquarters it is difficult to access that foreign knowledge directly without the subsidiaries' help (Ambos et al., 2011). In this case, subsidiaries' autonomy appears to be essential in order to acquire significant foreign knowledge. It has been shown that the degree of embeddedness of subsidiaries within their

external networks has positive implications on subsidiaries' autonomy (Young & Tavares, 2004). Thus, the more embedded the subsidiaries are (within their external networks) the more autonomous they are. Therefore, autonomous subsidiaries have the potential to access significant local knowledge which can be beneficial for the headquarters in terms of competitive advantage.

The effectiveness of subsidiaries' autonomous behaviour is still debatable. Several researchers have agreed that subsidiaries' autonomous behaviour is acceptable to some extent in some areas, such as operations, marketing and R&D (Paterson & Brock, 2002; Young & Tavares, 2004). The reason for accepting subsidiaries' autonomous behaviour is that before becoming a subsidiary, the firms had a history in their local markets and had interpersonal relationships with local players (Andersson et al., 2002). Several articles in international business journals have mentioned that when subsidiaries gain autonomy, the headquarters lose control over them (Verbeke & Yuan, 2005). Independence in decision making may encourage managers to focus on their own goals instead of the MNCs'. In this situation, an asymmetry regarding each other's values and objectives develops, which affects the relationship between the headquarters and subsidiaries. Conversely, researchers have also suggested that autonomy does not mean that the subsidiary will become fully independent from the headquarters, but instead will increase knowledge flow (Paterson & Brock, 2002). Without positive motivation autonomy cannot lead the subsidiaries to improvement. Appropriate supports and resources which the headquarters are able to provide (such as technological, financial and so on) are required to influence autonomous behaviour (Young & Tavares, 2004).

With the purpose of maintaining effectiveness and strategic positions, headquarters always look to gain control over subsidiaries, while subsidiaries usually struggle for autonomy (Ambos et al., 2011). In international management literature, it has been mentioned that the headquarters lose control over subsidiaries when they become autonomous (Young & Tavares, 2004). As autonomous subsidiaries are able to make strategic decisions for themselves and have the authority to undertake their activities, the headquarters fear they will lose control over their subsidiaries. However, there is a negative impact if the headquarters limit their subsidiaries' autonomous behaviour. It has been argued that limiting autonomy reduces the capability to gain knowledge from local networks, thus preventing knowledge creation (Piscitello & Rabbiosi, 2006).

On the other hand, with proper control mechanisms it is possible to control an autonomous subsidiary. For example, when the subsidiaries make any strategic decisions, these should be judged by top management at the headquarters (Verbeke & Yuan, 2005). The autonomous activity should be brought up for appraisal where both parties (headquarters and subsidiaries) speak and listen to each other regarding the rationale behind the action. The subsidiaries have to be accountable for their actions and also transparent in their decision-making processes. To make a fair judgement, the headquarters should be acquainted with the local (subsidiaries) environment and opportunities. This control mechanism also influences the relationship between the subsidiaries and the headquarters (Verbeke & Yuan, 2005).

Ambos et al. (2011) suggest that headquarters can use prices or net profits to justify subsidiaries' strategic activities, as price is one of the most vital instruments in market activities. According to Verbeke and Yuan (2005), as information regarding price or net profit is used in strategic decision-making processes, it can also be used for explaining the reasons for strategic actions. However, using the price mechanism is not possible in every case because of the uncertainty of the market (Buckley & Carter, 2002). Moreover, it is not possible to predict the future price of a product accurately, and thus the pricing method becomes critical for the headquarters.

Socialisation attributes can also be used for appraising subsidiaries' actions. These attributes consist of characteristics such as trustworthiness, experience, reputation and organizational culture (Verbeke & Yuan, 2005). If the subsidiaries' managers are loyal towards the headquarters, have enough experience to deal with local situations and have a good reputation in the internal and external networks, then the headquarters can rely on their activities. Their decision-making abilities are acceptable to the headquarters as they develop their socialisation attributes through their past activities and decision-making capabilities.

From the discussion above it can be seen that autonomous activity is crucial for subsidiaries as it enhances their knowledge creation capability. Although the headquarters can control their activities, subsidiaries are able to make strategic decisions on their own. Hence, it can be proposed that:

Proposition 2: *In order to influence knowledge creation at the subsidiary level, the headquarters will allow autonomous behaviour of the subsidiaries and also provide the required resources and support.*

3.3 Reverse knowledge transfer

The growing research interest in reverse knowledge transfer is relatively recent. While MNCs are continuously looking to gain competitiveness, scholars have introduced a concept called the resource-based view. According to the resource-based view, significant resources for gaining a competitive advantage are only available at the headquarters' level (McGuinness et al., 2013). Researchers have proposed that a firm's innovation capability increases if the firm combines its knowledge with its subsidiaries or other sources of knowledge (Michailova & Mustaffa, 2012). Thus, the firm's competitiveness also increases with its innovation capability. Identifying this concept has brought a major change in organizational knowledge transfer research. Researchers have realized that knowledge transfer from subsidiaries to headquarters (reverse knowledge transfer) needs more focus than knowledge transfer from headquarters to subsidiaries (conventional knowledge transfer). Some researchers have argued that the process of conventional knowledge transfer is more complicated than reverse knowledge transfer due to intra-firm relationships, and hence more focus on this topic is required (Yang et al., 2008). However, due to the vast amount of knowledge that is scattered in diverse foreign environments and the headquarters' difficulty in accessing foreign knowledge and resources, researchers have started to prioritize research on the concept of reverse knowledge transfer.

In international business literature, it has been confirmed that a majority of subsidiaries of an organization are involved in knowledge transfer, but the potential of the shared knowledge differs (Ambos et al., 2006). Not all types of knowledge are transferrable or easy to transfer from the subsidiaries to the headquarters or the headquarters to the subsidiaries. In order to find out the consistency of transferrable knowledge, researchers have identified six types of knowledge (Foss & Pedersen, 2002). Foss and Pedersen (2002) state that, the headquarters and subsidiaries are frequently engaged in transferring knowledge regarding marketing, technology and distribution. These types of knowledge are connected to local customers, cultures and norms and are of utmost importance to the headquarters. For example, customers' demands and preferences vary across geographical locations and cultures (Schlegelmilch & Chini, 2003). Because of this variance across nations, one country's marketing strategy, distribution channel or technological preference may not be acceptable in other countries. In order to survive in diverse foreign markets, headquarters require these types of knowledge, which are only accessible through their foreign subsidiaries. However,

researchers have also mentioned that knowledge regarding customers, their purchasing behaviour and competitors is not frequently shared between subsidiaries and headquarters, but if shared, the headquarters can benefit greatly from these types of knowledge (Ambos et al., 2006).

Several studies have taken place in the international business context in order to identify the factors that influence reverse knowledge transfer. To aid in identifying those factors, researchers have broken the transfer process into three parts, which are: sender, knowledge and receivers (Minbaeva, 2007). They have also proposed that the characteristics of each part influence the factors of reverse knowledge transfer. It has been proposed that any interaction or barriers related to knowledge transfer are considered as influencing factors of reverse knowledge transfer (Yang et al., 2008).

In addition to those factors, this study proposes that relevance of knowledge and channels for transferring knowledge are also significant for reverse knowledge transfer. Relevance of knowledge is a significant influencing factor as the headquarters' willingness to engage in reverse transfer or depends on this factor. The success of the reverse knowledge transfer depends on the channels through which the parties transfer the knowledge. Thus, relevance of knowledge, characteristics of knowledge, channels and organizational characteristics are considered influential factors in reverse knowledge transfer in this study.

3.3.1 Relevance of knowledge

The term "relevance" has been used by scholars to explain the degree of significance, relatedness or validity of the knowledge. Here, the relevance of the knowledge implies the degree of potential or affiliation the foreign-developed knowledge has with the home-grown knowledge (Yang et al., 2008). Hence, it can be seen that the relevance of knowledge is useful in explaining how significant to or related the subsidiaries' knowledge is with the headquarters' knowledge. In accordance with relevance theory, knowledge is considered relevant when the level of effectiveness is high and implication of the knowledge is easy to identify (McGuinness et al., 2013). Several researchers have used the relevance of knowledge theory to (partly) explain firms' absorptive ability as it explains the effectiveness of the knowledge (Lane & Lubatkin, 1998).

Firms' absorptive ability is significant as it helps the firms gain competitiveness. A firm's absorptive ability can be explained as their ability to identify the value of knowledge and

integrate and use the knowledge to the fullest extent (Camisón & Forés, 2011). Thus, the headquarters' absorptive capability starts with identifying the significance of the knowledge. Firms are likely to pursue new markets for their existing products or services (Buckley & Carter, 2002). They seek knowledge from their subsidiaries which is related to their prevailing knowledge in order to improve their existing products and services. In addition to the absorptive capability, the headquarters absorptive capacity will improve when they are able to use the knowledge to the fullest extent (Camisón & Forés, 2011). Identifying the significance of the knowledge that is provided by the subsidiaries is easier when the knowledge is relevant to existing knowledge. Moreover, relevance of knowledge theory suggests that the more the knowledge is related to the local knowledge, the easier it is to identify the potentiality of the knowledge and the easier it is to implement the knowledge (Yang et al., 2008). Yang et al. also mention that using the concept of firms' absorptive capability, the relevance of knowledge provides a process of linking, transferring and obtaining the knowledge; and assimilating and applying the knowledge to the fullest extent. Therefore, it can be stated that relevance of knowledge positively influences the headquarters' absorptive capability.

The relevance of knowledge can affect knowledge transfer in several ways. According to Yang et al. (2008), besides improving absorptive capability, relevance of knowledge also improves senders' willingness to be involved in the knowledge transfer process. For example, studies on psychology have argued that there is a positive relationship between resemblance and attraction (Bjorkman et al., 2004). Hence, the headquarters' interest in the unique knowledge will motivate foreign subsidiaries to become involved in the knowledge transfer process. Recognition of knowledge's relevance with existing knowledge helps the headquarters to identify the hidden value of the knowledge, which sometimes positively steers headquarters' innovation processes (Yang et al., 2008). Therefore, the recognition of knowledge relevance also motivates the receiver to integrate and use the knowledge.

Researchers have argued that between the two knowledge flows (conventional and reverse knowledge flow); knowledge relevance is more significant in reverse knowledge transfer (Bjorkman et al., 2004; Yang et al., 2008). In conventional knowledge transfer, the headquarters transfer their home-based knowledge to their subsidiaries so that the subsidiaries are able to use and exploit the knowledge (Mudambi, 2002). The headquarters has power over their subsidiaries in the conventional knowledge flow. Thus, the relevance of knowledge is comparatively less significant in conventional knowledge transfer. Conversely,

in reverse knowledge transfer, subsidiaries always seek acknowledgement of the collected knowledge and acceptance of the knowledge from their headquarters (Yang et al., 2008). The subsidiaries are required to make the headquarters interested in the acquired knowledge in order to be involved in knowledge transfer. According to Yang et al. (2008), an efficient way to make the headquarters interested in the acquired knowledge is to present the effectiveness of the knowledge in terms of support to their local knowledge or product. When the headquarters realize the relevance of the new knowledge to their local knowledge, it will be easier to establish reverse transfer of the knowledge (Mu et al., 2007).

3.3.2 Characteristics of knowledge

One of the key activities of the headquarters is creating and defusing knowledge to their subsidiaries, as it influences their competitiveness in the local market. Both headquarters and subsidiaries expect to gain knowledge from each other. Researchers in international business have argued that not every kind of knowledge is easily transferrable (Minbaeva, 2007). According to Minbaeva (2007), to understand knowledge transferability, researchers have identified three characteristics of knowledge, which are: tacitness, complexity and specificity. Several studies have been done on knowledge characteristics where scholars have proposed several characteristics, such as “articulability, teachability and demonstrability” (Michailova & Mustaffa, 2012, p. 386). Despite all other characteristics, tacitness, complexity and specificity of knowledge have been tested rigorously (Michailova & Mustaffa, 2012).

First, tacitness of knowledge refers to the characteristic of knowledge that is “embedded in values, actions, practices and behaviours and is not readily accessible, available and transferable” (Michailova & Mustaffa, 2012, p. 386). This type of knowledge is not easy to transfer as values or other characteristics of tacit knowledge are not always able to be expressed (Piscitello & Rabbiosi, 2006). A way of conceiving of the idea of tacitness is that, in many cases, people are not able to express what they know and sometimes that unexpressed value or thought can provide significant knowledge. Examples of tacit knowledge, marketing and management knowledge are well accepted in international business literature (Piscitello & Rabbiosi, 2006).

The only way to explain tacit knowledge to other parties, according to Minbaeva (2007), is through the actions of the knowledge owner, as the knowledge exists within an individual person. An effective interaction with the knowledge owner is the most efficient way to transfer tacit knowledge (Piscitello & Rabbiosi, 2006). Person-based procedures are

suggested to transfer tacit knowledge effectively (Michailova & Mustaffa, 2012). A face-to-face interaction, exchange of expatriates, or visits by management staff to several units may be used in order to build interpersonal relationships within internal networks. But these activities are expensive for the headquarters as they have to bear travel and other expenses (such as accommodation and food costs). As tacit knowledge is difficult, time-consuming and costly to transfer, it negatively influences the reverse knowledge transfer. As Minbaeva (2007) suggests, the more tacitness the knowledge has, the more time and money it will take to transfer that knowledge.

Explicit knowledge, as opposed to tacit knowledge, is knowledge which is relatively easy to codify and express (Michailova & Mustaffa, 2012). Knowledge is considered explicit when the owner of the knowledge is able to express it clearly without leaving any meaning hidden in the knowledge. Technologies that can be measured (such as production knowledge) are classified as explicit knowledge. Unlike tacit knowledge, explicit knowledge is easy and less time-consuming to transfer. Printed channels (such as documents, annual reports, blueprints and so on) can be used to transfer explicit knowledge (Piscitello & Rabbiosi, 2006). Electronic channels (such as e-mail and e-reports) are also used to transfer codified or explicit knowledge effectively (Michailova & Mustaffa, 2012).

Second, complexity refers to the amount of resources needed in order to implement the knowledge (Minbaeva, 2007). Knowledge becomes complex when it requires an excessive amount of resources and expertise to transfer and implement it. As it requires large amounts of resources and expertise, the headquarters are not interested in involving themselves in the transfer process. Similar to tacit knowledge, complex knowledge becomes expensive and time-consuming to transfer as it requires investment in a large number of skilled individuals, advanced technology and/or resources. Thus, complex knowledge has a negative impact on reverse knowledge transfer due to its high resource requirements.

Finally, specificity of knowledge points to the specific resource, operational skills and transactional costs for acquiring and exploiting the knowledge as well as the cost of production procedures (Minbaeva, 2007). In other words, to serve a specific group of customers, the headquarters are required to allocate specific skills and resources to characterize the knowledge. Due to the specific requirements, this aspect is called specificity of knowledge. This knowledge characteristic is mostly found in technological industry. In this industry, an organization has to introduce different technology for different customer

groups. For example in China, people prefer to use a washing machine which is not noisy as they frequently place the washing machine inside of their apartment. In many Western countries, on the other hand, noise from washing machine is not an essential factor because the washing room often in a purpose-built room. Thus the organization builds different sections in their production house. Different types of activities take place in different sections within an organization, and different knowledge is introduced in accordance with those activities (Piscitello & Rabbiosi, 2006). As organizations are most likely to operate in vertically assimilated structures, unique knowledge flows easily through the organization. Therefore, it is said that knowledge specificity has a positive influence on reverse knowledge transfer (Minbaeva, 2007). Conversely, based on the cost of knowledge specificity, it has a negative impact on reverse knowledge transfer. If the procedure of creating knowledge and transmitting skills is expensive, it will reduce both the subsidiaries and the headquarters' interest in getting involved in the knowledge transfer process (Buckley & Carter, 2002).

3.3.3 Channels

Channels are one of the most significant factors in knowledge transfer as the effectiveness and success of knowledge transfer depends on them. Without rich and effective channels, knowledge cannot transfer throughout an organization, thus knowledge transfer cannot take place within the organization (Napier, 2006). However, it has been stated that one channel cannot be suitable for transferring all types of knowledge due to the different characteristics of knowledge (Piscitello & Rabbiosi, 2006). Therefore, transmission of knowledge can fail due to the selection of an inappropriate channel for the knowledge in question. This kind of failure is known as transmission loss (Mudambi, 2002). For example, failure to codify tacit knowledge can increase the chance of transmission loss. In addition, choosing written channels for transferring tacit knowledge can also increase transmission loss as tacit knowledge is not always possible to express in written form.

However, transmission loss in the knowledge transmission process can be solved by employing rich and appropriate channels (Ambos & Ambos, 2009; Mudambi, 2002; Schlegelmilch & Chini, 2003). Based on this statement, many studies have been conducted on knowledge transfer mechanisms where scholars have proposed several mechanisms for transmitting knowledge. Among those mechanisms, technology-based mechanisms and person-based mechanisms are well accepted in international business literature due to their effectiveness in the knowledge transfer process (Ambos & Ambos, 2009; Minbaeva, 2007).

Technology-based mechanisms, including different types of software for collaboration, organizational intelligence, and knowledge distribution, are well-established channels for transferring knowledge within organizations (Ambos & Ambos, 2009). These mechanisms play a vital role in the knowledge transfer process as they enable the knowledge owner to codify, store and retrieve the knowledge for future purposes. However, these mechanisms are not easily accessible or able to be operated for all employees. Due to their lack of knowledge regarding these mechanisms, in many circumstances employees are not willing to use these mechanisms, so they stay away from the knowledge transfer process (Minbaeva, 2007). Many studies have confirmed that a key difficulty in knowledge management is people's rejection of technical mechanisms due to their lack of skill (Mudambi, 2002). It is, therefore, logical that if the organization can increase their employees' technical knowledge (regarding the use of sophisticated technology) the company can largely facilitate their knowledge transfer process as well as its effectiveness. According to Ambos and Ambos (2009), an organization's effectiveness can increase if its ability to use technological mechanisms increases.

Person-based mechanisms, such as face-to-face communication, exchange of expatriates and visits of management staff to several units, are vital channels for reverse knowledge transfer (Piscitello & Rabbiosi, 2006). Thorough use of person-based mechanisms helps the organization to build strong relationships between the headquarters and subsidiaries. This relationship influences the organization's knowledge transfer process through efficient and smooth knowledge sharing (Ambos & Ambos, 2009). Person-based mechanisms also facilitate the transfer process of tacit knowledge positively and effectively. Personal interaction between the two parties (headquarters and subsidiaries) encourages them to develop and share the same values, beliefs, norms and interests (Rabbiosi, 2011). However, similar to the technology-based mechanisms, person-based mechanisms also have some drawbacks. As discussed earlier, maintaining person-based mechanisms is expensive for the organization (Michailova & Mustaffa, 2012). Travel and living expenses, including food and accommodation, are relatively expensive. Because of the cost ineffectiveness of person-based mechanisms, the headquarters may be demotivated to use these mechanisms to a greater extent. However, despite their drawbacks, person-based mechanisms have been identified as effective channels for transferring knowledge, specifically tacit knowledge (Johnston & Paladino, 2007).

Formal mechanisms and informal mechanisms are two other well-known channels for transferring knowledge (Schlegelmilch & Chini, 2003). Formal mechanisms refer to the formal interactions between two parties. Formal organizational reports or meetings can be seen as formal mechanisms, which positively influence knowledge transfer between the headquarters and subsidiaries (Mudambi, 2002). Informal mechanisms, on the other hand, refer to social channels such as unofficial visits to sub-units and social parties or get-togethers (Piscitello & Rabbiosi, 2006). These two mechanisms are related to the technology- and person-based mechanisms. For example, a formal report or blueprint is an effective technology-based mechanism and a formal mechanism. Similarly, a social meeting can be seen as a person-based mechanism and an informal mechanism.

As the quality and quantity of knowledge transfer most likely depends on these channels (Ambos et al., 2011), headquarters should take responsibility to make them (appropriate channels) available to their subsidiaries, and also assist them in using the channels efficiently. According to Ambos and Ambos (2009), if the headquarters facilitate rich channels and encourage their subsidiaries to use those channels, it will assist them in creating a smooth knowledge transfer process and help them gain competitiveness in the global market.

3.3.4 Characteristics of organizations

Another factor that affects the reverse knowledge transfer process is the characteristics of organizations. Research has indicated that the characteristics of senders and receivers are influencing factors in knowledge transfer (Minbaeva, 2007; Mu et al., 2007; Piscitello & Rabbiosi, 2006). In terms of reverse knowledge transfer, the subsidiaries act as senders and the headquarters act as receivers. Despite acting as senders or receivers, both headquarters and subsidiaries are recognized as individual organizations in their respective markets. Therefore, in this study, the characteristics of the senders and receivers are considered as characteristics of the organizations.

In terms of the subsidiaries, it has been stated that subsidiaries can perform two key roles in the international market. They can either exploit home-based (from the headquarters) knowledge in the market or they can create new knowledge and send it to the headquarters. Based on their activities, researchers have identified two categories of subsidiaries, which are: competence-creating subsidiaries and competence-exploiting subsidiaries (Piscitello & Rabbiosi, 2006; Yang et al., 2008).

Subsidiaries can be identified as competence-creating subsidiaries when they produce unique knowledge which is beneficial to the headquarters and other sub-units (Yang et al., 2008). Competence-creating subsidiaries are expected to introduce new knowledge, products or technology and diffuse them throughout the internal network. As subsidiaries with this characteristic help the headquarters to gain competitiveness, they (the headquarters) are willing to provide more facilities (such as access to home-based resources) to them. This characteristic also helps the subsidiaries to gain a strong position when negotiating with the headquarters regarding budgeting resources or other facilities (Garcia-Pont et al., 2009).

Competence-exploiting subsidiaries, on the other hand, are subsidiaries which exploit home-based knowledge in the market (Yang et al., 2008). Subsidiaries with this feature are expected to adopt the knowledge that they gain from the headquarters and then implement it in the local market. The headquarters facilitate competence-exploiting subsidiaries with a constant flow of knowledge (Piscitello & Rabbiosi, 2006). However, it is also possible that competence-exploiting subsidiaries can transform into competence-creating subsidiaries. They are expected to exploit home-based knowledge in the local environment and, while doing so, they are able to develop relationships with local players (Garcia-Pont et al., 2009). Based on those relationships, they are able to access local knowledge which can be useful to the headquarters for producing unique products or modifying existing products in order to meet local demand.

From the headquarters' perspective, their (headquarters') structure can also affect the knowledge transfer process. According to Yang et al. (2008), knowledge transfer within the internal network can be more effective if the organization employs a formal or vertical organizational structure. As the key role of the headquarters is diffusing knowledge to their subsidiaries, using a vertical organizational structure can influence knowledge transfer positively. As a knowledge-exploiting firm, the headquarters are able to transfer home-based knowledge to their subsidiaries effectively through the vertical (formal) structure (Minbaeva, 2007). However, an informal structure is also suggested by researchers when the headquarters act as knowledge-exploration organizations (Håkanson & Nobel, 2001). An informal organizational structure allows the headquarters and the subsidiaries to interact with each other more frequently and easily. It also helps both parties to develop a strong relationship and trust. This relationship helps the headquarters to collect potential competencies and knowledge from their subsidiaries when the subsidiaries are acting as competence-creating subsidiaries. The subsidiaries are also willing to share their competencies with the

headquarters or other sub-units of the organizational structure due to the strong ties between them. Therefore, because of the effectiveness of the formal and informal organizational structures in knowledge transfer, many MNCs employ a combination of both structures in their organizations.

The above discussion demonstrates that these four factors (relevance of knowledge, characteristics of knowledge, channels and characteristics of organization) have significant effects on reverse knowledge transfer. The effectiveness of reverse knowledge transfer and the quality and quantity of knowledge mostly depend on those factors. A lack of one of these factors may substantially hinder the transfer process. The above discussion also demonstrates the headquarters' involvement with every factor. Therefore, in order to be effective and efficient in reverse knowledge transfer, the headquarters should facilitate those four factors. Therefore, it can be proposed that:

Proposition 3: *The headquarters will provide the required resources such as channels and support factors related to knowledge transfer and this will help the transmission of information and its absence will hinder knowledge transfer.*

4.0 Barriers to reverse knowledge transfer

How reverse knowledge transfer plays a significant role in MNCs gaining competitive advantage has been discussed. It has also been shown that home-based knowledge alone is not sufficient to gain competitiveness in the global market; the headquarters require knowledge from their foreign subsidiaries. There are many significant benefits in reverse knowledge transfer for both the headquarters and the subsidiaries, which should encourage them to get involved in reverse knowledge transfer. However, several factors can act as a hindrance to the transfer process or can reduce the parties' interest in engaging in the transfer process. Some of these are discussed below:

4.1 Headquarters' unwillingness

The headquarters' willingness to get involved in knowledge transfer can be affected by several factors. One of the key factors is the risk of knowledge spillover. Knowledge spillover occurs when the subsidiaries have a strong relationship with their local actors (such as local suppliers, local customers, local competitors and so on) and, based on that relationship, they share sensitive home-based knowledge such as R&D knowledge (Santangelo, 2012). This study argues that the headquarters should allow their subsidiaries to embed with their external networks in order to gain opportunities to access and gain local knowledge. Subsidiaries develop relationship-based embeddedness with local partners based on honesty and trustworthiness (Yang et al., 2008). This kind of embeddedness allows them to share information or knowledge with each other. But there is a possibility of sharing sensitive knowledge, intentionally or unintentionally (knowledge spillover). Knowledge spillover, whether it is intentional or not, may cause the headquarters to lose competitiveness in the local market (Ambos et al., 2006). As embeddedness increases the risk of knowledge spillover, the headquarters do not willingly encourage or attempt to restrict their subsidiaries developing embeddedness with their external networks (Santangelo, 2012). Therefore, the subsidiaries' ability to create knowledge to be shared with the headquarters has been minimized.

Another key factor that affects headquarters' willingness to transfer knowledge is knowledge asymmetry. Knowledge asymmetry indicates the inequality between the subsidiary's knowledge and the home-based knowledge. In other words, knowledge asymmetry occurs when the headquarters cannot utilize a major portion of the knowledge delivered by the

subsidiary due to the way it has been presented and lack of detailed information (Singh, 2007). Due to language differences, lack of structure and cultural differences, subsidiaries may not be able to provide the information regarding the knowledge to the headquarters in a suitable way (Foss & Pedersen, 2002). Unavailability of detailed information makes the knowledge hard to acquire. Therefore, the headquarters are not able to understand the potential of the knowledge and are unable to utilize it.

4.2 Subsidiaries' unwillingness

Subsidiaries' unwillingness is another barrier to reverse knowledge transfer. For several reasons a subsidiary can be demotivated to get involved in reverse knowledge transfer. For example, in some cases the headquarters do not want to learn or are not interested in learning from their subsidiaries and do not seek knowledge from their subsidiaries (Ambos et al., 2006). In this case the headquarters expect that their subsidiaries will act as competence-exploiting subsidiaries, where only the headquarters will create knowledge and transfer it to their subsidiaries to exploit in the local market. This kind of situation makes the headquarters unable to recognize the subsidiaries as knowledge creators and also makes them (the headquarters) unable to identify the potential of the knowledge that is collected by their subsidiaries (Bjorkman et al., 2004). While the headquarters do not show any interest in getting knowledge from their subsidiaries, they (the subsidiaries) also get demotivated to share their knowledge with the headquarters.

Another cause of subsidiaries' unwillingness to transfer knowledge is the relationship status between the headquarters and the subsidiaries. Researchers have used agency theory to explain the relationship between the headquarters and the subsidiaries. Agency theory suggests that the interaction between the headquarters and subsidiaries can be explained as a "principal-agent relationship" (Andersson et al., 2005, p. 524). The principal company (the headquarters) tries to ensure that the agents (subsidiaries) act according to company regulations and share the same visions and goals (Andersson et al., 2005). However, it may be that the course of action differs greatly depending on country and culture due to societal or geographical divergence. The relationships between the headquarters and its subsidiaries can then move to a critical stage due to the asymmetry in goals, interests and vision (Li, 2005). These kinds of differences may cause barriers to the knowledge transfer process.

Another demotivating factor is company structure. For example, subsidiaries are not motivated to get involved in the reverse knowledge transfer process when they are faced with a complex structure in which to transfer the knowledge (Yang et al., 2008). The cost structure for transferring knowledge should be clearly laid out in the company's agenda and should be economical for both parties (Buckley & Carter, 2002). Costs are incurred at every stage of the knowledge transfer process – starting with identifying and obtaining the knowledge and ending with transferring the knowledge to the headquarters. The person-based channel is one of the most expensive channels for transferring knowledge. Thus, the headquarters should clarify which party will bear the cost at every stage of the process.

Another factor that demotivates subsidiaries from sharing unique knowledge with other units of MNCs is anxiety in regard to losing competitiveness in the internal network. That sometimes the manager of the subsidiary may think that if they share their unique knowledge with other units of the MNCs, then the other units will absorb their knowledge and use it to improve their performance within the internal network through increasing sales and profit scales (Bjorkman et al., 2004). Fear of losing competitiveness to other units in the MNCs can take place in the subsidiary manager's mind. Accordingly, they stay away from reverse knowledge transfer and do not utilize potentially profitable knowledge (Bjorkman et al., 2004).

4.3 Motivational factors

Lack of motivational factors has also been recognized by several researchers as a barrier to reverse knowledge transfer. According to Millar and Choi (2009), emphasis on motivational factors can influence the knowledge transfer process by facilitating organizational strategic goals, shared vision and norms. Motivational factors comprise sources of knowledge and also knowledge recipients' motivations. If both parties are satisfied regarding their compensation and daily needs then they will be interested in getting involved in the knowledge transfer process. Another way to motivate the knowledge source is to reward the subsidiaries for creating unique knowledge and use their methods of knowledge creation as a model for other sub-units of the MNCs.

4.4 Lack of proper coordination

Sharing expatriate employees is one of the best-known person-based channels for transferring knowledge across internal networks. Several scholars acknowledge this channel as the most

effective despite the cost. However, scholars also acknowledge that this channel can be a barrier in the knowledge transmission process. Sharing expatriate employees in order to transfer knowledge or training can fail due to a lack of proper coordination (Napier, 2006). The key reason for coordination failure is the resistance of the expats to learn from the other parties. The expats can be resistant because of their own perceived status. For example, an expat may consider himself or herself as an expert due to their job title or level of salary is higher than their mentor. In this case, the expat may not willingly admit their lack of resources or knowledge. A situation like this may demotivate both parties from becoming involved in reverse knowledge transfer.

5.0 The research question and model

Generating global competitiveness is a major focus of international business research (Almeida & Phene, 2004). Obtaining or transferring knowledge from subsidiaries is a significant factor in MNCs creating a competitive advantage. While there have been significant studies on knowledge creation and assimilation, the process of transferring knowledge from subsidiaries to the headquarters is not completely understood. Therefore, the general aim of this study is to develop and examine a model for effective reverse knowledge transfer between subsidiaries and headquarters.

Over the years, the role of MNCs' subsidiaries has changed. Headquarters are gaining competitive advantage in various countries through the knowledge that is gained through their foreign subsidiaries. Effectively transferring this kind of knowledge to the headquarters is important. This study proposes a model which can be used as a benchmark for transferring knowledge from subsidiaries to headquarters effectively and efficiently.

In this study four propositions have been developed which address the model and also help to answer the research question

“What organizational policies and processes facilitate or obstruct reverse knowledge transfer?”

The proposed model is the result of the combination of these four proposals. This model is presented as a “process” structure, divided into four parts, as illustrated in the model below:

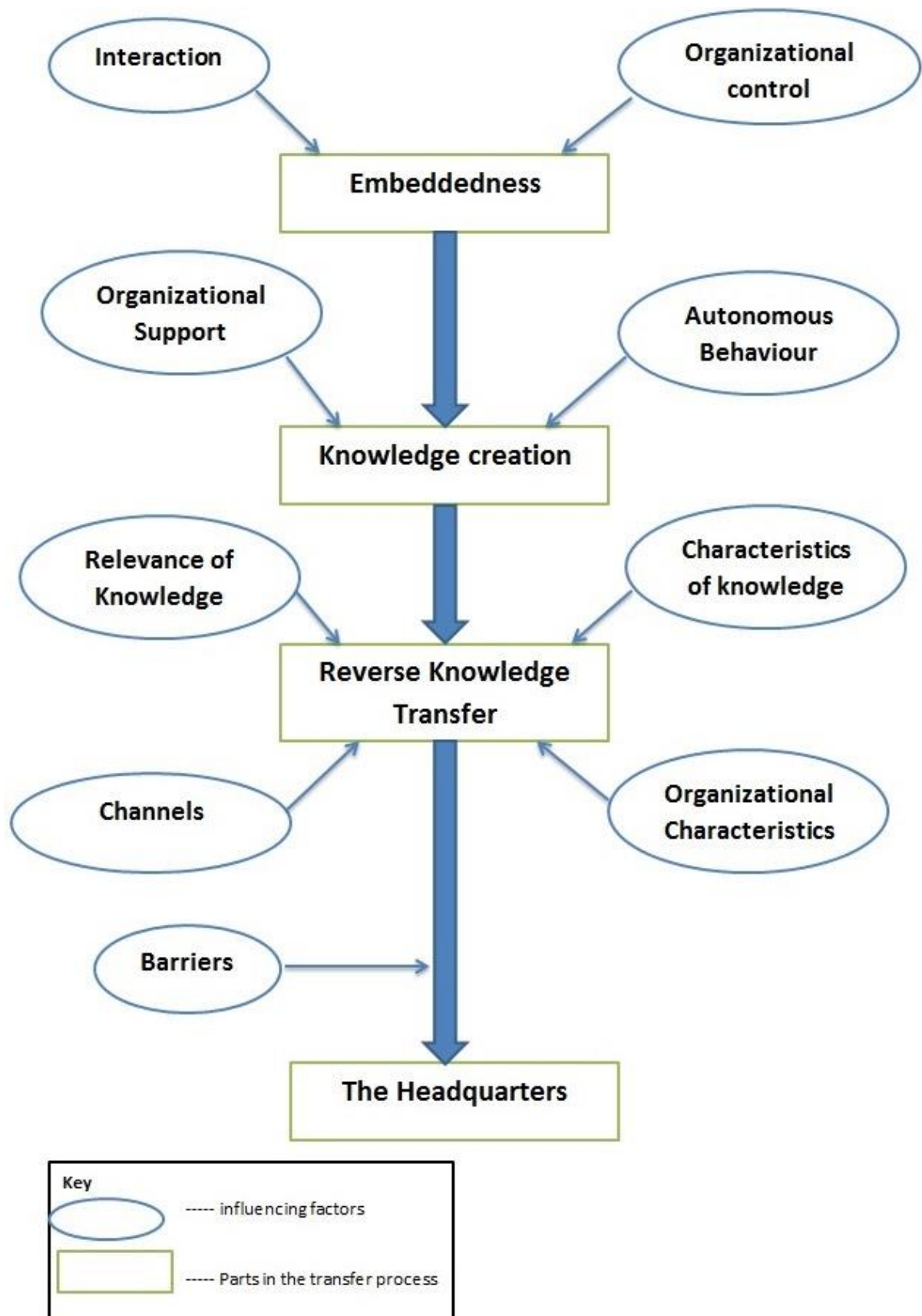


Figure 5.1. A model for effective reverse knowledge transfer

The first element of the model is embeddedness, which is related to Propositions 1a (Section 3.1 p.13) and 1b (Section 3.1 p.15). This manuscript argues that embeddedness is a vital factor for effective knowledge transfer and the headquarters should allow their subsidiaries to embed themselves in their internal and external networks. Through strong embeddedness, subsidiaries are able to gain and access knowledge from internal and external networks. Healthy interaction and use of proper control mechanisms can make embeddedness efficient for the headquarters. The second element of the model is knowledge creation, which is primarily the result of the embeddedness and the subsidiaries' autonomous behaviour. In order to gain a competitive edge in the global market, the headquarters have to make sure that the subsidiaries are creating knowledge. Along with autonomy, support from the headquarters is also required for creating knowledge at the subsidiary level. The third element is reverse knowledge transfer, which is the pivotal step in this model. This paper argues that successful reverse knowledge transfer depends on four factors: relevance of knowledge, characteristics of knowledge, channels and characteristics of organizations. Finally, a successful execution of the previous three parts delivers the knowledge to the headquarters. However, several barriers may be present between the knowledge and the headquarters.

5.1 Variables

Embeddedness allows subsidiaries to establish strong relationships with their local players (such as suppliers, customers) and also with other units of the organization. Through these relationships, embeddedness helps subsidiaries gain and access unique knowledge from their local environments. The headquarters are able to enjoy several benefits from the knowledge acquired, such as helping them to fine tune their global strategies and develop unique products to meet local demand. This paper suggests that through proper interaction of the two parties, embeddedness can be established. However, it is also notable that embeddedness has some pitfalls, such as increased risk of knowledge spillover. In some cases, relationships between the subsidiaries and other sub-units, or the subsidiaries and the headquarters, do not work so well because of an asymmetry of their vision or goals. This paper proposes that through proper control mechanisms the pitfalls of embeddedness can be minimized. Thus, embeddedness is the dependant variable in terms of Propositions 1a and 1b (Section 3.1), which is influenced by the headquarters' control and the interaction between subsidiaries and their networks. Interaction is the independent variable for Proposition 1a (Section 3.1) and organizational control is the independent variable for Proposition 1b (Section 3.1).

Without interaction with internal and external networks, subsidiaries are not able to create new knowledge. However, generating knowledge at the subsidiary level is important for the subsidiaries as it allows them to gain competence in internal networks. It also helps them gain a better position in the company for negotiating resource allocation. This study suggests that in order to facilitate subsidiaries' knowledge creation abilities, the headquarters should allow them (the subsidiaries') autonomous behaviour. Autonomous behaviour alone cannot influence a subsidiaries' knowledge creating ability. Appropriate support from the headquarters is also required. Without proper resources and support (such as technological, financial) from the headquarters, it is hard for subsidiaries to integrate and implement the knowledge collected. Thus, knowledge creation is the dependent variable in Proposition 2 (Section 3.2 p.22), which is influenced by autonomous behaviour and organizational support. Therefore, the independent variables are subsidiaries' autonomous behaviour and organizational support.

Proposition 3 (Section 3.3.4 p.31) is related to reverse knowledge transfer and the factors that influence it. This paper proposes that there are four significant factors that influence reverse knowledge transfer. Those factors are: relevance of knowledge, characteristics of knowledge, channels for transferring knowledge and organizational characteristics. The headquarters may not be interested in getting involved in reverse knowledge transfer if the knowledge does not seem beneficial to them. Thus, knowledge relevance is important in knowledge transfer as it determines the degree of potentiality of the knowledge. Characteristics of knowledge are also important as they have an impact on the relative cost of transferring knowledge. If the knowledge is tacit and complex, it may cost the headquarters more than transferring explicit and specific knowledge. Headquarters may not be interested in tacit and complex knowledge. However, for effective knowledge transfer, the headquarters are required to facilitate appropriate channels. This is important as the quality and quantity of knowledge depend on efficient knowledge transfer. Characteristics of the organization are also highly significant in this part. The organizational structure of the headquarters explains how effectively and efficiently knowledge can flow within the network. Reverse knowledge transfer is, therefore, the dependent factor in Proposition 3 (Section 3.3.4); the independent factors are relevance of knowledge, characteristics of knowledge, channels for transferring knowledge and organizational characteristics.

6.0 Methods

This chapter introduces and discusses the processes and methods of this study. The structure and design of the research, participant selection, data collection and ethical considerations are highlighted and rationalized.

6.1 Method

This study adopts a case study research approach. According to Yin (2003), a case study investigates a current phenomenon in a situation where it has taken place. Through this research design I was able to conduct a detailed and thorough analysis of a single organization. Moreover, case study is an effective research method due to its flexibility in obtaining information (Bryman & Bell, 2007). The relevance of case studies is extremely high because researchers are able to answer “how” and “why” questions regarding the phenomenon under study (Myers, 2009).

In order to answer the research question of this study, qualitative and quantitative data were collected and analyzed. Collecting and analyzing qualitative and quantitative data refers to the mixed method research approach.. The reason for choosing mixed methods for this study is to get a better understanding of answers to the questions, for which a combination of both qualitative and quantitative data is required (Creswell & Clark, 2007). Researchers have agreed that there are always some disadvantages or limitations inherent in all research methods, and mixed methods research allows the researchers to minimize or remove some of these limitations (Creswell, Clark, Gutmann, & Hanson, 2003).

6.2 Population and sample

The population sample of this study was New Zealand MNCs from various industries such as dairy, food, fashion and design, and home appliances that have subsidiaries in foreign countries. As this study was about knowledge transfer from subsidiaries to headquarters, and was conducted in New Zealand, the sample frame was narrowed down to companies that have subsidiaries and headquarters based in New Zealand. However, through initial contacts with several companies, several unexpected circumstances occurred.

Considering identifying companies willing to participate in academic research studies, New Zealand has eight universities with about 10,900 student researchers (Universities, 2012). There are also eighteen polytechnics and institutes of technology offer postgraduate qualifications with an unknown number of student researchers. According to Statistics New Zealand (2012), about 15,000 businesses in New Zealand are involved in doing business in foreign countries. Therefore, there are potentially about 1.4 student researchers per international business in New Zealand; not all students are researching international operations, but the ratio gives some indication of how difficult it might be to obtain permission to access employees for university research. Another problematic issue is that the vast majority of businesses in New Zealand are relatively small operations for example majority of business have less than 100 employees.

When this project began it was hoped that several companies headquartered in New Zealand with wholly-owned foreign subsidiaries could be found. It was found that NZ construction companies send project managers and other expatriates to foreign jobs, and manufacturing and service companies engage in foreign trade via joint ventures. However, after several weeks of searching, only one was found. There may be others; some companies contacted did not respond. Within the time constraints of a one-semester Master of Business dissertation project, only one company in Auckland with a foreign subsidiary was located, and that company had only one subsidiary in South America. Fortunately, the company is a large long-standing multinational which can reasonably be considered a typical New Zealand large enterprise. The company has required that it not be identified.

As with many New Zealand companies, this company was reluctant to allow open access to managers by university student researchers, so I worked through a high-level manager in the human resource (HR) department to arrange contact with potential participants for the study.

Working with the HR manager, it was discovered that there were only four managers who extensively engaged in activities involving knowledge transfer to and from headquarters and the subsidiary. These were quite high-level managers and it was fortunate that I was able to obtain an agreement to invite them to participate in the study.

In summary:

- Few companies in New Zealand operate foreign subsidiaries. Most of the MNCs choose to have joint ventures in foreign countries as it provides several benefits. For

example, through this the parent company can easily enter a foreign country as it solves any destination country FDI restrictions (Park & Kim, 1997).

- Secondly, getting approval from companies for participation in studies that cuts into employee work time is relatively hard. For example, there is little public information available regarding the best contact person in order to get approval in most companies.
- Finally, some companies were not willing to participate in this study as there was a possibility of confidential information spillover and potential loss of participants' confidentiality.

At the initial stage of this study two companies from two different industries were planned as a sample. The reason behind this was that findings could be different depending on industry. The key theme of the findings is the process of receiving knowledge, and this could be the same for companies from two different industries. But the types of knowledge received and their preferences for certain types of knowledge could be different. For example, a company within the home appliances industry could prefer technological knowledge, while a company from the consumer goods industry could prefer market or marketing knowledge. However, the sample size was reduced to one company as there were few companies with foreign subsidiaries, and an unavailability of interested participants.

After contacting several companies, my research supervisor and I managed to get approval from one company. Due to confidentiality factors there is an agreement not to identify the company. Hence, the company will be referred to as “the company” in this study. Like other companies in many industries, the sample company also prefers to build joint ventures in foreign countries, thus the company has only one subsidiary in South America. Therefore, this company met the two requirements for participation: a NZ-based headquarters with foreign subsidiaries. However, due to confidentiality factors this paper does not contain any discussion of the industry of the company or its subsidiary.

6.3 Participants

As the topic of this study is knowledge transfer from subsidiaries to headquarters, the participants for this study were managers who are involved with offshore subsidiaries. Initially, my supervisor and I hoped to target at least 50 participants for the study. However, as discussed above, this may not be possible in New Zealand. In addition, data collection can

be prolonged due to many of these types of managers being out of the country at any given time.

The participants were managers who interact with foreign subsidiaries. The HR department of the company was contacted and was asked to suggest potential participants.

The research supervisor personally contacted an executive of the company with whom he is personally acquainted, who provided the appropriate person with whom to initiate the study proposal. After obtaining agreement to conduct this study, four of the most knowledgeable and involved managers were selected to be invited to participate. The company looked upon this project as doing the university a favour, and as interfering with important work. Care was taken not to make extensive demands on time of employees.

Given the fact that the company is New-Zealand-owned with long-term operations in the country, in a traditionally important industry, I am as comfortable as one can be with a one-company sample of the representativeness of this company in relation to other New Zealand companies with foreign subsidiaries.

6.4 Research design

The research design of this study is summarized below:

- Prior to undertaking the survey an intensive investigation of literature on reverse knowledge transfer was conducted. The literature helped to identify gaps in the existing studies on reverse knowledge transfer. One of the gaps is that there is no suggested structure to follow in order to have an effective reverse knowledge transfer process throughout an MNC. However, the literature provided significant information related to reverse knowledge transfer and also assisted in establishing the model to a great extent.
- Applications for research approval and ethics approval were submitted. A comprehensive inquiry regarding the research process to be used in this study was included in the research proposal. Enquiry regarding ethical issues such as rights and confidentiality of the participants and procedures for collecting consent from the participants were covered in the ethical application.

- After a literature review and consultation with the research supervisor, I constructed a survey of 21 questions (taking approx. 20 minutes to complete). The survey consisted of closed-ended questions and several relevant open-ended questions.
- A telephone interview with the participants was requested from all participants in order to understand their personal insights on their responses to the survey.
- Analysis consisted of compiling and reporting the survey responses and commentary from the telephone interviews, producing a case study on knowledge transfer management.
- Due to the small sample, simple descriptive techniques had to be employed for analysis of the data and presentation of the results.

As noted above, a consent form and survey incorporating several open- and closed-ended questions (quantitative data) was used to answer the research question. The consent form included a request for permission for a follow-up telephone interview for clarification of responses and comments that were not clear. After collecting and analysing the survey questionnaires, a telephone interview with those respondents who were available (all are high-level managers who travel a great deal) was undertaken in order to understand their personal insights, which were used for qualitative analyses in this study.

A semi-structured questionnaire (see Appendix 3) was developed from responses to the survey questions and used in telephone interviews. Telephone interviews were recorded with permission of the participants in order to facilitate analysis. To interpret the interviews, I employed thematic coding, as suggested by Bryman and Bell (2007), to organize and categorize data, as thematic coding is one of the most commonly used methods for such processes and studies.

6.5 Data collection

6.5.1 Survey questionnaire

A survey questionnaire was designed under the supervision of my research supervisor in order to collect the quantitative data. Four sets of survey questionnaires (as our total number of participants was four) along with the consent forms for participation in the survey and the telephone interview were sent to the HR department of the company. The surveys were distributed by the HR department to the appropriate participants. However, the total number

of surveys returned was three. The level in the organisation of the participants was quite high, and the HR department was unable to take much action to assist in encouraging participation.

The questions in the questionnaire were designed to understand and measure the company's values and practices regarding factors related to reverse knowledge transfer explained in the literature review section of this study. Data regarding embeddedness, knowledge creation and reverse knowledge transfer were gathered. The questionnaire is presented in Appendix 1 and is explained below:

Embeddedness:

In order to measure interaction between the subsidiary, its external network and the headquarters, I asked the participants to select sources from five options (local customers, local suppliers, local competitors, local professional market research companies and local institutions such as schools and universities). The participants were requested to check all that applied. One open-ended option (other) was included where the participants were asked to specify other sources of subsidiary knowledge. In case a participant was not aware of the sources of a subsidiary's knowledge, the option "I do not know" was included. The answers to this question helped me to understand with whom in the external network the subsidiary interacted to collect knowledge. The participants were also asked to rate whether the headquarters' stated goals encouraged the subsidiary to establish a rich relationship with its external network. A five-point Likert scale was presented to answer this question, where 1 = "strongly disagree" and 5 = "strongly agree". Answers to this question helped to understand the company's policy regarding embeddedness.

To understand the degree of organizational control over the subsidiary, three questions were asked. The first question was whether the headquarters engages with the subsidiary to gather knowledge about the relationship between the subsidiaries and its local networks. In order to understand how the headquarters evaluate their subsidiary, the participants were asked to rate the importance of three issues (net profit, number of new products/patents and knowledge development) on a five-point Likert scale where 1 = "not at all" and 5 = "very important".

Knowledge creation:

To understand whether the headquarters treats their subsidiary as a competence-creating subsidiary or a competence-exploiting subsidiary, the participants were asked to answer whether the headquarters encourages and supports subsidiary knowledge creation and sharing

with the headquarters and other sub-units. "Actively encourages", "actively discourages", "doesn't have a policy or practice" and "I don't know" were the options for this question. A brief indication of why the company actively discourages knowledge creation was requested if any participants selected that option.

The participants were asked to compare knowledge generation between the headquarters and the subsidiary. A five-point Likert scale of five kinds of knowledge (marketing, technological, logistic, market data on consumers and market data on competitors) was presented from "much lower" to "much higher". The answers to this question helped me to understand what kind of knowledge the subsidiary creates most by interacting with its external network. The participants were also asked through a five-point Likert scale, to measure how easily the subsidiary can access new knowledge from the headquarters. This question helped to measure the supportive behaviour of the headquarters towards knowledge creation at the subsidiary level.

To understand the headquarters acceptance of the subsidiary's autonomous behaviour, the participants were asked to select the levels where five types of decisions (hiring top management in the subsidiary, entering new markets, modification of existing products, introduction of new products and selecting local partners) are made. Three levels (world headquarters, regional headquarters and local subsidiary) of the decision-making stage were presented for this question.

Reverse knowledge transfer:

To measure what kind of knowledge the headquarters receive most from their subsidiary, the participants were asked to mark a five-point Likert scale (1 was "not much and 5 was "a great deal") on marketing knowledge, technological knowledge, logistic knowledge, market research on consumers and market data on competitors. In order to measure the degree of headquarters' support for transmitting knowledge, the participants were asked to rate how supportive the headquarters are on a five-point Likert scale, where 1 = "the headquarters never provides required support" and 5 = "the headquarters always provides support".

To measure the degree of relevancy of the knowledge provided (by the subsidiary), the participants were asked to rate how useful the knowledge is on a five-point Likert scale. In order to understand the characteristics of provided knowledge and how the headquarters deals with each characteristic, the participants were asked to rate two five-point Likert scales.

Three characteristics of knowledge (tacit, complex and specific) were given for rating, where 1 represented “low” and 5 represented “great”. Of the two scales, the first scale helped me to understand the amount of received knowledge and its characteristics and the second scale helped to understand how much time managers spend managing and distributing the knowledge. Additionally, the participants were asked to rate how frequently the headquarters is willing to exchange expatriates in order to transmit knowledge. A five-point Likert scale was presented where 1 = “never” and 5 = “always”. The answers to this question helped me to understand whether the headquarters is willing to provide the best channel to transfer knowledge. The participants were also asked to answer whether the headquarters’ resources are accessible to the subsidiary and if the headquarters quickly approves the use of unique knowledge when notified. These two questions were to help understand the structure of the company as it has been argued in this study that fast transfer and approval represents informal organizational structures.

Finally, the last question of the questionnaire was an open-ended question where the participants were asked to list and define the barriers to knowledge transfer that the company has faced. An open-ended option was given with every question (“other”) if the participants wanted to add anything. Additionally, an “I don’t know” option was included with most questions to express participants’ unawareness of the issue.

6.5.2 Telephone interview

After analysing the survey questionnaires, several gaps were identified,

- Firstly, the control mechanism the headquarters employs to control their subsidiary was not clear. Thus, the first question was prepared to identify whether the headquarters uses direct control mechanisms or other mechanisms. The interview started by providing a scenario of control mechanisms that other companies employ, such as controlling daily activities and selecting suppliers. Then the participants were asked what headquarters practices were in terms of this scenario.
- Secondly, the survey questionnaire did not contain any questions regarding knowledge spillover. Therefore, the second question of the interview was designed to fill this gap. The participants were told that some headquarters fear sharing sophisticated knowledge with their subsidiaries because of knowledge spillover (the term “knowledge spillover” had been explained before asking the question). Then the

participants were asked to share whether they had faced any situation where they feared knowledge spillover, and how they had solved it.

- Thirdly, in order to be clear about accountability of decision making, the third scenario was provided to the participants. The scenario explained that when subsidiaries have freedom to make decisions, several headquarters demand explanation and clarification for the decisions that are made. Since, from the survey questionnaire, it was clear that their (participants') subsidiary has some freedom to make certain decisions, the participants were asked what their headquarters practices were in terms of the subsidiary's accountability.
- The fourth scenario of the interview was related to knowledge relevance. The participants were told that several companies value knowledge that is related to existing knowledge. In this situation, the headquarters focus more on transferring knowledge that is related to existing knowledge than knowledge that is unique or innovative. Then the participants were asked what their headquarters practices were in terms of the knowledge relevance.
- Last but not least, the organizational structure of the company was not clear after analysing the survey questionnaires. Therefore, the participants were told that researchers have found that informal interaction between headquarters, subsidiaries and other sub-units influences reverse knowledge transfer as it allows them to interact more freely with each other. The participants were asked what kind of organizational structure their company practices and why.

A brief semi-structured telephone interview was designed and used for collecting supplemental and clarifying data. A consent form regarding participation in the telephone interview was provided to the participants along with the survey questionnaire. In the consent form the participants were asked to provide their contact numbers and availability times (see Appendix 2). The confidentiality of the participants was confirmed in the consent form.

The interviews lasted about 15 minutes with each participant. Prior to the interviews, my research supervisor provided constructive guidelines regarding how to conduct the interviews. He was present during the first interview to provide any support to facilitate the interview. Following the supervisor's guidelines I started the conversation with a greeting and self-introduction. After the introduction, the consent for participation was confirmed.

Then the participant was asked whether it was a good time for an interview and it was mentioned that the interview would take 10–15 minutes. One participant agreed to answer the questions and two participants were in the middle of meetings. Participants who were busy, suggested emailing them the topic and they would find time for the interview. They were emailed directly and they replied to the email a few days later and provided a suitable time. After confirming consent permission to record the interview was requested. It was also confirmed that the record would only be accessed by the researcher and would be destroyed after analysis. All of the participants consented.

As mentioned above the interview was a semi-structured telephone interview, and under supervision of the research supervisor, I had prepared a few questions for the interview. The questions were prepared to fill the gaps in the quantitative data (survey questionnaires) and also to clarify any issues that were not clear after analysing the surveys. A draft of the questionnaire for the interview is shown in Appendix 3. The questions are explained below:

The interviews were concluded by thanking the participants for their time. All of the participants were kind, listened carefully and asked questions if anything was not clear to them, and finally they wished me the best for this study.

6.6 Credibility of the data

To measure the quality of both qualitative and quantitative research, it is essential to run a rigour test. There are various criteria for running the test for quality, such as validity. However, there have been disagreements between qualitative and quantitative researchers regarding using the same criteria for both forms of research (Bryman & Bell, 2007). Qualitative researchers consider that the meaning of the criteria that quantitative researchers use is not appropriate. In other words, it does not express the appropriate meaning in qualitative research. For example, Bryman and Bell (2007) mention that the definition of validity (criteria used in quantitative research) refers to the meaning of measurement – measuring some variables – while there are none to measure in qualitative research. Therefore, qualitative researchers have proposed different criteria to measure the quality of the research, such as credibility, transferability, dependability and confirmability (Thomas & Magilvy, 2011).

The maintenance of these four criteria mostly depends on the researchers' ability, skills and effort (Thomas & Magilvy, 2011). However, in this study I have tried to maintain credibility,

transferability, dependability and confirmability by providing a summary of the findings of this study to the HR executive of the participants' company (credibility and transferability) and also by minimizing my personal views while decoding the data (confirmability). Undertaking a telephone interview using a semi-structured questionnaire allowed me to fill in the gaps through clarifications of the responses that were encountered in the survey, which made the study more dependable.

6.7 Ethical considerations

To ensure the participants' confidentiality, a confidentiality statement was included at the beginning of the questionnaire. Moreover, participants had the right to not answer questions they considered an invasion of privacy or company confidential information.

The individual responses were kept confidential only known by the participants, the research supervisor and the researcher. Individual responses were not provided to the company and could not be connected to any individual. Descriptive statistics were used in the research report and will be provided to the company manager with no reference to the individual participants. Great care has been employed to maintain anonymity and confidentiality.

7.0 Data analysis

As discussed in the methods section, in the organisation studied, there were only four managers who were involved in knowledge transfer with foreign subsidiaries, and one declined to participate. With this small sample it is not possible to generalize the analysis beyond the target organisation. However, the company is an influential New Zealand business leader, locally owned, and may be considered representative of New Zealand company operations. Making this assumption, the responses from the managers are expected to be similar to other managers in other NZ companies. This, of course, must be proven, or disproven, by further research.

7.1 Quantitative data analysis

Initially when the company was selected as the case study, it was not known whether the company actively engages in reverse knowledge transfer or not. However, it was presumed that as the company is a multi-national and also has a company-owned subsidiary in an overseas market, they must engage in knowledge transfer with their subsidiary. To justify this assumption, the respondents were asked in the questionnaire to identify which kinds of knowledge transfer the company engaged in. In answer to this question, all three respondents answered that their company engages in both conventional and reverse knowledge transfer.

In total, five questions were asked to measure the extent of embeddedness, where three questions were in regard to interaction and two were about organizational control. According to the participants, the headquarters actively encourages the subsidiary to embed themselves within the external network (two participants out of three agreed with this statement) in order to create knowledge. Moreover, the headquarters also actively encourages and supports the subsidiary to build interpersonal relationships (two of the participants supported this, while the remaining participant answered that the company does not have a policy) with local customers, suppliers, competitors, research organizations and local institutions such as schools, universities and so on.

In order to keep control of the subsidiary, the headquarters gathers knowledge regarding the relationship status between the subsidiary and their external network (one participant supported this statement, another answered no and the remaining participant did not answer the question). As a control mechanism, the headquarters likes to use net profit to measure the subsidiary's performance. To the participants, net profit is the most important element to

measure the subsidiary's performance (supported by all participants), followed by patents owned by the subsidiary (supported by two participants) and knowledge development (supported by two participants).

In order to measure the degree of knowledge creation, four questions were asked. Three questions out of four were about organizational support and the other was about the subsidiary's autonomous behaviour. Regarding organizational support, the participants were asked to rank different types of knowledge (marketing, technological, logistic and market data on consumers and competitors) and make a comparison between headquarters and subsidiary knowledge creation. In addition to this question the participants were asked whether the headquarters encourages their subsidiary to create knowledge. A majority of the participants answered that the headquarters encourage their subsidiary to create knowledge and also ranked the subsidiary's knowledge creation regarding market data on consumers and competitors as much higher than the headquarters, followed by marketing knowledge. According to the participants, logistic knowledge creation at the subsidiary level is average and technological knowledge creation is lower than that of the headquarters'.

The participants were also asked to rank a five-point Likert scale (1 = "not available at all" and 5 = "is easy") to identify how easily the subsidiary can access new knowledge from the headquarters. Two of the participants selected two, which is "not really available", while one of the participants selected four, which is "somewhat available".

In order to identify the extent of the subsidiary's autonomous behaviour, the participants were asked to identify the level of decision making in regard to several factors. According to the participants, the headquarters gives freedom to the subsidiary to select local suppliers or partners and modify existing products (all of the participants supported this). However, the headquarters keep control of decision making in regard to hiring top management in the subsidiary and entering new markets (two of the participants supported this). However, one of the participants put both headquarters and the local subsidiary at the decision-making level for hiring top management in the subsidiary. Thus, it can be concluded that the subsidiary is free to some extent, but, in order to maintain proper control, the headquarters keep some power to itself.

To measure the level of reverse knowledge transfer several questions were asked which also indicated the extent of influencing factors on reverse knowledge transfer. According to the participants, the headquarters receive marketing knowledge which is mostly tacit knowledge

(two of the participants ranked it four on a five-point Likert scale). Moreover, the managers (participants) spent little of their total time managing tacit knowledge (only 30% of total time was indicated by two participants). They also suggested the received knowledge from the subsidiary is useful to the headquarters (two of the participants ranked it four on a five-point Likert scale). Besides this, the managers frequently use person-based channels (two of the participants answered “frequently” and one of them answered “always”) to transfer knowledge from the subsidiary to the headquarters. However, the headquarters does not allow the subsidiary to instantly use unique knowledge to modify existing knowledge or products (two of the participants supported this statement).

An open-ended question was asked to identify the barriers that the participants have faced to knowledge transfer from the subsidiaries to the headquarters. The participants identified four key barriers: complex structure for transferring knowledge, lack of up-to-date technology, lack of appropriate models and individual leadership behaviour.

7.2 Qualitative data analysis

Thematic analysis is one of the popular research methods in order to analyze a large number of qualitative data and generalize the proposition. However, in this study, the qualitative data had collected from three participants only (through conducting semi-structured interview). And clearly the number of participants of this study is not sufficient for thematic analysis and also generalizes the propositions. However, thematic analysis was conducted in this study in order to analyze the small amount of data which also express the researcher’s competence to use the research method to analyze qualitative data.

As the interview was semi-structured, conversation was started with each participant by giving a scenario. The first scenario was “several headquarters control their subsidiaries’ daily activities in order to control them. For example, the headquarters choose the local suppliers for their subsidiaries, which piece of knowledge the subsidiaries, can share with their local parties and so on.” After providing the scenario their headquarters’ activities regarding this perspective were queried. From their answers two major concepts could be discerned. The participants mentioned that their subsidiary has the freedom to choose their suppliers and share knowledge. However, the subsidiary must also get approval from the headquarters:

P1: We use a combination of both – direct and indirect control. The subsidiary is allowed to choose their local suppliers but before getting a contract with them they need to send details of the supplier and what kind of product or resources they are supplying to the headquarters.

P2: The answer is yes and no. We have a global supplier. But when the supplier is not able to meet the demand the subsidiary chooses their own supplier.

This represents two concepts – one is “local decision” and the other is “approved by headquarters”. These two concepts were grouped under one concept, a “combination of local and home”. The headquarters controls a small portion of the subsidiary’s decision-making ability; this was put under the “control” theme (see Appendix 4, Theme 1)

As the subsidiary has freedom in decision making in many cases, there is a high probability of the subsidiary being autonomous. Thus, the next scenario regarded the subsidiary’s autonomous behaviour. The participants were asked whether their subsidiary has the power to form its own business or marketing strategies. In addition, if it (the subsidiary) has that power is it accountable for its activities? From the participants’ answers it was discovered that the company has a global strategy that everyone has to follow.

P1: If you talk about strategy, we have a global team to form our strategy. We have 40 top managers from everywhere in the world in this team. They form the strategy and provide it to the subsidiary to follow.

P3: Sometimes we control them, sometimes we don’t. We have a global strategy for everyone. The subsidiary also has to follow it. Sometimes they are allowed to make their own strategy. But before applying that strategy or decision it must go through the headquarters. There is a term we use to explain this that is “bottom-up, top-bottom”.

In addition to their global strategy, the subsidiary is free to make some decisions. In this case the headquarters ensure that the leadership of the subsidiary’s managers matches with the headquarters’. The participants also mentioned that their headquarters follow a “bottom-up, top-bottom” strategic policy where decision-making power flows both ways. Moreover, for the global market, the headquarters also maintain a global strategic team which consists of 40 top managers from all over the world. The key task of this team is forming strategies for every global market. Hence, even though the subsidiary is free to make decisions, in many

cases the headquarters are able to control it through the global strategy. These concepts were put under the “control” theme (see Appendix 4, Theme 1).

From the responses of the participants it was clear that the headquarters trust the management of the subsidiary. The participants were asked whether the headquarters share sensitive information with the subsidiary and if they (the headquarters) have ever encountered knowledge spillover. It was discovered that the headquarters share sensitive knowledge with their subsidiary as they (the headquarters) trust them. As the headquarters have been working with the subsidiary for over 40 years, and based also on the subsidiary managers’ previous decision-making capability, the headquarters see the subsidiary as sharing the same values. However, the participants also mentioned that if the headquarters are not able to choose the right person as a manager they terminate the contract with the subsidiary.

P1: No, we haven’t faced anything like this (knowledge spillover). We provide our sensitive knowledge to them and they understand sharing the knowledge will affect the company.

P2: We share our knowledge with the subsidiary because we trust them. We’ve been working with them over 40 years. This long time is enough to understand and trust each other.

P3: We need to make sure that we pick the right person to deal with. Their leadership style and their values must match with our company. If we do these things correctly then we can trust them and knowledge leakage cannot happen. If the values or leadership style does not match with the company then we just get rid of them.

Therefore, several concepts from the conversation on this topic were revealed, such as “pick the right people”, “previous experience”, “trust” and “termination of contract”. As the topic and concepts were related to knowledge spillover, they were put under the “knowledge spillover” theme (see Appendix 5, Theme 2).

For the last question of the interview the participants were asked about the interaction between the subsidiary and the headquarters. They mentioned that anybody from anywhere in the company can contact each other any time they want. The headquarters also arranges some formal and informal meetings for employees to interact with each other. One of the participants named this process of interaction as a “matrix relationship”, as people have freedom to interact with anyone within the network.

P1: *We actually have a matrix relationship in our organization. Anybody in our company from other parts of the world can contact us or the subsidiary at any time and ask for what they need. There is no standard procedure for that. We understand that if we have standard procedure for contacting each other in our organization, it only delays the whole process.*

P2: *We use both – formal and informal structure in our company. We arrange formal meetings for everyone. We discuss business at that time. We also arrange parties for all of the staff. We discuss anything - related and unrelated to the business.*

A few concepts were picked up from their answers, such as “formal and informal meeting” and “matrix relationship”. As these concepts illustrate the company structure they were put under the “organizational structure” theme (see Appendix 6, Theme 3).

8.0 Discussion

The key purpose of this study was to answer the research question “what organizational policies and processes facilitate or obstruct reverse knowledge transfer?” In this section I will try to answer the research question. In addition to this, a discussion of the results of the quantitative and qualitative data analysis is provided in this section. A summary of the quantitative and qualitative data analyses is provided in Table 1.

Table 8.1: Summary of findings

Factors	Findings	Types of data
Embeddedness	Both external and internal embeddedness are beneficial.	Quantitative data
	The subsidiary gains potential knowledge from the external network.	Quantitative data
	The headquarters prefers to control the subsidiary to some extent.	Qualitative and quantitative data
	Instead of controlling the subsidiary directly, the company uses a combination of both – home and local controls. This means the subsidiary is allowed to choose the local partners in which to embed, but before forming business relationships with them the subsidiary must get approval from the headquarters.	Qualitative data
Knowledge creation	Generation of marketing data and market data on consumers and competitors is higher at the subsidiary level.	Quantitative data
	Support for characterising knowledge can come from both sides.	Qualitative data
	Autonomous behaviour of the subsidiary is acceptable to some extent.	Qualitative and quantitative data
	Global strategies and the global strategic team control the subsidiary.	Qualitative data

Continued next page.

Reverse knowledge transfer	The headquarters mostly receives tacit knowledge. That means the knowledge that the subsidiary provides is mostly hard to codify for example management or marketing knowledge.	Quantitative data
	A small amount of total time is spent on managing the knowledge which is relatively hard to codify.	Quantitative data
	Use of person-based channels.	Quantitative data
	Usefulness of the knowledge provided by the subsidiary shows the relevance of existing knowledge.	Quantitative data
	A combination of a formal and informal organizational structure is employed by the company.	Qualitative data
	A matrix relationship throughout the organization facilitates knowledge transfer.	Qualitative data

8.1 Embeddedness

A significant finding of this study was that the headquarters do not entertain the probability of knowledge spillover through their subsidiaries, which is the key risk of embeddedness. The participants in this study confirmed that working a long time (over 40 years) with a subsidiary allows the headquarters to build trust and interpersonal relationships with the subsidiary. Based on this interpersonal relationship and trust, the headquarters do not hesitate to share sensitive knowledge with the subsidiary. In order to build that trusting relationship the headquarters has to consider three factors. These are:

- **Choosing the right people:** The headquarters are required to choose the right people as managers to deal with subsidiaries. If the headquarters are not able to choose the right people, asymmetry in regard to goals, cooperation and knowledge may occur. This is important for building an interpersonal relationship between the two parties. If the parties do not like each other, developing a trusting relationship between them would be difficult.
- **Shared values:** The headquarters also have to ensure that both parties share the same values. Asymmetry of shared values affects the relationship, interaction and trust between the two parties. If the headquarters and subsidiaries share the same values then the headquarters do not hesitate to trust them (the subsidiaries). Shared values can also affect knowledge transfer – both conventional and reverse knowledge

transfer. One of the key values of MNCs is that competence-creating subsidiaries share their competence with the headquarters and other sub-units (Bjorkman et al., 2004). The participants in this study confirmed that as the parties have shared values (headquarters and the subsidiary), the subsidiary is willing to share any significant knowledge or competence with the headquarters and the other sub-units. Moreover, due to mutual values, anyone in the internal network is able to contact the subsidiary, headquarters or other sub-units at any time – which was confirmed by the participants. Therefore, shared values help the subsidiary to build a healthy relationship with each party within the internal network.

- **Leadership style:** the participants mentioned that the leadership styles at the subsidiary and headquarters levels may play a vital role in knowledge transfer. According to them, leadership behaviour may help or hamper the process of reverse knowledge transfer. Leadership that facilitates collaboration between other parties is expected from the subsidiary's management. A leader with collaborative characteristics always wants to share competencies or knowledge with other parties. This characteristic allows the leader to interact with others and develop strong relationships with them. Therefore, a collaborative leadership style influences the interaction between the two parties and also influences the innovation process (Oddou, Osland, & Blakeney, 2008). However, no robust literature or study was found on this topic, which leaves an opportunity for future study.

The degree of trust and the relationship between the two parties mostly depend on the degree of interaction. The findings of this study suggest that subsidiaries' embeddedness within internal and external networks is driven by the degree of interaction. High levels of interaction help the subsidiaries to build good relationships within the internal and external networks. The findings also suggest that the headquarters encourage the subsidiaries to build an interpersonal relationship with the local players through a high degree of interaction. Through interpersonal relationships with local players, a subsidiary is able to gain significant knowledge from its local environment. The findings confirm that the subsidiaries gain potential knowledge (such as marketing knowledge and market data on local consumers) from their external networks and their ability to generate these kinds of significant knowledge is higher than that of the headquarters.

8.2 Knowledge creation

The findings of this study show that the headquarters would like to allow subsidiaries' autonomous behaviour to some extent. For example, a majority of the participants mentioned that their subsidiary has the freedom to choose its local suppliers or partners. Moreover, the subsidiary is also allowed to modify existing products to meet local demand. However, the headquarters likes to have control over the decisions regarding hiring top management for the subsidiary. For example, the subsidiary is allowed to choose the person for top management, but before sending the contract or job description to the person, the subsidiary has to receive approval from the headquarters. If the headquarters thinks that the subsidiary has chosen the right person and approves the hiring, then the subsidiary can hire the person for top management. It can be seen that in terms of autonomy in decision making, the subsidiary has freedom in some cases, but the headquarters likes to have a say in very important decisions.

A combination of local and headquarters involvement in the decision-making process is critical for the headquarters. In the literature review it was shown that subsidiaries generally seek autonomy because it provides them with several benefits. For example, autonomous behaviour influences the subsidiaries' knowledge creation capability and also influences their relationship with local business players. The headquarters also want their subsidiaries to establish relationships with their local players or maybe make decisions on their own. The headquarters also want to control their subsidiaries to maintain their effectiveness and strategic position. A combination of local and home involvement in the decision-making process allows the subsidiaries to make decisions to some extent, establish relationships with local players and also allows the headquarters to have some control over their subsidiaries as it gives the headquarters the power to make strategic and significant decisions. In other words, it keeps both parties (headquarters and subsidiaries) satisfied.

Another key finding of this study is that support for creating or materializing knowledge can come from any party – the headquarters or the subsidiaries. It was discussed earlier that even though the subsidiaries gain potential knowledge they may need support (such as operational and R&D) from the headquarters. Because of this, the subsidiaries become dependent on the headquarters. However, the participants in this study suggested that the opposite can also occur. Sometimes the headquarters develop unique knowledge, but to characterize the knowledge, they require support from their subsidiaries. In this case only subsidiaries hold

the appropriate resources, such as technology, and the headquarters become dependent on them to utilize the potential knowledge.

8.3 Reverse knowledge transfer

This study suggests that reverse knowledge transfer is driven by the characteristics of knowledge, channels, organizational characteristics and relevance of knowledge. The study participants confirmed that the headquarters mostly receive complex and tacit knowledge from their subsidiary and they spend a very small amount of time managing the knowledge. This means the headquarters are not very interested in dealing with complex and tacit knowledge, even though they mostly receive these kinds of knowledge. As tacit or complex knowledge is not very easy to transfer, using a person-based channel is required by the headquarters in order to transmit the knowledge. The participants also confirmed the use of person-based channels within the company. The best aspect of using person-based channels is that they reduce the probability of transmission loss and improve the quality and quantity of knowledge. However, the company should consider the cost effectiveness of using person-based channels. The cost of sending somebody from the headquarters to the subsidiary is relatively high as all costs including travel and accommodation have to be borne by the headquarters.

A combination of formal and informal organizational structures is recommended as a finding of this study. The company has successfully established a mixture of formal and informal structures through establishing a matrix relationship throughout the internal network. This type of structure allows employees to transfer knowledge effectively. For example, each time a sub-unit of the company requires any knowledge, resources or support from any part of the organization, they are allowed to contact the other party directly. This allows the headquarters to reduce the time and cost of transmitting knowledge and increases the effectiveness of knowledge transfer. Moreover, as discussed in the literature review, a combination of formal and informal organizational structures strengthens the relationship and trust between both parties.

8.4 Barriers

Several barriers were identified by the participants in this study. As discussed earlier, the complex structure for identifying and transferring knowledge and a lack of up-to-date technology were identified by the company. Depending on company structure, a company

may prefer their subsidiary to have limited interaction with local players. The reason behind this preference might be the fear of knowledge spillover. It was discussed in an earlier section of this essay (chapter 4.1, p.32) that in order to prevent knowledge spillover the headquarters limit their subsidiaries' interaction with local players. However, limiting subsidiaries' interaction may also limit their knowledge creating capability. A company should establish a high degree of trust and interpersonal relationship with their subsidiary in order to prevent knowledge spillover, rather than limiting their interaction with local players.

Another barrier to reverse knowledge transfer identified by the participants was the lack of models (as an organization). According to the participants, the company should develop a successful business model which is transferable across the organizational network. Developing such a model could influence reverse knowledge transfer as the model would provide a guided and tested structure for transferring knowledge. Moreover, when the company uses one of their units as a model, it will encourage other units to improve their activities and attempt to become the model for the company.

The participants also identified individual leadership behaviour as a barrier to reverse knowledge transfer. A leadership style that does not support cooperation with other parties may hamper the knowledge transfer process. As the managers of the subsidiaries decide whether to become involved in the knowledge transfer process or not, their leadership style becomes vital for the headquarters. In this case, as suggested earlier, a leader with a cooperative leadership style is required in the subsidiaries' top management team. As hiring top management for the subsidiary is mostly decided by the headquarters, the headquarters have to make sure the manager has the preferred leadership style. In addition to that, the headquarters can also establish a leadership model that they will encourage their managers to follow or even better. According to the participants, if the headquarters establishes a model of leadership that promotes active communication and knowledge sharing and shares it across the organization, it will positively influence reverse knowledge transfer.

9.0 Conclusion

This study was an attempt to investigate and establish a theoretical model for reverse knowledge transfer. In earlier studies on this subject, proper reverse knowledge transfer is not completely understood. Researchers have partly explained the process of knowledge transfer, such as the factors that influence reverse knowledge transfer. However, researchers have not covered the whole process. For example, to transfer knowledge the subsidiaries are required to create knowledge, and to create knowledge the subsidiaries are required to establish strong relationships within their internal and external networks. The key requirement that the subsidiaries need to meet is to get approval for building relationships and transferring knowledge from their headquarters. This study discusses several significant aspects related to reverse knowledge transfer.

The propositions of this study were prepared to answer the research question “what organizational policies and processes facilitate or obstruct reverse knowledge transfer?” This study proposed that the headquarters will allow their subsidiaries to embed within their internal and external networks and subsidiaries will exchange information with the headquarters or other sub-units. From the case study it can be confirmed that the company encourages their subsidiaries to embed with internal and external networks as their subsidiary can gain significant knowledge from their local environment and pass it to the headquarters and other sub-units.

This study also proposed that to influence the knowledge creation capability at the subsidiary level the headquarters will allow autonomous behaviour of the subsidiaries and also provide required resources. The case study analysis confirmed that the company allows autonomous behaviour of their subsidiary as this freedom increases the subsidiary’s self-confidence. Moreover, an autonomous subsidiary is able to focus on creating competencies and gaining success in the local market, which is beneficial for the headquarters. However, a key risk of allowing the subsidiary autonomy is that the headquarters may lose control over the subsidiary, although this can be prevented by applying a proper control mechanism. Limiting the autonomous behaviour of the subsidiary can be seen as obstructing knowledge creation.

In line with the propositions, this study also proposed that the headquarters will provide required resources such as channels and support factors related to transfer. From the findings of the case study it can be stated that the company provides every possible support to make

the transfer process successful. The company employs one of the best channels (person-based channel) to transfer knowledge, even though this method is expensive. Moreover, the company makes use of an organizational structure and process of interaction for ensuring efficient knowledge transfer. Overall, this study suggests that the responsibility for developing an efficient reverse knowledge transfer process lies not only with the subsidiaries, but also with the headquarters. This study recommends that the headquarters should consider every influencing factor related to knowledge transfer and provide the required resources and support to their subsidiaries.

9.1 Management implications

This study contains a clear understanding of several factors that help or hinder the process of reverse knowledge transfer. It contains a discussion on the significance of the factors that help managers understand the necessity of considering those factors while transferring knowledge. This study also contains a discussion of the risks of those factors, which will alert the managers to the negative impacts of those factors (such as knowledge spillover and losing control of subsidiaries). Several possible solutions (control mechanisms) have been suggested in this study which may help managers to mitigate those risks. In addition, some barriers of reverse knowledge transfer (such as motivational factors and the unwillingness of senders and receivers) have been discussed in this study to help understand hindrances to the transfer process. This study also provided relevant issues to consider (such as the cooperative leadership style and reward model) in order to overcome those barriers. Moreover, this study proposes a theoretical model of reverse knowledge transfer that can be used as a benchmark to ensure effective reverse knowledge transfer in an organization (see figure 5.1 p.37).

9.2 Limitations

With several implications for managers, this study also has some limitations.

- Firstly, this model was tested from the headquarters perspective only. In this study only data from the headquarters was collected to examine the model, which is clearly not enough. Data should also have been collected from the subsidiary. However, as it is a small-scale study for a dissertation, and funds for contacting the subsidiary were unavailable, data from the headquarters', which is located in New Zealand, were all that was collected.

- Secondly, there was only one case study, which is not sufficient for testing the model. The unwillingness of MNCs in New Zealand to participate in the study was one of the key reasons for choosing only one case study.
- Thirdly, the number of participants was only three, which is certainly too small number to generalize the propositions. Therefore generalization of the propositions was not possible in this study which is also one of the greatest limitations of this study.
- Fourthly, due to the small number of participants an appropriate method for analysing the quantitative data was not possible. In the previous chapter (see chapter 6.2 p. 42) I included a section demonstrating how the process and the outcome of the study could be with more data as it might become available.
- Finally, although interviewing three managers from the company provided many insights, it did not provide enough qualitative data for a definitive analysis.

9.3 Opportunities for future study

- Firstly, the results need to be verified across several companies. A similar study should take place with a much larger case study and more participants.
- Secondly, a similar study that considers not only the headquarters' perspective but also the subsidiaries' perspective should be carried out. Consideration of the subsidiaries' perspectives will allow for an understanding of the actual relationships between the subsidiaries and their external networks.
- Thirdly, in this study the participants confirmed that leadership style has a clear impact on knowledge transfer. Therefore, a broader study that considers the impact of leadership styles on reverse knowledge transfer should be conducted.
- Finally, Hofstede's (1984) cultural dimensions and the additional dimensions developed to date need to be considered in a broader yet similar study. The cultural factors of both parties (headquarters and subsidiaries) could have an impact on knowledge transfer. For example, managers from individualist cultures may not cooperate with headquarters, or managers from high power distance societies may not seek to learn from the headquarters or other sub-units or from their external networks.

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Appendices

Appendix 1: Questionnaire

Title: A Study of Reverse Knowledge Transfer

1. Is your company engaged in:

- ☐ Conventional knowledge transfer
- ☐ Reverse knowledge transfer
- ☐ Both
- ☐ I do not know

If your company headquarters does not receive new knowledge from subsidiaries, please briefly list your belief(s) as to why not:

2. What kind of knowledge does your company receive most from subsidiaries? (Please rank 1 as not much and 5 as a great deal), mark with x.

	1=Not much	2	3	4	5=A great deal
Marketing knowledge					
Technological knowledge					
Distribution / logistics knowledge					
Market research data on consumers					
Market data on competitors					
Other					

Please Identify "Other":

Policies and practices that affect knowledge flow:

3. My organization's stated goals encourage a rich set of external (outside the company) relationships for subsidiaries. (Please mark with an X)

Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
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4. Where do your company subsidiaries gain knowledge? Check all that apply

- ☐ From local customers
- ☐ From local suppliers
- ☐ From local competitors
- ☐ From local professional market research companies
- ☐ From local institutions such as school, university
- ☐ Other (please specify) _____
- ☐ I do not know

5. Does headquarters encourage and support its subsidiaries to develop significant business relationships with its local external network?

- ☐ Actively Encourages
- ☐ Actively Discourages
- ☐ Doesn't have a policy or practice
- ☐ I don't know

If actively discourages, please indicate your beliefs as to why:

6. Does your company actively encourage the subsidiaries to create and share new knowledge directly with other foreign subsidiaries in the company?

- ☐ Actively Encourages ☐ Actively Discourages
- ☐ Doesn't have a policy or practice
- ☐ I don't know

If actively discourages, please indicate your beliefs as to why:

7. Compared to Headquarters knowledge generation, the subsidiaries' amount of new knowledge generation within the company is:

Knowledge area:	Much lower	Lower	Average	Higher	Much higher
Marketing knowledge					
Technological knowledge					
Distribution/ logistic knowledge					
Market data on consumers					
Market data on competitors					
Other knowledge: list here:					

8. Does headquarters gather specific knowledge about the relationships between the subsidiaries and their local networks?

- ☐ Actively engages with subsidiaries
☐ Doesn't engage with subsidiaries (**skip item 9**)
☐ Doesn't have a policy or practice
☐ I don't know

If does not engage, please indicate your beliefs as to why:

9. If headquarters does actively engage in learning about network interactions, headquarters is:

Rarely active	Active	Strongly active
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10. Please rate how useful is the knowledge that the headquarters receives from the subsidiaries? (1=Not very useful, 5=Very useful), please check appropriate rating:

1 2 3 4 5 ☐ Don't know

Subsidiaries are members of the company networks and also of local networks.

11. Is it easy for the subsidiaries to access new knowledge from the headquarters? (1= not available, 5= easy) , please circle appropriate rating:

1 2 3 4 5 ☐ Don't know

12. Are all the company resources open and available for every subsidiary?

- ☐ Yes ☐ No ☐ Don't know

If not please indicate your beliefs as to why here:

Sometimes products and services need to be adapted to suit the local market:

13. When notified, does headquarters quickly and readily approve such modification of knowledge/product that the headquarters provides?

- ☐ Yes ☐ No ☐ Don't know

If no please indicate your beliefs as to why here:

General information:

14. Please identify the level at which following decisions are made; mark with X

	World Headquarters	Regional Headquarters	Local Subsidiary
Hiring top management in subsidiaries			
Entering new markets			
Introducing new products			
Modification of existing products			
Selecting local suppliers/partners			

15. To measure a subsidiary's performance, how important are following issues? mark with x

	1	2	3	4	5
Net profit					
Number of new product/patent					
Knowledge development					

16. If your company decides to give a bonus for their performance, who will get this bonus?

- ☐ The president of the subsidiary only
- ☐ The management team only
- ☐ Every employee in the subsidiary
- ☐ I do not know

Describing knowledge, *tacit knowledge* (unspoken and unexpressed knowledge) is hard to transfer as it and this knowledge can be explained only through direct action of the owner of the knowledge. Another aspect is *complexity* of the knowledge which refers to how dependent the knowledge is on technology, resources, individuals and so on. *Specificity* is the third characteristic of the knowledge which refers to the transaction cost for using skills and assets to exploit the knowledge.

17. What percent of your time is spent managing and distributing these kinds of knowledge: mark with x

	10%	30%	50%	80%	100%
Tacit knowledge					
Complexity of knowledge					
Specificity of knowledge					
<input type="checkbox"/> I do not engage in these activities					

18. Please rate the amount of received knowledge characteristics from subsidiaries. (1=Low, 5=Great), mark with x

	1	2	3	4	5
Tacitness of knowledge					
Complexity of knowledge					
Specificity of knowledge					
<input type="checkbox"/> I do not have access to this information					

In terms of tacitness of knowledge, it is presumed that to get this kind of knowledge the company has to exchange expatriates (send experts to the subsidiary country or bring the experts from the subsidiary country).

19. Please rate how willing the headquarters is to transfer tacit knowledge by means of exchange of expatriates, mark with an X

	Never	Rarely	Sometimes	Frequently	Always
Willing to exchange expats					

20. Does headquarters usually provide required support for knowledge distribution to the subsidiaries, such as technical support, financial and personnel resources, and so on? (1-Never, 5- always)

1 2 3 4 5 ☐ Don't know

21. Please list and define the primary barrier(s) to knowledge transfer you see in your company.

Appendix 2: the consent form for participation in interview

Please insert in return envelope

Invitation to Participate in a Business Research Study

Project Title: A case study investigation of a model for effective reverse knowledge transfer

Referenced in the survey cover sheet, we request your participation in a potential follow-up telephone interview of about 15-20 minutes in which I will be able to clear up any issues I am not certain of after the analysis of the surveys. If you are willing and able to grant me this time please list your telephone number, which indicates your consent to the interview (your consent will be verified at the beginning of the interview), and, if required, your extension number:

Telephone number_____ Extension_____

Best time to contact me: _____

If it is necessary to locate you when called, please include a name by which you can be located if someone else answers the telephone:

Please include in the return envelope.

The information on this card will be seen only by the researcher and the research supervisor.

Thank you

(Md Mashiur Rahman)

Appendix 3: draft questionnaire for interview:

- Several headquarters controls their subsidiaries daily activities in order to control them. For example selecting suppliers, what knowledge they can share and so on. Do you (the headquarters) direct or control any of the daily activities of your subsidiary?
- Sometimes headquarters fear that their subsidiary may unintentionally or intentionally share significant and confidential information (such as R&D knowledge) with external players . Due to this kind of information leakage MNCs lose their competencies in the foreign market. In addition this fear demotivates headquarters from being involved in reverse knowledge transfer. Does your headquarters fear the same? Have you encountered any situation like this?
- Sometimes headquarters prefer that their subsidiaries act on their own such as making their business strategy or marketing strategy. However the headquarters arranges a meeting in a specific time interval and asks their subsidiaries about why they have taken such decisions. This means that every subsidiary is free to make decisions or activities but at the end they are accountable for that. What is the case with your organization?
- Some more conservative companies might be focussed on developing and building on existing knowledge. Such companies might place more value on knowledge that flows up from subsidiaries that verifies or builds on what already exists, and place less emphasis on new, different, and unique knowledge. What is the case with your organisation?
- In several pieces of research it has been found that informal organizational structure influences reverse knowledge transfer because this structure allows managers to have a better interaction with everyone in the network. Does your company use an informal structure?

Appendix 4: Theme 1

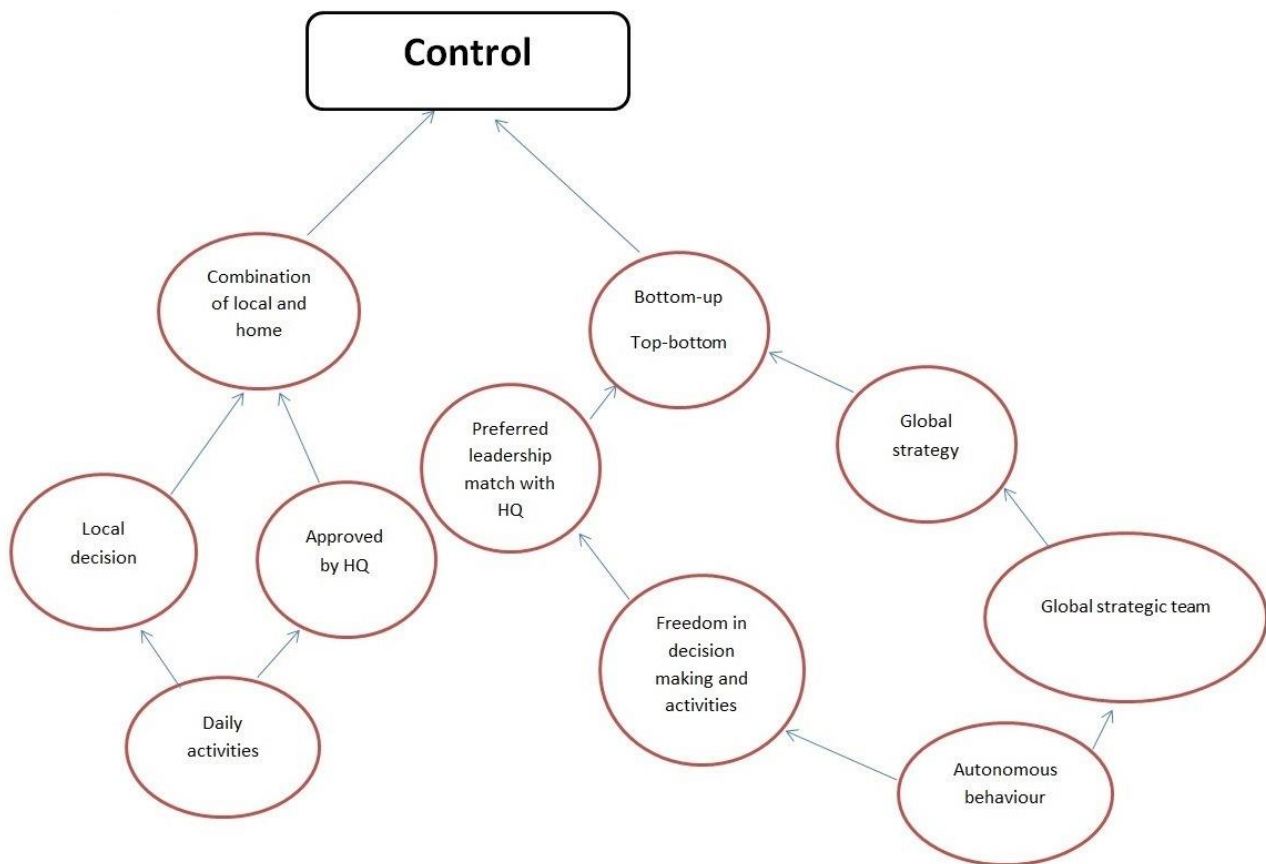


Fig 2: Theme 1

Appendix 5: Theme 2

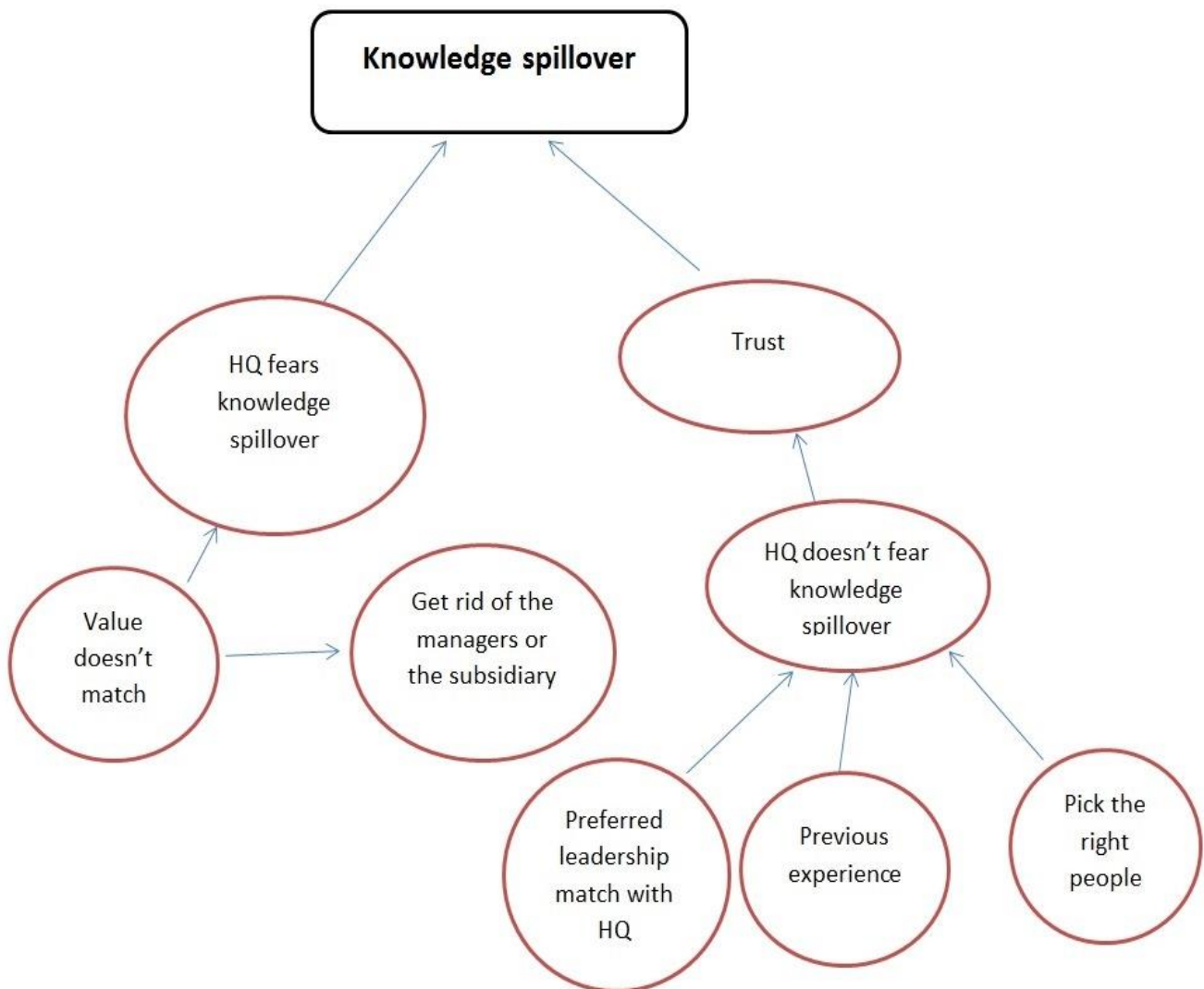


Fig 3: Theme 2

Appendix 6: Theme 3

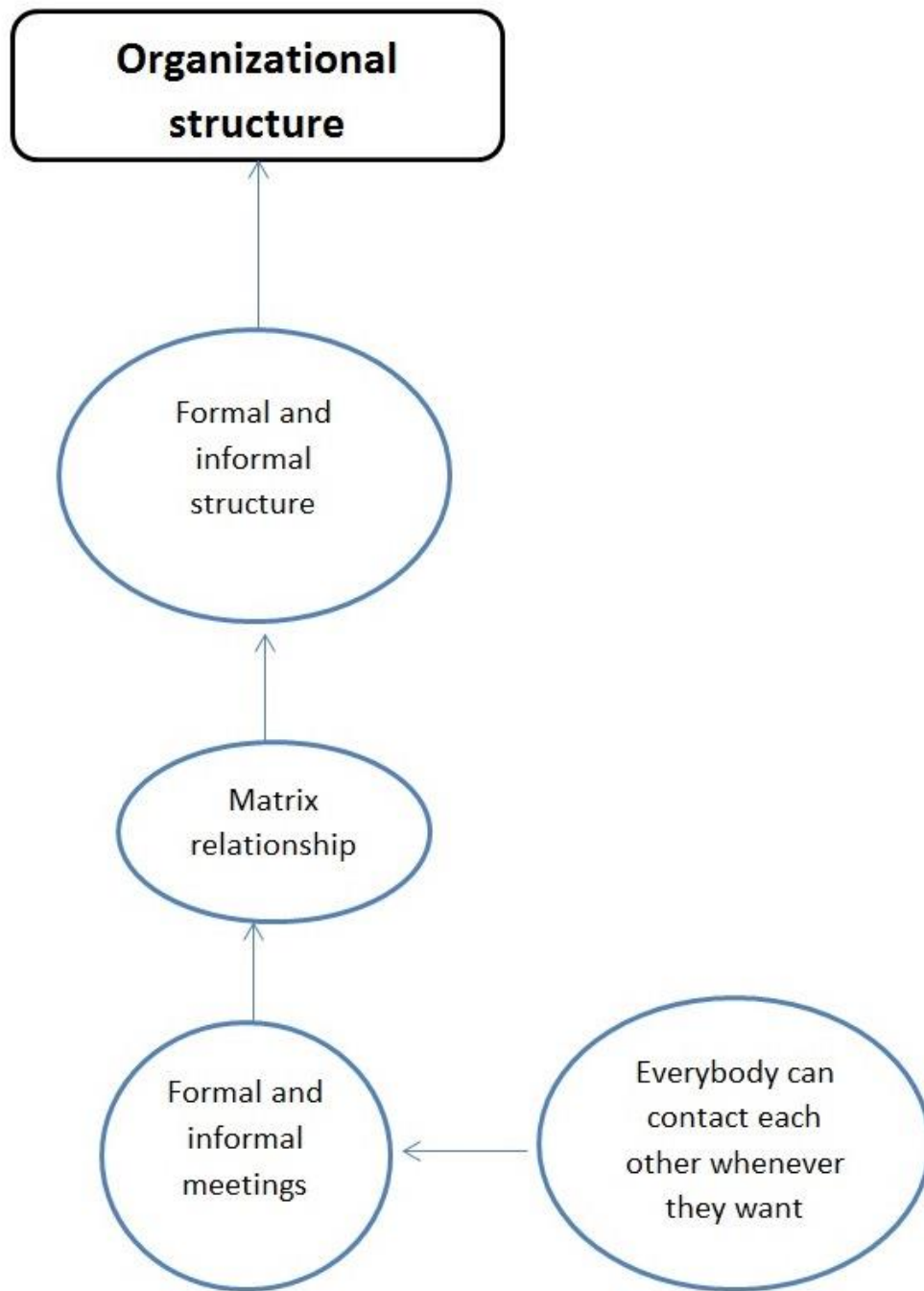


Fig 4: Theme 3