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Spread the word: Language matters

The impact of language diversity on intra-firm knowledge flows and the moderating roles of language capabilities and expatriate deployment

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Master thesis

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Management Summary

The number of multinational companies (MNCs) has grown rapidly in the past 20 years making MNCs a common phenomenon in today's business environment. Since MNCs face many management issues that are uncommon to nationally-oriented firms a vast amount of literature has emerged regarding international management. It is striking however, that one of the most visible components of this multinationality, namely language, has been ignored widely. Several case studies have already shown that language can affect the daily practices within an organization significantly. Among these effects, the effects on communication and knowledge flows are most evident. Despite several calls for more attention to language management in international business, the literature is still very thin and empirical data is lacking. Therefore this study aims to answer the following problem statement: *'What are the moderating effects of language capabilities and expatriate deployment on the relationship between language diversity and intra-firm knowledge flows of multinational companies?'*

Because currently the main literature on this topic has been based on case studies, this study adds to the literature by empirically testing the impact of language diversity on knowledge flows within almost fifty MNCs. Approximately 170 managers of subsidiaries dispersed over 38 countries have filled out questionnaires that provided the data for this study. Analyses of this data did not show the hypothesised negative relationship between the number of languages used in the daily communications and intra-firm knowledge flows. Also the moderating effects of language capabilities and expatriate deployment were not supported. However, despite the poor fit between the data and the theoretical framework, this study does show that language diversity and the possible resulting problems are very present; within the sample almost 70% of the subsidiaries indicated that they had to deal with more than one language in their daily communications showing the relevance of this study. Next, the subsidiaries acknowledged several language-related problems among which the occurrence of communication problems, shadow structures and the empowerment of employees by language skills. Although future research is needed to provide better insights, this study has shown that managers who neglect language management will pay a high price for this.

Preface

Right now you are looking at the research I performed as my master thesis in order to graduate for the Master International Management at Tilburg University. After months of digging into literature, refreshing and upgrading my statistical skills, struggling with SPSS and other frustrations I am very happy and proud to present you my master thesis: '*Spread the word: language matters.'*

I would not have been able to complete this thesis without the support of my supervisor, professor N.G. Noorderhaven, who guided me throughout the whole process and provided me with valuable feedback and advice along the way. Therefore I would like to use this opportunity to thank him for the pleasant cooperation and his support.

Since this study is based on empirical data collected by professor Noorderhaven and professor Harzing, I want to thank them both for allowing me to use their data collection.

Next, I would like to thank professor Dumas for showing an interest in my research and performing the acts of the second reader. Without getting ahead of myself I also want to thank him for offering to supervise me during the writing process of my following master thesis at this university.

I am grateful to my parents who provided me all the possibilities to accomplish my studies and who have supported me throughout all these years. Next I want to say special thanks to my boyfriend Arno for hearing all my thoughts and frustrations and for his support throughout my whole studies. Last but not least I am thankful to all my friends who provided me with the necessary distraction, listened to my stories and cheered me up.

Daniëlla Voermans,

Tilburg, March 2011

Table of Contents

Chapter 1: Introduction

> *"Today, there are some 82,000 TNCs worldwide, with 810,000 foreign affiliates. (..) Exports by foreign affiliates of TNCs are estimated to account for about a third of total world exports (..) and the number of people employed by them worldwide totalled about 77 million in 2008."*
>
> - UNCTAD (2009), p.XXI -

1.1 Introduction and problem indication

The quotation from the world investment report 2009 of UNCTAD stated above shows how important transnational or multinational companies (MNCs) are in today's business environment. Taking into account that just a mere 3 000 MNCs existed in 1990 (Froetschel, 2003), it is clear that MNCs are a phenomenon of the last two decades. MNCs face many management issues that are uncommon to nationally-oriented firms. As a result, an extensive body of literature on international management has emerged over the last few decades. Among them, the effects of culture on the management of MNCs have been studied widely in the international business literature (e.g. Hofstede, 1983; Cox & Blake, 1991; Newman & Nollen, 1996; Earley & Peterson, 2004; Stahl et al., 2010). It is striking, however, that one of the most visible elements of culture and multinationality has been ignored by most of these authors, namely language. Therefore language has been referred to as *'the most neglected field in management'* by Reeves and Wright (1996), as *'the forgotten factor in multinational management'* by Marschan et al. (1997), as *'the lost continent'* by Holden (2002) and as *'the forgotten and neglected orphan of international business research'* by Feely and Harzing (2002).

Welch et al. (2005) perceive this ignorance as very striking since they believe language constitutes *"almost the essence of international business"* (p.11). Next to being a vehicle of sense making and communication, language is also a source of identity (Noorderhaven, 2010; Van den Born & Peltokorpi, 2010) and therefore linked closely to cultural diversity. This has caused language diversity to be treated often as an element of

cultural diversity and psychic distance[1] (Welch et al., 2001; Andersen & Rasmussen, 2002). Piekkari et al. (2005) however argue that language should be unbundled from the culture and psychic distance boxes and receive more attention in international management and the literature. This view is supported by Chakrabarti et al. (2005) who, based on a study of international acquisitions, discovered that the cultural distance between buyer and seller was less important than having a common language. Also Vaara et al. (2005), Marschan et al. (1997) and Andersen and Rasmussen (2002) confirmed the importance of language diversity by case studies.

More specifically, Luo and Shenkar (2006) argue that language should be perceived as a strategic asset by MNCs. The reason behind their strategic approach is that language not only influences the effectiveness and degree of communication but also control, strategy and performance of the company. Also Marschan et al. (1997) stress this line of reasoning and argue that *"language needs to be considered as an important element in managing multinationals because it permeates virtually every aspect of their business activities"* (p.591).

Despite these calls for more attention to language management in international business, the literature is still very thin and empirical data is lacking. Interestingly, the first article considering this subject dates back to 1987, when San Antonio investigated a US company in Japan and described how language skills empowered employees and language served as a group-identity marker. The subject however was not picked up by many other researchers until the late 1990s when a few authors started investigating the effects of language diversity throughout MNCs. Since then, the subject has only slowly gained in popularity. The last couple of years however, the interest in language diversity management seems to be growing as can be indicated by the special issue on language in the Journal of Business Communication in 2010.

The main studies on language management are based on case studies. A good example is the study on Kone Elevators, which has been the basis for multiple articles written by Marschan-Piekkari, Welch and Welch (e.g 1997, 1999ab, 2001 and 2005). Although these case studies have provided important insights into the field of language management they also impose generalizibility problems. Therefore several researchers (e.g. Welch et al., 2001; Tietze, 2007; Harzing & Feely, 2008; Louhiala-Salminen & Rogerson-Revell, 2010) have highlighted the need for better empirical testing on the effects of language

[1] Psychic distance is a concept linked to cultural distance which explains expansion patterns of MNCs.

throughout a MNC. This research responds to these calls and adds to the literature by empirically testing the impact of language diversity on knowledge flows within almost fifty MNCs.

Next to enriching the very scarce literature on language management within MNCs, this research aims to provide useful insights for managers of multinationals. Many managers perceive language as a static obstacle that has to be dealt with, or they believe a corporate language will solve all the communication and knowledge flow problems their firm is facing (Luo & Shenkar, 2006). Both these perceptions are likely to be too simplistic. By showing the impact of language diversity on knowledge flows, the focus of this thesis is on the strategic value of language management. When managers become aware of the importance of language management they will be able to actually manage language and use it to improve the functioning and performance of their firm.

New markets can mean new opportunities for a firm. However, when a firm crosses borders the complexity of language management increases due to the increased number of languages it has to deal with (Welch et al., 2005). Failing to manage these language issues will cause many difficulties, of which communication and knowledge flow problems will be most evident. In this study the focus is on intra-firm knowledge flows, which are described as the transfer of knowledge and skills between subsidiaries and headquarters of a MNC. Poor language skills can act as a barrier towards communication and thereby impede and alter information flows between headquarters, subsidiaries and the markets. This in turn can result in misunderstandings, conflicts, employee dissatisfaction (Charles, 2007), poor strategic fit of the subsidiaries (Luo & Shenkar, 2006) and lost opportunities (Hagen, 1988; Crick 1999). All these results will negatively impact the performance of the MNC and should therefore be avoided. The examples above show the far-reaching impact of language on the organization of the firm. Hereby it is clear that a high price will be paid by firms who neglect language management.

Language diversity refers to the number of different languages that a firm or a subsidiary has to deal with on a regular basis. Within a MNC three different levels of language can be present; the language of the corporate headquarter, local language(s) of subsidiaries and possibly a corporate language, also called lingua franca, which in most cases is English. Language diversity stems from the differences between the languages at these levels. Some subsidiaries face multiple languages at the local market, which makes it an even more delicate issue. Language policy, or language management, refers to the management

of these language levels. Although many different strategies exist to deal with language diversity they can be distinguished by their focus on one of the levels described above.

The language capabilities of the firm can be equated to the sum of the language capabilities of its employees (Welch et al., 2001). When employees of different subsidiaries and headquarters of the MNC possess critical language skills, communication will be facilitated and knowledge sharing increased. This can reduce the negative impact of language diversity on intra-firm knowledge flows.

Nowadays expatriate deployment is a common phenomenon in international business. Since one of the main goals of these staff transfers is knowledge transfer (e.g. Delios & Björkman, 2000; Harzing, 2002; Lazarova & Tarique, 2005) a positive relation is expected between expatriate deployment and the transfer of knowledge and skills within the MNC. Additionally expatriates are expected to moderate the relationship between language diversity and intra-firm knowledge flows in two main ways. First, their efforts to enhance communication may partly offset the negative effect of the language barrier. Second, they can add to the language capabilities of a MNC, which can reduce the language barrier (Marschan-Piekkari et al., 1999b; Feely & Harzing, 2003). The moderating role of expatriates is expected to grow when they possess critical language skills because this enhances integration and communication (Marschan-Piekkari et al., 1999b; Peltokorpi, 2007; Van den Born, 2010).

1.2 Problem statement and research questions

Based on the short literature review above, the central question dealt with in this thesis is: *'What are the moderating effects of language capabilities and expatriate deployment on the relationship between language diversity and intra-firm knowledge flows of multinational companies?'*

In order to be able to answer the problem statement the following research questions are dealt with in the next chapters:

1. What is the influence of language diversity on knowledge flows within a MNC?
2. What is the effect of language capabilities on the relationship between language diversity and intra-firm knowledge flows?
3. What is the effect of expatriate deployment on intra-firm knowledge flows?
4. What is the effect of expatriate deployment on the relationship between language diversity and intra-firm knowledge flows?

As can be seen in the graphical representation in appendix 1, all variables are measured at the subsidiary level.

In this study knowledge flows refer to the transfer of knowledge and skills within the MNC. This means that the measure includes the knowledge and skills that the subsidiary receives from its headquarter and other subsidiaries of the MNC, as well as the knowledge and skills it provides to its headquarter and other subsidiaries of the MNC. These knowledge flows have been measured in four business areas.

Language diversity is a measure reflecting the number of languages used in the subsidiary and the differences between the local, subsidiary, corporate and headquarter languages. So this measure includes all the languages that a subsidiary manager has to deal with while performing his responsibilities. It is important to note that this study measures the languages that are actually used, rather than the language structure proposed by the headquarter.

In this study, language capabilities are defined as the level of language proficiency of the subsidiary and headquarter management teams. Their language proficiency has been measured for the subsidiary, headquarter and corporate languages.

Expatriates are defined as employees from the headquarter or other subsidiaries of the MNC that are on a temporary assignment at the subsidiary (Noorderhaven & Harzing, 2002). Expatriate employment will be measured by the number of expatriates working at the subsidiary at the time of measurement.

The research design for this study is the development and testing of a conceptual theory. After having developed the hypotheses based on the theoretical framework, these are tested using data from a study of Noorderhaven and Harzing. In 2002 they performed a study concerning headquarter-subsidiary relationships. About 170 subsidiaries of almost 50 MNCs, dispersed over 38 countries, have filled out their questionnaire. Although a part of this questionnaire concerned language diversity, these data have not been used in previous research. Next to language diversity, topics in this questionnaire concerned general information about the subsidiary and the headquarter, corporate strategy and the role of the subsidiary, autonomy and coordination mechanisms, expatriates, and subsidiary performance. To be able to gather all this information the questionnaires were addressed to subsidiary managers. It is important to note that the raw data of this research are used and not just the outcomes of previous analyses.

1.3 Structure of the thesis

Before analyzing the empirical data, a literature review is performed to create a basis for the theoretical framework. Chapter two discusses the current literature concerning the influence of language diversity on knowledge flows within MNCs. Special attention is paid to the use of English as the lingua franca within multinationals. The moderating effects of language capabilities and expatriate deployment on the relationship between language diversity and knowledge flows are discussed in Chapter three. Chapter four describes the research methodology after which Chapter five describes the results from the analyses performed on the empirical data. Finally, conclusions, recommendations, limitations of the study and suggestions for further research are outlined in Chapter six.

Chapter 2: Language diversity and knowledge flows

This chapter sketches the first lines of the theoretical framework by discussing language diversity, intra-firm knowledge flows and how the first one can affect the latter. After the brief introduction of language diversity in the previous chapter, the concept and its importance in international business are deepened in this section by explaining the consequences of language diversity throughout the organization. To be more precise, paragraph 2.1 explains the strategic importance of language management for a MNC. Next, paragraph 2.2 concerns the influence of language diversity on daily practices, including employee empowerment (2.2.1), the emergence of shadow structures (2.2.2), employee perception (2.2.3) and market interactions (2.2.4). Special attention is paid to the consequences of adopting English as the lingua franca in paragraph 2.3. Finally, in paragraph 2.4 hypotheses are formulated as preparation for the empirical tests in Chapter five.

2.1 Strategic importance of language management

Like stated in the first chapter, language diversity is a very important, though often neglected, issue for MNCs. Since MNCs consist of multiple subsidiaries and one or more headquarters dispersed over multiple countries, language barriers will be present for the majority of the subsidiaries when communicating with the market or within the MNC's network. These barriers can impede communication and alter knowledge flows within the MNC's network. The importance of these knowledge flows as a source of competitive advantage has been widely accepted in management literature and practice nowadays (e.g. Dyer & Nobeoka, 2000; Gupta & Govindarajan, 2000; Mudambi, 2002; Björkman et al., 2004; Luo & Shenkar, 2006). Therefore the distortion of knowledge flows by language diversity can have significant impact on the functioning and performance of MNCs.

Because language affects almost every element of an organization a strategic approach towards language management seems logical. Luo and Senkar (2006) indeed argue that language diversity should be perceived as a strategic asset and therefore be integrated into the corporate organizational strategy. To be more specific, they perceive language management as *"a variable mechanism that needs to balance global integration with local adaptation in line with corporate strategy and an evolving global environment"* (p.322).

Their perspective emphasizes that language issues are dynamic instead of static and that language policies should be the result of deliberate decisions. When language policies are designed in accordance with firm strategy, firm operations and performance will be affected positively. According to Luo and Shenkar (2006) an integrated language design will improve firm performance in several ways; it enhances intra-firm communication and information exchange, improves coordination and integration, improves inter-unit learning which is essential for knowledge transfer, improves intra-unit value creation, stimulates communication and socialization, and reduces perceived cultural distance among managers of the MNC. The majority of these performance enhancers are related to knowledge transfer, indicating the importance of knowledge flows to a firm according to Luo and Shenkar (2006). To reap these benefits a firm should continue to manage its language policies actively, even after a good language design has been established. The reason is that the firm should remember the dynamics of its policies and be able to adjust them when the environment changes.

Other authors have also argued for a more strategic role of language within international management. Marschan et al. (1997), for example, argue that a MNC's language policies should match its strategies because of the far-reaching impact of language throughout the organization. They emphasize the human resource perspective by stating that people should connect within a MNC to maximize performance. Language diversity can cause exclusion of people with poor language skills and jeopardize feelings of belongingness (Welch et al., 2005; Harzing & Feely, 2008). This can affect the corporate identity and will especially hamper informal communication, which is an important source of intra-firm knowledge transfer (Marschan et al., 1997; Tsai, 2002; Charles, 2007). Also Henderson (2005) emphasizes that language affects socialization processes and team building. Welch et al. (1999b) and Harzing and Feely (2008) on the other hand, focus on barriers to communication that language differences erect and how this hampers information to flow through the MNC and influences overall management. Next, some authors argue for a strategic approach towards language management because of the effects on coordination and control mechanisms (e.g. Björkman & Piekkari, 2009). However, the main conclusion of all these authors is that language has a far-reaching impact on MNCs and therefore deserves more strategic attention than it receives nowadays.

2.2 Consequences of language diversity on daily practices within a MNC

Having determined the strategic value of language policies, a step down on the organizational ladder has to be made to perceive how language diversity affects the daily practices within an organization. Hereby the main focus lies on the consequences of differences between local, headquarter and corporate language. The most important consequences for intra-firm knowledge flows are described below, namely the empowerment and disempowerment of employees (2.2.1), emergence of language clusters and shadow structures (2.2.2), and employee perception and satisfaction (2.2.3). Next to intra-firm knowledge flow consequences, some consequences are named briefly that concern communication of the MNC with the market (2.2.4), to provide a rather complete picture of the impact of language diversity.

2.2.1 Employee (dis)empowerment

One of the most important consequences of language diversity is that it can alter the power of employees and managers within an organization (San Antonio, 1987; Welch et al., 1999b, 2001, 2005; Charles, 2007). Before the more theoretical approach will be discussed a case study will be described to illustrate this power concept.

A good example of how language affects power relationships has been provided by Vaara et al. (2005) who studied the merger between the Finnish Merita Bank and Nordbanken from Sweden. The merger was supposed to be a 'merger of equals' and the choice of a corporate language of the top management was perceived as a minor issue. Therefore the decision was made from a practical point of view; since all Finish top managers were supposed to speak almost fluent Swedish, Swedish was adopted as the corporate language. Although all Finns learn at least a certain level of Swedish at school, top management had overestimated the language skills of the Finnish employees which resulted in very skewed power balances among employees of both parties. This imbalance had three main effects which reduced the power of the Finns. First of all, the Finnish employees and managers felt handicapped by their limited language skills which complicated communication. Second, the Finnish managers were not able to negotiate, write, argue and express themselves as clearly as their Swedish counterparts. This limited their ability to show their qualities and expertise which caused them to be perceived as less competent. So language incompetence was confused with professional incompetence. Finally, the imbalance resulted in social language-based networks which naturally impeded the

integration of the two parties. All these effects, worsened by a colonial history, made the Finns feel inferior to the Swedish. Although some Finnish employees were able to profit from a gatekeeper position, a part of them still suffered professionally. Finally the firm decided to change the corporate language into English when it merged with a Danish bank in 2000. This shift proved to be successful because the employees perceived the power balance between the two parties to be restored.

The example of Merita-Nordbanken shows that the language issue is easily overlooked but can have large implications. It especially showed the empowerment and disempowerment that can be caused by language competence. This effect has also been found by Welch et al. (1997, 1999ab, 2001, 2005) when they studied the Finnish MNC Kone elevators. Although the official corporate language of Kone Elevators was English, not all employees and managers spoke English well. As a result, employees and managers who mastered English well increased their power within the organization, while employees less competent in English were forced into a less powerful position. Because English was a necessary skill to communicate with the headquarter, employees and managers less competent in that language turned to multilingual colleagues who spoke their language and English. These bilingual or multilingual people became language nodes, functioning as an intermediary by which communication was conducted. Hereby they were granted a gatekeepers position; they determined which information, knowledge and skills were transferred between parties. These positions allowed them access to information which was normally not included in their functional description, which increased their power even further. Therefore many of these gatekeepers accelerated their professional career within the company. From the company's perspective the presence of such positions is dangerous because gatekeeper positions make knowledge flows very vulnerable. An employee may abuse its power and alter or conceal certain information for his or her own sake. Additionally, knowledge flows will be altered because just one persons acts as an interpreter and translating is always subjective to the perceptions and interpretations of the translator (Charles & Marschan-Piekkari, 2002; Welch at al., 2005; Welch & Welch, 2008). When the gatekeeper perceives a piece of information to be unimportant, the information is likely to remain unused and may unintended negatively affect firm performance. Finally, the MNC will face a major problem when a gatekeeper leaves the company and is no longer able to function as a language node.

2.2.2 Shadow structures

A second important consequence of language diversity is the emergence of a shadow structure in the organization based on language clusters (e.g. Marschan et al., 1997; Welch et al., 2005). This means that positions within the firm or subsidiary are based on language competence rather than the official organizational structure as directed by top management. Because language skills can empower and disempower employees based on their access to information and dependence on language nodes, the official functions and positions within the firm become blurred. This structure is very likely to lead to suboptimal results because language competence, in most cases, does not equal professional competence. Therefore there is no match between necessary skills and information to perform the position optimally.

Next to altering the organizational structure because of individual power inequalities, language can also alter the organizational structure by the emergence of language clusters (Welch et al., 1999b). When language diversity is present in a MNC, employees are likely to cluster with colleagues speaking the same language. Employees select their personal network on among others, perceived similarity (Byrne, 1971; Harzing & Feely, 2008). Sharing a common language naturally creates a feeling of belongingness. Additionally, colleagues who speak the same language often share a common cultural background, fostering these language clusters even more. Informal communication is an important determinant for knowledge creation and knowledge sharing within an organization (Marschan et al., 1997; Tsai, 2002; Charles, 2007). Therefore this clustering affects intra-firm knowledge flows.

This clustering however, also occurs on a higher organizational level (Welch & Welch, 2008; Kostanek, 2009). Limited language skills can result in weak relationships with headquarters and other subsidiaries. When these relationships are based on language competence rather than their strategic role within the MNC, knowledge flows are affected, which in turn can lead to suboptimal decisions, relations and performance.

When a subsidiary has very limited language skills this language clustering can result in subsidiary isolation. An example is provided by Marschan et al. (1997), again concerning the Kone multinational. The headquarter distributed information towards its subsidiaries in English only, causing a lot of ineffective communication; managers did not understood the language or did not had the time to translate the information and pass it on to their subordinates. A Spanish manager who did not master the English language, stated that the subsidiary had become isolated from the rest of the MNC because they were unable to

communicate with the Finnish headquarter. This is also a good example of a situation where no language nodes are present, thereby disempowering the complete subsidiary.

2.2.3 Employee perception

A third consequence of language diversity refers to the perceptions and feelings of a MNC's employees. To ensure employees are satisfied, communication is essential and the basis for all forms of communication and relationships is language (Kostanek, 2009; Charles, 2007). People tend to like persons that are similar to themselves (Byrne, 1971), causing among others the language clusters described above. These clusters within and among subsidiaries can create inclusion and exclusion feelings; employees may feel that they belong to a certain cluster or informal group and feel excluded from other groups. When language diversity is present these groups are often based on language, facilitating intra-group communication and complicating inter-group communication. Like stated above, these informal groups have a large impact on the informal knowledge flows. Language barriers may also affect perceived cultural distance, thereby affecting integration among employees and subsidiaries. Colleagues within a certain language cluster or group are likely to be perceived as more similar, while the distance between the different clusters will be perceived larger than reality. These feelings of social inclusion and exclusion reflect on the corporate identity of the MNC (Welch et al., 2005). Additionally they have an important impact on informal intra-firm knowledge flows which may hamper MNC performance (Marschan et al., 1997; Kalla, 2006; Charles, 2007).

2.2.4 Market interaction

Finally, language diversity impacts knowledge flows of the MNC with the market. Since the focus of this study is on intra-firm knowledge flows only the three most important consequences of language on market interaction is described very briefly.

First, when employees of subsidiaries master local languages, this gives a signal to the market about local adaptation (Luo & Shenkar, 2006). Many customers and local authorities value this local adaptation, affecting their relationship with the MNC.

Second, language is often an important issue for possible prospect employees of the subsidiary (Van den Born, 2010). When a lingua franca is adopted the available labour pool

for the subsidiary decreases. Additionally a lingua franca is likely to signal an international corporate image, which may attract or repel potential employees.

Finally, language impacts the number and kind of opportunities that a firm perceives and chases (Hagen, 1988; Crick, 1999). Communication is necessary to discover, measure, evaluate and react upon changes in the market or consumer needs. The opportunities that a firm pursues will in turn affect the language diversity it has to deal with and impact its corporate image.

2.2.5 Conclusion

Looking at the literature review above the main strategic consequences of language diversity can be grouped under the following results: an altered power structure among employees within the MNC; formation of language clusters and shadow structures; employee perception of inclusion, (cultural) distance and satisfaction; market signalling; and finally business opportunities. The last two consequences receive no further attention because they are beyond the scope of this study. The remaining four consequences can all negatively impact effective communication and intra-firm knowledge flows. It is interesting to note that these consequences mostly occur in an informal way, making them less visible and difficult to manage for top management. This may be one of the reasons why managers have not devoted a lot of attention to language yet.

2.3 Consequences of adopting a lingua franca

It seems language is a delicate and complex issue which needs to be managed carefully to maximize intra-firm knowledge flows. Within MNCs a common corporate language, also called lingua franca, has become more and more common as a solution to language diversity (Anderson & Rasmussen, 2002; Charles, 2007). This drive towards language standardization has been supported by increased levels of transnationality. When the number of languages that a MNC has to deal with increases, the need for control, coordination and often integration also increases. A quite simple solution from the top-management perspective is to adopt a lingua franca, which in most cases is English. This will simplify formal reporting, improve (in)formal communication and contribute to the feeling that employees belong to a global family (Welch et al. 1999a). Additionally it will avoid confusion at the top-management level caused by dealing with multiple languages

(Marschan-Piekkari et al., 1999b; Feely & Harzing, 2003). However, to reap the benefits of a lingua franca the firm must ensure that the employees within the MNC are able to communicate in this language. Although this prerequisite seems logical it is still a major problem faced by many MNCs. The Merita-Nordbanken case already illustrated this problem. Another example mentioned by multiple authors (e.g. Luo & Shenkar, 2006; Van den Born & Peltokorpi, 2010) is the MNC Citigroup. Although English is the official corporate language, about sixty percent of its worldwide employees do not master this language. This hampers communication and the transfer of information, knowledge and skills severely. The prerequisite of speaking English is only the first and most simple step towards a successful lingua franca. Like stated in the beginning of this chapter, language policies should be integrated into the MNC's strategy, and therefore take into account many factors.

Welch et al. (2001) argue that language standardization does not solve the knowledge flows problems, but just alters or relocates these problems to lower levels within the organization. When a MNC decides to adopt a lingua franca top-management perceives the language issues to be resolved while the problems are actually pushed down the hierarchy towards the subsidiary level. When this situation occurs, the problem of language diversity remains present and will therefore still affect the organization and its performance.

2.4 Conclusion

The above analysis shows the far-reaching impact of language diversity on both formal and informal knowledge flows within an organization and thereby the importance of the topic for multinational management. Looking at the quote of UNCTAD (2009) that introduced the previous chapter, the far-reaching impact of language diversity in the business economy is evident; in 2008 the world counted over 82 000 MNCs, with 810 000 subsidiaries, and 77 000 000 employees. All these firms, subsidiaries and persons face language diversity issues on a daily basis. Therefore, more insights into language diversity and management are needed.

This chapter has shown how language diversity can impact intra-firm knowledge flows. Knowledge flows can be impeded or altered by language differences which may negatively affect firm performance. Interestingly, many of these knowledge flows distortions occur on an informal level, making language diversity a very delicate and difficult issue for managers. Although adopting a common corporate language is often perceived as the

solution, this view is too simplistic. A lingua franca will alter and may mitigate the problems, but will not solve them.

To conclude this chapter the following hypothesis has been formulated based on the literature review above:

- *Hypothesis 1: language diversity will negatively impact intra-firm knowledge flows within a MNC.*

Chapter 3: The moderating effects of language capabilities and expatriate deployment

The previous chapter outlined the impact of language diversity on intra-firm knowledge flows. Now the strategic and managerial importance of language policies has been established a closer look is needed towards the moderating variables on this relationship. Like stated in the introduction chapter, both language capabilities and expatriate deployment are likely to affect the relationship between language diversity and intra-firm knowledge flows. Therefore paragraph 3.1 and 3.2 respectively describe the moderating influence of language capabilities and expatriate deployment on this relationship. Next, paragraph 3.3 describes the relationship between the two moderators. Finally, conclusions are outlined and hypotheses formulated in paragraph 3.4.

3.1 The moderating effects of language capabilities

Communication is the base of knowledge transfer and a prerequisite of communication is a common language (Charles, 2007; Welch & Welch, 2008; Kostanek, 2009). Therefore language can be seen as a medium for communication and knowledge transfer within a MNC (Vaara et al., 2005; Welch et al., 1999a). By nature, the language capabilities within a firm are determined by the language capabilities of its employees (Welch et al., 2005). When employees possess the critical language skills communication becomes easier and will increase in frequency. More frequent communication is the basis for creating and maintaining relationships which are crucial for trust and knowledge transfer (Becerra & Gupta, 2003; Charles, 2007). Additionally, frequent communication will increase integration and reduce exclusion feelings ranging from individuals, to groups of employees, to complete subsidiaries (Charles & Marschan-Piekkari, 2002). This will increase knowledge sharing further.

Another direct effect of possessing critical language skills is that it provides access to information which would have been impossible or at least difficult to access without these language skills (San Antonio, 1989; Welch et al., 2005; Peltokorpi, 2007). When individuals, groups and complete subsidiaries cannot access certain information they are often excluded

from decision-making, reinforcing isolation and exclusion feelings (Welch et al., 1999b; 2005; Welch & Welch, 2008).

Although language capabilities can weaken the negative effect of language diversity on knowledge transfer, they are not able to nullify the effect. As explained above, language diversity affects intra-firm knowledge flows in several ways, including both direct observable and more subtle effects. These direct observable effects refer to misunderstandings, miscommunications and misjudgements caused by a lack of language skills (Henderson Kassis, 2005). Therefore these problems can be solved largely by the possession of critical language skills. The more subtle effects, like social categorization issues, will be weakened but remain present even when the employees possess the critical language skills. This can be explained partly by the anxiety and uncertainty management theory as proposed by Gudykunst (1995) which implies that communicating in a second language will increase anxiety and uncertainty and reduce trust (Peltokorpi, 2007; Harzing & Feely, 2008). Employees can reduce anxiety and uncertainty by good language skills up to a certain extent. However, regardless of their level of fluency, individuals have different levels of confidence and attitudes towards communicating in a second language (Welch et al., 2005). The resulting lower level of trust will impact the relationships among employees and especially hamper informal knowledge transfer (Peltokorpi, 2007).

A final reason why language capabilities are not able to solve the language diversity issues completely, is because language skills are not identical to communication or cultural skills, which are also prerequisites for effective communication and knowledge transfer (Anderson & Rasmussen, 2002; Van den Born, 2010; Peltokorpi, 2010).

3.2 The moderating effects of expatriate deployment

Nowadays many MNCs engage in the transfer of staff between subsidiaries and headquarters. The two main purposes of this expatriate deployment are subsidiary control and knowledge transfer (e.g. Delios & Björkman, 2000; Harzing, 2002; Lazarova & Tarique, 2005). In the last situation, the expatriate may act either to transfer knowledge to the subsidiary or to acquire local knowledge (Delios & Björkman, 2000). Local knowledge is often embedded in tacit or informal practices, making interpersonal communications necessary for transferability (Hocking et al., 2007). Therefore the transfer of this knowledge often depends on expatriate deployment (Gaur et al., 2007). A large amount of knowledge transfer in MNCs occurs through informal and interpersonal communications which often takes place in social

situations (MacDonald, 1996). Therefore the integration of expatriates and the subsidiary employees is very important.

In their elucidation for a strategic approach towards language management, Luo and Shenkar (2006) also discuss the role of expatriates in management functions. They expect that the presence of expatriate managers in a subsidiary facilitates intra-unit communication, which will increase communication frequency, and thereby knowledge sharing with headquarters and other subsidiaries of the MNC. Several other studies have also indicated that expatriate employment has a positive impact on intra-firm knowledge flows (e.g. Edstrom & Galbraith 1977; Barner-Rasmussen & Björkman, 2005).

Because fostering knowledge transfer is one of the main goals of expatriate deployment, the expatriate's efforts to encourage communication may partly offset the negative impact of language diversity on intra-firm knowledge flows. As will be explained in the next paragraph, this moderating effect is likely to increase when the expatriate possesses critical language skills and acts as a language mediator.

3.3 Language capabilities and expatriate deployment

To show the relationship between language capabilities and expatriate deployment, this section will start with an illustrating example.

Hou, Jiang and Li (2003) showed the importance of expatriate language skills by a case study of the German MNC Bayer Healthcare which started operating in China as part of a joint venture in 1995. The abundant use of expatriates in the beginning phase did not lead to hoped results, mainly because German expatriates did not master the Chinese and English language, creating many communication problems. This lack of language capabilities resulted in strong language-based categorization and the German expatriates were perceived as arrogant by the local employees. The replacement of expatriates by local managers did not solve the situation until a German expatriate who was born in China was appointed a management function in the subsidiary. This manager was able to communicate in the local, headquarter and corporate language and heavily facilitated communications between the different parties. Additionally, the attitude of the local employees towards expatriates changed, further improving the knowledge sharing. This example demonstrates that language skills of expatriates are of upmost importance to facilitate communication, integration and knowledge transfer, but that this prerequisite is also easily overlooked by MNCs when selecting their expatriates.

As illustrated by the example, language capabilities and expatriate employment are related in several ways. First, as stated above, the language capabilities of a firm are determined by the language capabilities of its employees (Welch et al., 2005). Therefore expatriates possessing important language skills can add to the language capabilities of a subsidiary, thereby lowering the language barrier and facilitating communication and subsequent knowledge transfer of this subsidiary with other parts of the MNC (Welch et al., 1999a)[2]. A case study by Goodall & Roberts (2003) concerning the MNC Euroil shows that expatriates formed personal language-based networks which facilitated communication and knowledge transfer between different units in the MNC. However, in some cases the networks impeded knowledge transfer because access to the networks was language dependent.

On a more individual level expatriates can become language mediators by functioning as interpreters between headquarter and subsidiaries (Marschan-Piekkari et al., 1999b). This way the expatriate may ensure effective knowledge transfer between the subsidiary and the headquarter and break down or avoid subsidiary isolation (Welch & Welch, 2008). The language intermediate function appeared especially important when subsidiary staff lacked skills in the headquarter or corporate language (Welch et al., 2005). In those situations, the expatriate's role as communication facilitator sometimes became unintended, more important than his original function (Marschan-Piekkari et al., 1999a). Another interesting finding resulting from the case study on Kone Elevators was that the language node function of expatriates often continued after repatriation (Marschan-Piekkari et al., 1999a). Especially subsidiaries with low corporate or headquarter language skills relied on contacts with repatriates to gather information in their local language. These informal linkages with other units within the MNC facilitated formal, informal and tacit knowledge transfer (Marschan-Piekkari et al., 1999b; Hansen, 1999; 2002). This way communication clusters emerged around multilingual expatriates. Interestingly, as a consequence of worth-of-mouth one repatriate who had spent time in a Venezuelan subsidiary became a language node for several Spanish speaking subsidiaries (Marschan-Piekkari et al., 1999a). This way

[2] When these expatriates use intermediaries or interpreters in order to communicate with the local staff several caveats are present. First, both the expatriate and the local staff lose control over their messages. Second, even when the message is translated correctly, a loss of rhetorical skills and negotiation power is present which will reduce power within the organization (Cyr & Schneider, 1996). Finally, the dependency on mediators or interpreters can be very inconvenient and time consuming, which may hamper the daily operations in the firm (Feely & Harzing, 2003).

the long term positive effect of expatriate employment spread to other subsidiaries within the MNC.

However, like described in chapter two, this intermediate position also allows for abuse (Marschan et al., 1997; Marschan-Piekkari et al, 1999ab). Case studies on Kone Elevators and the Finnish MNC Wärtsilä NSD, showed that expatriates in this position may act as gatekeepers, filtering the knowledge flows for personal gains (Welch et al., 2001; 2005). These findings have been confirmed by Peltokorpi (2010), who conducted interviews in 58 Nordic subsidiaries in Japan and discovered that some expatriates filtered information because of control issues or personal benefits. However, the positive effects of expatriation are likely to outweigh the fewer cases where expatriates abuse their gatekeeper position.

Second, language skills will enhance the expatriate's integration into the subsidiary. Several studies have already indicated that a lack of language capabilities on the side of the expatriates or the local employees will seriously hamper integration and thereby impede knowledge transfer and sharing (e.g. Welch et al., 2001; Harzing & Feely, 2008; Van den Born & Peltokorpi, 2010). In relation to integration, language skills are also argued to increase cross-cultural adjustment and communication (Selmer, 2006; Peltokorpi, 2007; 2008). Like explained in Chapter 2, language can be an important factor determining social categorization. Expatriates who do not master the local language can easily be perceived as an out-group member and thereby be excluded from informal interactions. The Kone case study has shown that language skills were very important for the creation and persistence of relationships between local subsidiary employees and expatriates (Welch et al., 2005). Next, the case study by Goodall and Roberts (2003) showed that language-based networks of expatriates increased knowledge transfer by the establishment of trust and cooperation among different subsidiaries and headquarters.

An expatriate who speaks the subsidiary language however, also has to meet up to certain expectations of the local subsidiary employees since language skills are often associated with cultural competencies(e.g. Peltokorpi & Schneider, 2009; Peltokorpi, 2010). Therefore expatriates mastering local languages are allowed fewer cultural mistakes by the local staff than their counterparts possessing poorer language skills.

To conclude, the moderating effect of expatriate employment on the relationship between language diversity and intra-firm knowledge flows is likely to be larger when the

expatriate possess critical language skills. However, as illustrated by the example of Bayer Healthcare, these capabilities appear to be lacking in many cases because they are often overlooked in expatriate selection (e.g. Lester, 1994; Björkman & Schaap, 1994; Dowling & Welch, 2004). Therefore several authors have stressed the importance of language training for expatriates to enhance knowledge transfer (e.g. Selmer, 2006; Van den Born & Peltokorpi, 2010). According to Tungli & Peiperl (2009) MNCs are starting to recognize the importance of language competences of expatriates because they perceive these skills as increasingly important during expatriate selection. Although this recognition is not wide-spread yet, it seems to be a sign that language may receive the attention it deserves from MNCs in the future.

3.4 Conclusion

The literature review above shows how language capabilities and expatriate deployment may moderate the relationship between language diversity and intra-firm knowledge flows. Although both are not able to nullify the negative effect of language diversity, they are able to weaken the relationship, thereby increasing knowledge transfer and facilitating language management for the MNC. Next to their individual impact it is also important to acknowledge that the moderators are related. Therefore the magnitude of the moderating effect of expatriate deployment will be influenced by the language skills of the detached expatriate and the language skills of local subsidiary staff.

Like in the previous chapter, hypotheses are formulated to conclude this chapter.

- *Hypothesis 2: language capabilities will positively moderate the relationship between language diversity and intra-firm knowledge flows.*
- *Hypothesis 3: expatriate deployment will positively moderate the relationship between language diversity and intra-firm knowledge flows.*
- *Hypothesis 4: expatriate deployment will positively impact intra-firm knowledge flows.*

Chapter 4: Research Methodology

This chapter outlines the research methodology employed in this thesis. The first paragraph (4.1) describes the overall research design of this thesis, which consists of a literature review (4.1.1) and empirical testing (4.1.2). Section 4.1.3 devotes special attention to the data used for the empirical part of the research. Finally paragraph 4.2 describes the measures constituting the model and the control variables included in the analyses.

4.1 Research design

This thesis can be labelled as a theory-testing research, meaning that the research efforts are directed at empirically testing the hypotheses based on previous studies. Therefore this paragraph is divided into two sections; the first section discusses the literature review and the second section the empirical tests.

4.1.1 Literature review

The theoretical framework described in the previous chapters is based on a literature review. As will be explained by the next two definitions, this part of the research is descriptive in nature. According to Sekaran (2003) a literature review can be defined as *"a clear and logical representation of the relevant research work done thus far in the area of investigation"* (pp.66-67). Next, she describes a theoretical framework as *"a conceptual model of how one theorizes (..) the relationships among the several factors that have been identified as important to the problem"* (p.87). So the theoretical framework presented in the previous chapters is not only a well-structured summary describing the relevant existing researches concerning language diversity within MNCs, but it also shows the relationships among the concepts. Therefore this framework provides valuable insights into the topic and shows the current gaps in literature. Second, the framework describes and explains the different concepts included in this research, increasing the comprehensibility of the study. Finally, the theoretical framework provides hypotheses that are used as a departure point for the empirical analyses.

A literature review is by nature a qualitative research based on secondary sources (Sekaran, 2003). Therefore the quality of the sources used during the literature review influence the quality of the theoretical framework. The articles gathered to perform the literature review of this study are subtracted from Google Scholar and the Tilburg University Database. Several measures have been taken into account to prevent the use of low-quality articles and create a high-quality theoretical framework. First, Tilburg University (2010) provides well-known journals with quality labels, which facilitates judging the quality of the articles. Second, Journal Citation Reports provides Impact Factors, a quantitative tool to measure journal quality, for many academic journals[3]. Appendix 2 shows how the used articles rank on both of these measures. Looking at this table it is clear that the theoretical framework is based on high-quality sources. Next to evaluating the quality of journals, attention has been paid to the year of publication of the articles to prevent the inclusion of outdated studies. As can be seen in the references section, the theoretical framework is a reflection of relevant and recent studies.

4.1.2 Empirical investigation

Studies are designed to serve specific purposes, which depend on the development level of the research topic (Sekaran, 2003). For this research the purpose can be defined as hypotheses-testing, also known as theory-testing or explanatory research. This means that hypotheses drawn from existing theory are tested by empirical data. The descriptive literature review has provided several hypotheses which will be tested using data from about 170 internationally dispersed subsidiaries, gathered by questionnaires in 2002. According to Brock et al. (2008) an empirical study increases in generalizibility when it is performed internationally. Like described in the next section, the sample includes subsidiaries covering 38 different countries, reducing generalizibility issues. More details about the data collection are explained in the next section.

[3] This factor shows the average number of citations followed upon articles in a journal, published within the last two years.

4.1.3 Data collection

Like stated before, the empirical tests are based on data gathered by questionnaires in an earlier research performed by Noorderhaven and Harzing in 2002. This section describes how they have collected the data and developed the questionnaires.

The questionnaire was designed after an extensive review of literature concerning headquarter-subsidiary relationships (Noorderhaven & Harzing, 2009). Before the questionnaires were mailed to the targets three subsequent pilot tests were performed using focus groups. All tests were directed at improving both the content and the questionnaire design. Modifications based on the pilot test were made before the next pilot test was performed. After the final pilot test only some minor adaptations were made to enhance comprehensibility.

The final questionnaire comprised a wide range of topics concerning relationships between subsidiary and headquarter, among which general subsidiary and headquarter characteristics, coordination mechanisms, corporate strategy, expatriate employment, language diversity and knowledge flows. In total the respondents had to answer 149 questions to complete the questionnaire. Details about which subsidiaries and MNCs were selected as research targets can be found in appendix 3.

The 2754 mailed questionnaires were directed at the managing directors of the subsidiaries and resulted in a useable response rate of 8%. According to Harzing (1997) internationally mailed surveys usually achieve response rates varying from 6 to 16 percent. However, to avoid non-response biases the gathered data has been tested on multiple response biases. After these tests the researchers could assume with reasonably certainty that such biases were not present and therefore the response rate would not create any problems.

The final sample used in this research consisted of 169 subsidiaries, representing almost 50 MNCs. Each of these MNCs was represented by one to five subsidiaries. Since representation by five subsidiaries occurred for only six companies, response biases are very unlikely. The subsidiaries were located in 38 different countries and their headquarters in 16 different countries. A more elaborate description of the sample will be provided in Chapter 5.

4.2 Measures

This section describes the variables comprising the model, as well as the control variables that are added to the data analyses. Like stated in the introductive chapter, all variables within the model are measured at the subsidiary level and reflect the subsidiary point of view.

4.2.1 Model variables

This section describes the measures which together comprise the model under investigation. First, the dependent variables, intra-firm knowledge flows are elaborated on. Second, language diversity, the independent variable is discussed. Finally the two moderators, language capabilities and expatriate deployment are described.

The model incorporates four dependent variables to measure the ***intra-firm knowledge flows*** provided and received by the subsidiary. Within the questionnaire these knowledge flows have been defined as the transfer of knowledge and skills and the four dependent variables each represent a direction of the knowledge flows;

- Knowledge flows from the subsidiary to the headquarter
- Knowledge flows from the headquarter to the subsidiary
- Knowledge flows from the subsidiary to other subsidiaries within the MNC
- Knowledge flows from other subsidiaries within the MNC to the subsidiary

To measure these knowledge flows subsidiary managers graded the transfer of knowledge and skills on a seven-point Likert scale. This grading has been performed on 16 variables in total, reflecting four different business areas per dependent variable[4]. Since each dependent variable has been measured by four questionnaire variables, factor analyses have been conducted to ensure that the four measures are reflections of a single factor. All these analyses resulted in only one factor with an eigenvalue higher than one, indicating good consistency[5]. Additionally, Cronbach's alpha has been calculated to secure internal consistency even more. In the same order as the variables are listed above, the resulted alpha values are 0.900, 0.745, 0.851 and 0.837. A commonly used threshold to secure

[4] The four business areas on which knowledge transfer has been measured are product design, marketing know-how, distribution know-how and management systems and practices.
[5] A similar factor analysis showed that grouping the four dependent variables together into one dependent variable would result in consistency problems. Therefore the choice has been made to measure the intra-firm knowledge flows by four variables.

internal consistency is a Cronbach's alpha of at least 0.7 (Field, 2005), indicating that no consistency problems are present concerning the four dependent variables.

The independent variable of the model, ***language diversity***, has been measured by asking managers to fill out the number of languages their subsidiary has to communicate in on a regular basis. After the data collection, four categories have been created within this variable; one, two, three and four or more languages which the subsidiary has to deal with on a regular basis. The reason why all the subsidiaries dealing with four or more languages have been grouped together lies within the language levels as described in Chapter 1. These levels referred to the subsidiary, headquarter and corporate language. Since these three elements explain only three language levels, a language diversity higher than three refers to different causes than presence and overlap of these levels. The most likely causes for such a high level of language diversity are location in multilingual countries and relationships with parties not incorporated in the MNC. Next to this theoretically grounded reason, categorizing the variable has a second advantage over a count variable. Namely, it minimizes data loss because no outliers have to be excluded from the data. Since four subsidiaries did not answer this specific question regarding language diversity, 165 subsidiaries remained available for further analyses.

The first moderator to enhance the model is ***language capabilities***. Managers have rated language capabilities of the subsidiary and the headquarter staff on a 7-point Likert scale, ranging from very poor to excellent capabilities. For both staffs, capabilities have been rated regarding the corporate language and the language of the other party. Additionally managers have indicated the percentage of time subsidiary, headquarter and corporate language are used in oral and written communication between the headquarter and subsidiary management. Since language capabilities of the staff of other subsidiaries within the MNC cannot be measured, this moderator only applies to the vertical knowledge flows.

The language capabilities moderator takes the value of the most constraining language capability with respect to the main language of communication. This is represented by the lowest language capability of either the subsidiary or the headquarter staff in the language used most often in oral and written communication[6].

[6] In the few cases where the main languages for oral and written communication did not coincide, the main language used in oral communication was used as the effects of language diversity seem to be more pervasive in oral communications.

The most constraining language capabilities have been used since regarding communication, a chain is only as strong as its weakest link[7].

However, language capabilities and which language is used most often are correlated. Therefore this moderator may even underestimate the influence of language capabilities. Although this is a statistical limitation of the moderator, this measurement is believed to reflect reality in daily practices most accurately and therefore to be the most appropriate for this research.

The second moderator within the model is ***expatriate deployment***, which is measured by the number of expatriates at the subsidiary at the time the questionnaire was conducted. Within the questionnaire the term 'expatriate' was defined as employees from headquarters or other subsidiaries of the MNC performing a temporary assignment at the subsidiary. Expatriate deployment is measured by a dummy variable, simply reflecting whether any expatriates were present at the subsidiary or not. The reason to transform this count variable into a dummy variable lies within the subtle effects of language diversity. Expatriates can increase knowledge transfer by adding their language capabilities to the firm, thereby reducing the impact of language diversity on knowledge transfer. However, as described in Chapter 2, language has the power to create language clusters among employees. When at least one expatriate is present at a subsidiary and the number of expatriates increases, this does not have to result in increased knowledge flows since expatriates also tend to form clusters within the subsidiary. Additionally it seems unrealistic to assume that each expatriate would contribute the same language capabilities and communication skills to the subsidiary. Therefore a qualitative variable measuring whether any expatriates are present at the subsidiary is the most appropriate measure for this research.

4.2.2 Control variables

Table 1 lists all the variables that are included in the statistical analyses to avoid measuring effects other than the effects caused by the model variables described in section 5.2.1.

[7] When the average capabilities of both parties would be used this would result in artificially higher capabilities if one party masters the language very well, despite the fact that this would not facilitate communication.

Control variable	Measurement
MNC size	Number of employees
MNC Strategy	International, multi-domestic, transnational or global strategy
MNC experience	Years passed since the MNC established its first subsidiary in this country
Subsidiary size	Number of employees
Subsidiary age	Number of years in business after establishment
Industry in which the subsidiary operates	Motor, food & beverages, chemical, electronics or other industries
Entry mode	Subsidiary established as acquisition or Greenfield
Subsidiary completeness	Number of subsidiary functions
Work inflow and outflow	Intra-company sales and purchases with the subsidiary
Centralization of decision making	The influence the headquarter has on a range of decisions concerning, e.g., products, suppliers and prices
Upstream function	Subsidiary functions include R&D, assembly or production

Table 1: control variables

All these variables are expected to have an effect on intra-firm knowledge transfer independent of the effects of language diversity, language capabilities and expatriate deployment. Although the inclusion of most control variables is intuitively appealing a short motivation will be outlined.

As it is common practice in the management literature to control for firm-specific and industry-specific effects, this research includes several control variables relating to firm and subsidiary size, strategy, age and industry. Next, entry mode is controlled for because previous literature has shown that acquisitions tend to evoke more knowledge transfer than Greenfield entries (Gupta & Govindarajan, 2000).

The control variables regarding subsidiary completeness, work inflow, work outflow, and upstream function indicate the function of the subsidiary within the MNC network and to what extend the subsidiary cooperates with other subsidiaries to perform the tasks. Logically, when a subsidiary has to cooperate with other subsidiaries at a high frequency, knowledge transfer will be larger (Bouquet & Birkinshaw, 2008). In the same line of reasoning the level of subsidiary decision-making autonomy can affect intra-firm knowledge transfer and is therefore controlled for (Mudambi & Navarra, 2004).

The control variables MNC strategy and subsidiary industry are measured by dummy series with respectively ‘international strategy’ and ‘other industries’ representing the reference groups. Entry mode and upstream function are dummy variables were a subsidiary

established by an acquisition and a subsidiary performing a function within R&D, assembly or production are indicated by the value 1. The control variables measuring work inflow, work outflow and centralization of decision making are measured by several indicators and can be classified as reflective scales. This means that indicators included in the variable are expected to correlate with each other, because they all reflect a single concept (Diamantopoulos & Siguaw, 2006).

With the explanation of the control variables the outlining of the research design is completed. The next chapter will elaborate on the results from the analysis performed according to this research design.

Chapter 5: Results

This chapter summarizes the results of the literature review and discusses the empirical tests performed and their results. Paragraph 5.1 describes very briefly the main results from the literature review, which serve as starting points for the empirical analyses. Paragraph 5.2 elaborates on the preparation of the data for the final analyses, of which the results are described in paragraph 5.3. After these results additional analyses are performed and described in paragraph 5.4. Finally, conclusions are drawn in paragraph 5.5.

5.1 Results from the theoretical framework

Since conclusions from the theoretical framework are already elaborated on in Chapter 2 and 3, this section only lists the hypotheses resulting from the framework that will be tested empirically.

- Hypothesis 1: language diversity will negatively impact intra-firm knowledge flows within a MNC.
- Hypothesis 2: language capabilities will positively moderate the relationship between language diversity and intra-firm knowledge flows.
- Hypothesis 3: expatriate deployment will positively moderate the relationship between language diversity and intra-firm knowledge flows.
- Hypothesis 4: expatriate deployment will positively impact intra-firm knowledge flows.

5.2 Regression analysis

In this section the hypotheses above are tested empirically by analyzing correlations and performing OLS-regression analyses. Based on the research methodology outlined in the previous chapter, these OLS-regressions appear an appropriate method to test the hypotheses. Since these analyses can be grouped under parametric tests the distribution of the data needs to comply with certain assumptions to ensure reliable results (Field, 2005).

These tests have been performed and described in appendix 4. The results indicate that parametric tests are not a perfect fit with the data but are nevertheless a good option when the transformed data are used. With close attention to the sample descriptives it seems unlikely that the statistics will bias the results of the analyses and the respective interpretations.

Because hypothesis 4 requires separate regressions, paragraph 5.2.1 focuses on the first three hypotheses and paragraph 5.2.2 focuses on hypothesis 4 only.

5.2.1 Testing hypothesis 1, 2 and 3

Before the regression analyses are run, correlations can provide some preliminary information concerning the hypotheses that have to be tested. Appendix 5 contains the correlation matrix for the variables incorporated in the model. The correlation matrix does not provide support for the main relationship of this research, namely the negative influence of language diversity on intra-firm knowledge flows. Also the language capability moderator does not show a significant correlation with the knowledge flows. However, language capabilities do correlate with language diversity, indicating that a higher number of languages will lead to lower language capabilities. This is straightforward since the language capability moderator takes the value of the most constraining language capability. The use of expatriates seems to have a positive impact on the transfer of knowledge and skills from the subsidiary to the headquarter. Additionally, the matrix indicates that expatriate deployment is more common when subsidiaries have to deal with multiple languages. This is in accordance with the theoretical framework and may indicate that expatriates are detached to overcome language barriers. In line with this reasoning, a negative correlation between expatriate deployment and language capabilities is present, which may indicate that expatriates are deployed mostly in situations when at least either the subsidiary or the headquarter lacks sufficient language skills. A final insight from the correlation matrix is that the four directions of intra-firm knowledge flows are positively correlated, indicating that valuable information is communicated throughout the MNC when present. The knowledge flows from the subsidiary to the headquarter and to other subsidiaries show the highest correlation (0.652), followed by the knowledge flows the subsidiary receives from the headquarter and other subsidiaries (0.375). So the direction of the information, from the subsidiary perspective, shows higher correlations than whether the knowledge flows are vertical or horizontal in nature. The lowest, and only insignificant, correlation is between the

transfer of knowledge and skills to other subsidiaries and the knowledge and skills received from the headquarter (0.120).

In order to test the hypotheses OLS-regressions have been performed using the forced entry method, meaning that all the independent variables are entered simultaneously into the model which makes the order of predictors per step insignificant (Field, 2005). Tables 2 and 3 show the results of the regressions for each of the four dependent variables. To determine how well the collected data fit the suggested model, regressions have been performed step-wise. To prevent false conclusions, the first step shows to which level variation in the intra-firm knowledge flows can be explained by variation in the control variables, as listed in table 1. Step two adds language diversity to the explaining variables to test the main relation of this research. Step three and four subsequently add the language capabilities moderator and expatriate deployment moderator to the explaining variables. Because each step represents a model, the subsequent steps are named models in the tables below. Since the language capabilities moderator could only be measured for vertical communication, the regressions on horizontal communication contain only three steps. To ease comparison, the standardized coefficients have been displayed in the tables and the significance levels are added between brackets. The standardized coefficients of the control variables can be found in appendix 6.

	Dependent variable: transfer of knowledge and skills from the subsidiary to the headquarter				*Dependent variable: transfer of knowledge and skills from the headquarter to the subsidiary*			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
(Unstandardized Constant)	13.792®	13.227®	12.732	13.574	10.507®	11.837*	12.040*	12.026*
Number of languages used in daily communications:								
- Two languages	-	0.011	0.019	0.033	-	-0.141	-0.126	-0.130
		(0.923)	(0.880)	(0.790)		(0.225)	(0.289)	(0.279)
-Three languages	-	0.079	0.086	0.077	-	-0.161	-0.158	-0.156
		(0.499)	(0.484)	(0.526)		(0.162)	(0.173)	(0.181)
- Four or more languages	-	-0.007	-0.003	-0.023	-	-0.170	-0.163	-0.153
		(0.951)	(0.977)	(0.844)		(0.137)	(0.157)	(0.188)
Language capabilities moderator (reflected and inversed)	-	-	0.024	-0.002	-	-	-0.067	-0.095
			(0.847)	(0.989)			(0.526)	(0.412)
Expatriate moderator	-	-	-	0.158	-	-	-	-0.068
				(0.130)				(0.539)
R^2	0.289	0.294	0.294	0.314	0.296	0.324	0.327	0.331
Delta R^2	0.289	0.005	0.000	0.020	0.296	0.028	0.003	0.003
F-statistic	2.004*	1.685®	1.587®	1.646®	2.078*	1.941*	1.855*	1.774*
(significance)	(0.020)	(0.053)	(0.074)	(0.057)	(0.015)	(0.020)	(0.026)	(0.034)

®. Significant at the 0.10 level (2-sided).

***. Significant at the 0.05 level (2-sided).**

****. Significant at the 0.01 level (2-sided).**

Table 2: regression on the transfer of knowledge and skills between the subsidiary and the headquarter

	Dependent variable: transfer of knowledge and skills from the subsidiary to other subsidiaries			*Dependent variable: transfer of knowledge and skills from other subsidiaries to the subsidiary*		
	Model 9	**Model 10**	**Model 11**	**Model 12**	**Model 13**	**Model 14**
(Unstandardized Constant)	17.210*	14.978*	15.165*	16.672**	15.896**	15.887*
Number of languages used in daily communications						
- Two languages	-	-0.149	-0.143	-	-0.038	-0.038
		(0.199)	(0.222)		(0.758)	(0.758)
-Three languages	-	0.166	0.166	-	0.065	0.065
		(0.136)	(0.136)		(0.579)	(0.581)
- Four or more languages	-	-0.013	-0.016	-	-0.087	-0.087
		(0.899)	(0.876)		(0.434)	(0.438)
Expatriate moderator	-	-	0.050	-	-	-0.003
			(0.602)			(0.978)
R^2	0.163	0.222	0.225	0.097	0.111	0.111
Delta R^2	0.163	0.059	0.002	0.097	0.014	0.000
F-statistic	1.179	1.430	1.365	0.652	0.622	0.586
(significance)	(0.294)	(0.126)	(0.155)	(0.842)	(0.888)	(0.919)

®. Significant at the 0.10 level (2-sided).

***. Significant at the 0.05 level (2-sided).**

****. Significant at the 0.01 level (2-sided).**

Table 3: regression on the transfer of knowledge and skills between the subsidiary and other subsidiaries

Based on the regression tables above, the collected data does not seem to fit the theoretical model provided in the first chapters. The statistics of the overall models indicate that model variables add poorly to the explanation of variance in the intra-firm knowledge flows; r^2 increases only slightly when the explaining variables enter the model and the F-statistic even decreases in most models. Language diversity manages to increase the F-statistic only in the case of transfer of knowledge and skills to other subsidiaries of the MNC. However, this F-statistic shows insignificance, just as all the other F-statistics from the horizontal knowledge flows.

The expatriate moderator increases the F-statistic only for knowledge flows from the subsidiary to the headquarter. This may be an indicator that the moderating role of expatriates is mainly directed at improving communication with the headquarter.

Next to the overall model statistics, the coefficients of the different variables also provide valuable insights towards the hypothesis listed in paragraph 5.1. The first hypothesis

stated that language diversity negatively impacts intra-firm knowledge flows. Therefore a negative language diversity coefficient is expected. Starting with vertical knowledge flows between the subsidiary and the headquarter it seems the top-down knowledge flows are more prone to the effects of language diversity; first, the coefficients of language diversity are all negative, in line with the hypothesis. Additionally the coefficients are larger and show lower values of insignificance than the bottom-up knowledge flows. However, the models for both knowledge flows do not support the hypothesis that language diversity negatively impacts intra-firm knowledge firms. The same holds for the models incorporating horizontal knowledge flows between the subsidiary and other subsidiaries of the MNC; the language diversity coefficients are very small, insignificant and not consistently negative.

The language capabilities moderator has only been measured for vertical knowledge flows and shows low coefficients and high levels of insignificance for both streams. Next not all coefficients of the inversed variable are negative, as would be in line with the hypothesis. As with the language diversity measures, knowledge flows from the headquarter to the subsidiary appear to be more affected since the coefficients are higher and less, though still highly, insignificant. Therefore the data do not support the hypothesis that language capabilities positively moderate the relationship between language diversity and intra-firm knowledge flows.

Hypothesis 3 states that the presence of expatriates would positively moderate the relationship between language diversity and intra-firm knowledge flows. The data however, do not comply with this hypothesis. The knowledge flows towards the subsidiary show very high levels of insignificance, and very small negative coefficients. Expatriate deployment, however, may have a moderating effect on the relationship between language diversity and the transfer of knowledge and skills from the subsidiary to the headquarter since it shows a coefficient of 0.158 at a significance level of 0.130.

So based on the overall model statistics and coefficients the data does not support hypothesis 1, 2 and 3.

As can be seen in the tables the two moderators of the model are not based on the dummy series of language diversity, but on the categorical version of this variable[8]. This choice has been made to prevent creating such a high number of variables in the model, relative to the sample size, that inconclusiveness would be inevitable. However, to show that

[8] The variable is represented by four categories; it takes the value of one, two, three and four when the subsidiary uses respectively one, two, three or four or more languages in the daily communications.

this measurement method does not bias the results alternative regressions have been performed using the categorical language diversity variable as an independent variable. The results of these regressions are listed in appendix 7. As can be seen in this appendix only one change worth mentioning resulted from these regressions; model 20 and 21, with the transfer of knowledge and skills from the headquarter to the subsidiary as dependent variable, showed language diversity coefficients of respectively -0.186 and -0.180 significant at the 10% level. When the expatriate moderator was added in the final step the relation turned insignificant (0.107).

5.2.2 Testing hypothesis 4

Separate regressions have been run to test whether expatriates have a positive impact on intra-firm knowledge flows as stated in hypothesis 4. Looking at the correlation matrix in appendix 5, the expatriate dummy has a significant correlation of 0.192 with the transfer of knowledge and skills to the headquarter. The other three knowledge streams show very low and insignificant correlations.

Quite simple analyses have been run because the literature has already shown a long-time acknowledgement of the importance of expatriates in knowledge transfer (e.g. Edstrom & Galbraith 1977; Ondrack 1985; Delios & Bjorkman, 2000; Downes & Thomas, 2000; Minbaeva et al., 2003; Lazarova & Tarique, 2005; Belderbos & Heijltjes, 2005). Again four OLS-regressions have been run to test the effects on the four streams of knowledge flows separately. The results of these regressions are displayed in appendix 8 and do not support the hypothesis that expatriates increase the transfer of knowledge and skills throughout a MNC. All the models show, after the addition of the expatriate dummy, very slight increases in R^2 and the F-statistic only increases in model 36, concerning the transfer of knowledge and skills from other subsidiaries of the MNC towards the subsidiary. However, since this F-statistic is insignificant it does not provide any support for hypothesis 4. Additionally, the model shows a negative and insignificant expatriate coefficient, which is not in line with the hypothesis. Comparing the models of vertical and horizontal knowledge flows it is remarkable that the models seem to explain the vertical knowledge flows better than the horizontal. Additionally the models explaining vertical knowledge flows show positive, though insignificant, expatriate coefficients. This may be another indication that vertical knowledge flows are more prone to the effects of expatriate deployment.

To conclude, the results do not confirm the hypothesis that expatriates facilitate intra-firm knowledge transfer. Theoretically this can be explained by the studies of amongst others Welch et al. (2001, 2005) and Peltokorpi (2010), which showed that expatriates can also reduce knowledge transfer. It is possible that the expatriates created both positive and negative influences on knowledge transfer, diluting the overall impact.

5.3 Further analyses

The regressions of paragraph 5.2 showed that the collected data did not match the theoretical model very well. Therefore additional insights into the collected data can provide valuable information, which is performed in this paragraph by outlining descriptive statistics of the sample data.

The sample included 169 subsidiaries from 38 countries, representing almost 50 different MNCs. Appendix 9 shows exactly which countries are represented by subsidiaries and headquarters, as well as the respective frequencies in the sample. Since some countries are represented by a very high number of subsidiaries or headquarters, these frequencies tend to vary a lot among countries. Since countries and language are strongly related this is an important fact that has be kept in mind when interpreting the regression results of the previous paragraph.

The independent variable of interest considers language diversity. This sample contained 164 subsidiaries which revealed their language diversity. Of these 164 subsidiaries 30.5% used only one language in their daily communications, 34.1% used two languages, 23.2% used three languages, and finally 12.2% of the subsidiaries used four or more languages on a daily basis. For this last category one subsidiary using 10 languages represents the upper limit. Table 4 shows the average language capabilities, use of expatriates and the intra-firm knowledge flows per level of language diversity. So the first number in the table shows the average value of the language capabilities moderator of all subsidiaries communicating daily in one language only. Expatriate deployment has been measured by a dummy variable in this research. However, the number of expatriates deployed per language diversity level may also provide some interesting insights. Therefore the values of expatriate deployment as count variable have also been included in the table. The first value in the table is the mean and the value between brackets indicates the median.

	1 language	2 languages	3 languages	4 or more languages
Language capabilities	0.6894 (1.0000)	0.4377 (0.3333)	0.4638 (0.3333)	0.4613 (0.5000)
Expatriate deployment (dummy)	0.5102 (1.0000)	0.6364 (1.0000)	0.6842 (1.0000)	0.8000 (1.0000)
Expatriate deployment (count variable)	2.08 (1.0000)	4.85 (1.0000)	6.08 (1.0000)	5.00 (2.5000)
Knowledge flows to the headquarter	11.8402 (11.000)	11.9095 (12.0000)	12.8958 (13.0000)	12.3482 (10.5000)
Knowledge flows from the headquarter	15.8487 (15.500)	15.3261 (15.6320)	15.0641 (15.0000)	13.9632 (13.0000)
Knowledge flows to other subsidiaries	12.4705 (12.500)	12.1081 (11.4978)	14.6054 (15.0000)	13.9910 (11.5003)
Knowledge flows from other subsidiaries	11.0427 (10.0221)	11.3973 (11.0000)	12.4165 (12.0000)	9.8477 (8.6538)

Table 4: language diversity and model variables descriptives

Starting with the language diversity moderator, the descriptives do not seem to indicate a negative linear relationship between language diversity and language capabilities. But it does show that language capabilities decrease significantly when more than one language is used in daily communications. Whether two, three, four or more languages are used, however, does not seem to impact the most constraining language capabilities.

In line with the regressions and correlation matrix, the number of expatriates employed at a subsidiary increase with language diversity. Although the count variable of expatriate deployment shows a decreasing mean when four or more languages are used daily, the median shows a high increase.

Looking at the dependent variables of this research, the intra-firm knowledge flows, the descriptives are in line with the results of the regression analyses in the previous paragraph, meaning that a negative relationship between the knowledge flows and language diversity is not confirmed. The transfer of knowledge and skills from the headquarter to the subsidiary however, does show a decreasing trend in accordance with the theoretical framework. This may indicate that vertical knowledge flows from the headquarter to their subsidiaries are more prone to the effect of language diversity than knowledge flows with another direction. Additionally, it is interesting that the values of all four knowledge flows decrease significantly when language diversity increases from three to four or more. This may indicate that subsidiaries face difficulties handling the languages problems when a

fourth language enters the communications next to the subsidiary, headquarter and corporate languages.

An important measure included in the questionnaires which has not been analysed so far, is the level of communication problems. Subsidiary managers indicated on a 7-point Likert scale to what extent they agreed or disagreed with the statements displayed in the tables below. The scale has been reduced to three categories, simply indicating whether the manager agreed with the statement, disagreed, or scored neutral. The first table shows the percentages of agreement based on the whole sample.

Statement	Disagree	Neutral	Agree
(1) Misunderstandings and conflict between this subsidiary and the headquarters result from communication difficulties.	45.1%	24.1%	30.9%
(2) Speaking the corporate language or the language of headquarters is important for your power and influence in this MNC.	15.6%	15.6%	68.7%
(3) Communication channels are often determined by language capability rather than position in the company.	35.8%	25.3%	38.9%

Table 5: communication problems

Looking at the percentages in this table, it seems that the subtle effects of language diversity, represented by statement two and three, are more present than the direct effect of communication difficulties which is represented by statement one. However, still more than 30% of the managers did agree with this statement indicating that communication difficulties are still a very important issue within MNCs.

In order to get a better insight whether these communication problems vary according to language diversity, the levels of agreement to the statements of table 5 are outlined per level of language diversity in the table 6. As can be recalled from table 5, the first statements concerns problems resulting from communication difficulties. The level of agreement with this statement grows with the number of languages used in daily communications. Intuitively this finding seems logical. It is however peculiar that the smallest increase occurs when language diversity increases from one to two. Next to that the percentages of disagreement do not follow an increasing trend. Therefore the positive correlation between language diversity and problems resulting from communication difficulties does not seem to be very convincing.

Statement	Agreement	1 language	2 languages	3 languages	4 or more languages
(1)	Disagree	47.7%	37.5%	57.9%	40.0%
	Neutral	25.0%	33.9%	10.05%	20.0%
	Agree	27.3%	28.6%	31.6%	40.0%
(2)	Disagree	25.6%	12.7%	7.9%	15.0%
	Neutral	23.3%	14.5%	5.3%	20.0%
	Agree	51.1%	72.7%	86.8%	65.0%
(3)	Disagree	38.6%	23.3%	44.7%	45.0%
	Neutral	25.0%	32.1%	18.4%	20.0%
	Agree	36.4%	44.6%	36.9%	35.0%

Table 6: communication problems and language diversity

The second statement argues that speaking the lingua franca or headquarter language is important to gain power and influence in the MNC. The table shows a decreasing trend in the percentages of disagreement and an increasing trend in the agreement to this statement when language diversity increases up to three. When a subsidiary has to deal with four or more languages, however, exactly the opposite occurs. A possible explanation may be that when a fourth language enters the subsidiary - next to the subsidiary, headquarter and corporate language – the corporate or headquarter language may decrease in importance.

Statement three relates to the occurrence of shadow structures and states that communication channels are often determined by language capabilities rather than the position in the MNC. Table 6 does not indicate a clear pattern concerning this statement. The issue, however, seems to be most present in subsidiaries communicating in two languages on a daily basis, since this group shows the highest levels of agreement and the lowest levels of disagreement. Peculiarly, the issue seems to be least present in subsidiaries dealing with three or more languages.

Looking at the overall table, communication problems seem to be least present at subsidiaries communicating in one language, and most present at subsidiaries using three languages in their daily communications.

Finally, an interesting finding is that the managers in charge of a subsidiary dealing with three languages in their daily communications have few neutral opinions towards the statements compared to the subsidiaries with other levels of language diversity. This may be an indication these managers are more aware about the language diversity issues than their counterparts.

5.4 Conclusions

After the hypotheses had been listed and the appropriateness of the application of parametric tests had been confirmed by several tests, the collected data has been analysed using correlation matrices and OLS-regressions. The main results are outlined below.

The correlation matrices show support for hypothesis 4 only, indicating a positive correlation between expatriate deployment and intra-firm knowledge flows. Additionally, expatriate deployment correlates negatively with language capabilities and positively with language diversity. This may indicate that expatriates are deployed to overcome language barriers, in line with the theoretical framework. Finally, the four types of knowledge flows are correlated indicating that valuable information is communicated throughout the MNC. Hypothesis 1, 2 and 3 however are not supported by the correlation matrices.

The regression analyses show a poor fit between the theoretical framework and the collected data; all four hypotheses were not supported by the data. However, the alternative regressions did show a significant negative effect of language diversity on the transfer of knowledge and skills from the headquarter to the subsidiary, in line with hypothesis 1. Despite the many insignificant results, the vertical knowledge flows seem to be most prone to the effect of language diversity, expatriate deployment and the expatriate moderator.

These findings have also been confirmed by further analyses of descriptive statistics. Next to that the descriptives revealed that almost 70% of the subsidiaries used more than one language in their daily communications and that the subsidiaries are still very prone to communication problems. Concerning these problems, the subtle effects of power and position problems are present more often than general misunderstandings. This shows that language diversity and communication problems are very present in MNCs.

Chapter 6: Discussion and conclusion

In this concluding chapter, the main results of this thesis are presented and discussed. The first paragraph (6.1) discusses the answers to the problem statement and research questions that have been provided by the empirical research described in Chapter 5. Next, paragraph 6.2 outlines the academic and managerial contribution of the thesis. After that, the limitations of this study are described in paragraph 6.3 and suggestions for further research are mentioned in paragraph 6.4. To end, paragraph 6.5 provides the final conclusions.

6.1 Answering the problem statement

As stated in the introduction chapter, the problem statement of this thesis is: *'What are the moderating effects of language capabilities and expatriate deployment on the relationship between language diversity and intra-firm knowledge flows of multinational companies?'*

In order to answer this central question, research questions and their according hypotheses have been formulated. Next, these hypotheses have been tested by analyzing data of about 170 subsidiaries of almost 50 MNCs, dispersed over 38 countries, collected through questionnaires by Noorderhaven and Harzing in 2002. The first four sections (6.1.1 - 6.1.4) provide answers to the four research questions before in section 6.1.5 the problem statement is answered.

6.1.1 The effect of language diversity on intra-firm knowledge flows

The first hypothesis of this study states a negative relationship between language diversity and intra-firm knowledge flows. The correlation matrix and regression analyses do not provide support for hypothesis 1, meaning that the data does not show a negative relationship between the number of languages used in daily communications and the transfer of knowledge and skills within the sampled MNCs.

Looking at the regression results and descriptive statistics, knowledge flows from the headquarter to the subsidiary, however, appear to be more prone to the effects of language diversity than knowledge flows in other directions. This observation is also confirmed by the

alternative regressions, which showed a significant negative effect of language diversity on knowledge flows in this direction[9].

A final interesting observation is that the values of all four directions of knowledge flows decrease significantly when language diversity increases from three to four or more. This could be a sign of management difficulties or indicate that these subsidiaries perform very specific tasks that do not rely on a high level of knowledge transfer.

6.1.2 The moderating impact of language capabilities

Hypothesis 2 states that language capabilities perform a positive moderating impact on the relationship between language diversity and intra-firm knowledge flows. The data allowed the moderator to be measured for the vertical knowledge flows only and do not support the hypothesis. As with hypothesis 1, the knowledge flows from the headquarter to the subsidiary appear to be more affected. However, the results for this direction are still very insignificant and therefore do not allow any conclusions.

Naturally, the data show that a higher level of language diversity is related to lower language skills measured by the most constraining language capabilities. In addition, when more than one language is used for daily communications, language capabilities decrease considerably. It seems to be of less impact on the language capabilities whether two, three or four or more languages are used because language capabilities affect the choice for the language used.

6.1.3 The moderating impact of expatriate deployment

The data do not support Hypothesis 3, which states a positive moderating effect of expatriate deployment on the relationship between language diversity and intra-firm knowledge transfer. Although not significant, the data showed that the moderating role of expatriates was most important for knowledge transfer from the subsidiary to the headquarter, indicating that expatriate deployment is mainly directed at improving communication with the headquarter.

In line with the theoretical framework, expatriates are deployed more often when subsidiaries have to deal with multiple languages and when language capabilities of either the subsidiary or headquarter are low. This seems to be a strong indication that expatriates are detached to reduce the language barrier.

[9] Significant at the 10% level

6.1.4 The effect of expatriate deployment on intra-firm knowledge flows

The final hypothesis, which stated a positive relationship between expatriate deployment and intra-firm knowledge flows, is also not supported by the data of the sampled MNCs. The vertical knowledge flows, especially from the subsidiary to the headquarter, seem to be more prone to expatriate deployment than the horizontal knowledge flows.

6.1.5 Answer to the problem statement & discussion

Since all four hypotheses were not supported by the collected data of the sampled MNCs, it is not possible to provide a valid and reliable answer to the problem statement. However, despite the poor fit between the data and the theoretical framework, this study does provide very valuable insights into the problem statement and the concept of language diversity in general. These insights will be discussed below.

First, the data showed that language diversity is a relevant topic because almost 70% of the subsidiaries in the sample used more than one language in their daily communications and communication problems are very present. Almost 40% of the subsidiaries indicated that language capabilities, rather than the position in the company, often determined communication channels. This shows that the language-based shadow structures which were found in the Kone Elevators case studies, are also present in many other MNCs. Next, almost 70% of the subsidiary managers acknowledged the importance of speaking the corporate or headquarter language to be able to exert power and influence in the MNC. So the data shows considerable support that language can empower and disempower employees within organizations. Although still over 30% of the subsidiaries acknowledged the presence of misunderstandings and conflicts caused by communication difficulties, the subtle effects of language diversity seem more important and present. Hereby this study provides among the first generalizable support for both language-based shadow structures and the power of individual language capabilities in MNCs. So although hypothesis 1 is rejected, the data do support that language diversity affects MNCs.

Second, language diversity and expatriate deployment seem to affect vertical knowledge flows more than the horizontal ones. This could be a reflection of reality or it can be an indication of different perceptions; vertical knowledge flows are inevitable for the subsidiary managers and therefore the effects on these knowledge flows may be more

visible. Knowledge transfers with other subsidiaries of the MNC, on the other hand, are often more random. It is therefore plausible that managers are less capable to assess the level of knowledge transfer with other subsidiaries. Future research can provide better insights into this topic.

The indication that expatriates have a larger impact on vertical knowledge flows than on horizontal knowledge flows can be explained by their main functions. As described in Chapter 3, expatriates are often employed to transfer knowledge from the headquarter to the subsidiary or to acquire local subsidiary knowledge and transfer this to the headquarter (Delios & Björkman, 2000). Additionally expatriates can enhance horizontal communication by the networks they create (Goodall & Roberts, 2003). However, this is a side effect rather than their main function.

Finally, despite the long-time acknowledgement of the positive effects of expatriates on intra-firm knowledge transfer, the moderating role of expatriates receives better support from the data than the direct effect of expatriate deployment on intra-firm knowledge flows. Since previous research often ignored language diversity it is both possible that this study shows deviating results and that expatriates increase knowledge sharing partly by overcoming language barriers. This last explanation has been supported by the case studies on Kone Elevators (e.g. Marschan et al., 1997) and Euroil (Goodall & Roberts, 2003). Additionally, several other authors (e.g. Feely & Harzing, 2003; Peltokorpi & Schneider, 2009) have argued that expatriates perform a special role concerning language barriers. Therefore the second explanation is deemed to be more likely.

Since the data on communication problems seems to provide support for the theoretical framework, it is remarkable that none of the hypotheses resulting from this theoretical framework is supported by the data. There are several possible explanations for this, which lie both in the nature of the language diversity effects and in the measurement methods used to subtract data from the sampled subsidiaries.

First, the knowledge flows were scored by the subsidiary manager, making them very vulnerable to the perception of this one person. Especially when this person mastered the critical language capabilities and did not experience many communication difficulties himself, knowledge sharing may have been overestimated.

Second, an important part of the transfer of knowledge and skills occurs on an informal basis. It is very difficult to measure this informal interaction, especially when a subsidiary increases in size or the subsidiary manager spends little time at the work floor.

Therefore it is very likely that the subsidiary managers evaluated the knowledge flows largely on formal knowledge transfer. Because language diversity is likely to affect informal knowledge transfer severely, this effect may have slipped under the radar.

Third, the subtle effects of language diversity seem to be more present than simple misunderstandings. Since these effects are subtle in nature they are also difficult to measure and may not have been fully incorporated into the scoring of the knowledge flows. A good example is the presence of language-based shadow structures. Since the critical information is transferred throughout the MNC the managers may perceive this knowledge transfer as good and rank it accordingly. However, as explained in Chapter 2, it is very likely that the information is not or only partly transferred to the persons who can make the best use out of this information. Therefore the transfer of knowledge and skills may be hampered severely but remain largely unnoticed.

So although the questionnaires indicated the presence of the communication problems resulting from language diversity, it is very likely that these effects have not been incorporated sufficiently into the measure of knowledge flows. A different questionnaire design may solve this problem in future research. As the literature on language diversity evolves over time, more effects or determinants may become known which can enhance the measurement methods and provide better results in the future.

6.2 Contribution

As explained in the first chapter of this study the effects of language diversity in MNCs have been demonstrated by case studies but are still widely ignored in the field of international business. Since the main studies on language diversity are based on case studies a need has been expressed for empirical testing on the effects of language throughout an MNC (e.g. Welch et al., 2001; Tietze, 2007; Harzing & Feely, 2008; Louhiala-Salminen & Rogerson-Revell, 2010). This study responded to these calls and adds to the literature empirical tests concerning the impact of language diversity on knowledge flows within almost fifty MNCs spread over 38 countries. Furthermore, the moderating roles of language capabilities and expatriate deployment on this relationship have not been tested empirically in previous research, providing another addition to the thin literature. Finally, by unbundling language diversity from the culture and psychic distance constructs and presenting it as an independent concept of international business, this study hopes to convince future researchers that language should be perceived as an important issue in the

international business literature. Therefore this study supports the call by Harzing and Feely (2008) that "*language should also be seen as an independent variable having its own specific effects on strategy, structure, and management in (multinational) corporations"* (p.51).

In addition to the enrichment of the very scarce literature on language management within MNCs, this research also aims to provide managerial implications. First, this study has shown that language has a profound effect on communication problems which spread beyond simple misunderstandings. When managers are aware of language-based shadow structures and the power of language skills they can act accordingly to ensure effective knowledge transfer. Second, this study suggests that language is not a static obstacle but a strategic concept which can be managed. Taking into consideration that the language capabilities of a firm are determined by the language capabilities of its employees, MNCs are able to manage as well language diversity as the language capabilities. Although further research is needed on the moderating role of expatriates, this study shows that managers should take into account the language capabilities of expatriates.

6.3 Limitations

The tests in this research have been executed very carefully to enhance reliability. However, as can be seen in appendix 9 the sampled subsidiaries are mainly located in developed economies. Therefore the results may be difficult to apply on developing countries. The same reasoning does not allow for any generalization beyond manufacturing MNCs, since the sample contained only manufacturing firms.

Next, the response rate was quite low, though not unusual for such a study. Although tests have been performed to avoid selection bias, it is impossible to lock out all possible biases. For this study, it could have been important that the questionnaires were administrated in English.

Next, the questionnaires have been answered by the subsidiary manager. Although this is the right level to test the hypothesized effect, responses by just one person are always vulnerable to possible biases, as has been indicated in paragraph 6.1.5. This same paragraph also pointed out that it is possible that the measurement of knowledge flows may not have been able to capture the subtle effects of language diversity and informal knowledge transfer. This could also be explained by the fact that many measures from the questionnaires, including knowledge flows and language capabilities, are based on the perception of the subsidiary manager.

Finally, because this study has been the first to provide generalizable, empirical testing on language diversity, it is likely that some influencing factors have been overlooked.

6.4 Future research possibilities

Since the literature concerning language diversity in MNCs is still very thin, additional research is called for. Although this study made a start, more empirically tested evidence on the effects of language diversity throughout organizations is still needed. Especially the more subtle effects of language diversity which have been discovered by case studies can provide interesting research topics to unravel the far-reaching effects of language.

Second, a possible moderating role of a lingua franca on the effects of language diversity should be investigated. Almost 80% of the subsidiaries in the sample of this study were from an MNC that had a lingua franca, indicating the relevance of this subject. That English plays a special role is also confirmed by the sample; in more than 90% of the cases where a lingua franca existed this was English.

Third, this thesis only researched the effects of language diversity on intra-firm knowledge flows. However, as stated in Chapter 2, language diversity also affects a MNC's relationships with the market. Further research on these relationships could for example focus on the relationship with customers or local suppliers.

Next, although the focus of this study was on knowledge flows, the effects of language diversity are expected to spread throughout the whole organization. So future research can for example investigate the effects on strategy, market entries, or, maybe most importantly, human resource policies.

Some final interesting topics for further research are how language diversity is perceived by top management of a MNC, how language diversity affects control and coordination mechanisms, and the role expatriates and inpatriates can fulfil in language management.

6.5 Concluding remarks

This thesis started with a quote from the world investment report 2009 of UNCTAD, which stated that 82 000 MNCs were present in 2008, incorporating 810 000 foreign subsidiaries and 77 000 000 employees. Although the collected data did not support the

theoretical framework this study has shown that language diversity issues and the resulting problems are very present in MNCs. Despite the fact that future research is still needed it can be concluded from this study that language diversity is a very relevant, powerful, far-reaching concept which needs to be managed carefully. Therefore this study concludes with one final remark, directed at both academics and managers:

Spread the word: language matters.

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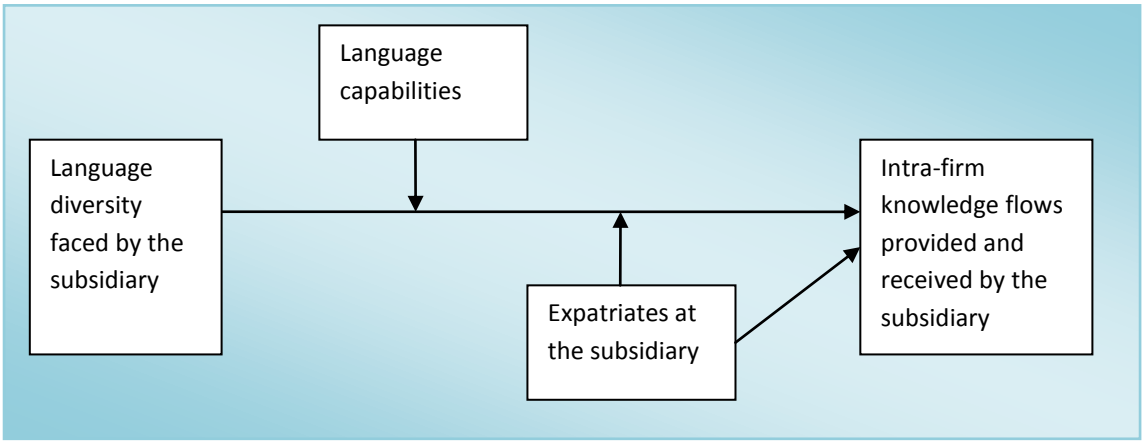
Appendices

Appendix 1: Problem Statement



Independent variable Moderators Dependent variable

Figure 1: graphical representation of the problem statement

Appendix 2: Quality of academic journals

Table 7 on the next page shows the journals, including their respective impact factors, which have been consulted in order to perform this thesis. The impact factors have been retrieved mainly from the ISI Web of Knowledge. The third column lists the number of articles per journal that have been used in this study. Finally, the last column shows whether Tilburg University has provided the journal with a label concerning quality. It is important to note that these labels were only assigned to journals in the fields of business and economics. Therefore not all journals cited in this study have been investigated for a quality test.

A minus sign indicates that a journal was not rated or labelled. The table only includes the data for journals of which at least to articles are included in this study. The data of all the remaining journals are summarized under the label of other journals.

Journal	Impact factor 2009	Number of articles	Tilburg University quality label
Journal of International Business Studies	3.766	11	Top-core journal
International Business Review	1.062	4	-
International Journal of Human Resource Management	0.830	4	-
International Studies of Management and Organization	-	4	-
Journal of Business Communication	-	3	-
Organization Science	3.126	3	Extra top-core journal
Strategic Management Journal	4.464	3	Top-core journal
Administrative Science Quarterly	3.842	2	Extra top-core journal
Cross-Cultural Management: An International Journal	-	2	-
European Management Journal	-	2	-
Human Resource Management	0.930	2	-
Journal of International Management	1.854	2	-
Journal of World Business	2.627	2	-
Other journals	Ranging from not rated or 0.419 to 12.854	26	Ranging from no rating to extra top-core journal

Table 7: literature review quality

Appendix 3: Details concerning the data collection

As stated before, the data used in this study has been collected by Noorderhaven and Harzing in 2002. Therefore the text below is based on Noorderhaven and Harzing (2009) and Harzing and Noorderhaven (2006ab).

The Dun & Bradstreet *Who Owns Whom* database has been used to draw the sample. In order for a MNC to be sampled it had to operate in one of the following four manufacturing industries: motor vehicles and parts, chemicals, food and beverages, or electronics. These four manufacturing sectors had been chosen because they were perceived as very different by Noorderhaven and Harzing. Next, the firm needed to be headquartered in the USA, UK, Germany, France, Japan or the Netherlands. The locations of the subsidiaries were scattered over more than 50 different countries. For each of the home countries, three to five MNCs were selected per industry. The sample was not totally balanced because the Netherlands and Germany both lacked MNCs in two industries. In total 82 MNCs were sampled. For each of those 82 MNCs, thirty to fifty subsidiaries were selected. Special attention had been devoted that maximum five subsidiaries of a MNC were located in the same country. A final criterion was that subsidiaries needed to employ at least 25 employees in order to be sampled.

In total 2754 subsidiary managing directors were approached to answer the questionnaire, but 553 questionnaires were returned to the senders as being undeliverable. After the initial mailing and a follow-up mailing 174 filled-out questionnaires was the result. Because five of these questionnaires missed more than 15% of the values they were excluded from the sample, resulting in a total usable sample size of 169 subsidiaries.

Of these 169 subsidiaries, 85% had filled out at least 95% of the questionnaire. Noorderhaven and Harzing used the expectation-maximization method to establish missing values. They argue that this method is appropriate due to the relatively small sample size and the fact that many missing values appeared to be incidental. The main advantage of this method over other methods to estimate missing values is that the EM-method does not reduce the variability of the data. (For more information: Hair et al., 1998; Fichman & Cummings, 2003)

Appendix 4: Parametric tests assumptions

Based on the research methodology outlined in Chapter 4, an OLS-regression test seems to be an appropriate method to test the hypotheses empirically. Regression analyses can be grouped under parametric tests (Field, 2005; Conover & Iman, 1981), which are all based on a distribution which complies with four requirements. These four assumptions concern the normal distribution of data, homogeneity of variance, requirements for interval data and independence of data (Field, 2005). So in order to perform regression analyses the distribution of the collected data has to be tested. Therefore this section will test whether the variables in the model conform to the four assumptions and parametric tests are a suitable test statistics. Although these tests are rooted in complicated statistics, only the implications of the results will be elaborated on, in line with the purpose of this research.

A4.1 Testing normality

The data in the sample needs to approach a normal distribution because parametric tests rely on the assumption that the collected data originates from normally distributed populations (Field, 2005; Nieuwenhuis, 2009). Frequency histograms provide a great deal of information whether a variable does approach a normal distribution. Based on the histograms of both the model variables and the control variables it was clear that not all of them were normally distributed. Following a common practice in statistics, these non-normal variables have been transformed in order to make them approach the normal distribution better (Nelder & Wedderburn, 1972; Field, 2005). These transformed variables have been used in the analyses.

In order to test the transformed variables on the normality requirement, several tests have been performed. First, the levels of skewness and kurtosis have been measured. To visualize these terms; looking at the bell-shaped normal distribution, skewness refers to the tails of the distribution and kurtosis to the flatness of the distribution (Field, 2005). To be more precise, negative values of skewness indicate that the distribution shows a heap of scores, also called a tail, at the right side of the distribution, while positive values imply a tail at the left side of the distribution. Flat or pointy curves compared to a normal distribution are indicated respectively by negative and positive levels of kurtosis (Field, 2005). As can be seen in table 8, the transformed variables show both low levels of skewness and kurtosis, indicating they approach a normal distribution. However, both these tests look only at one aspect of normal distribution. Therefore the Kolmogorov-Smirnov and Shapiro-Wilk tests

have also been performed to test the data on normality. These two tests basically create a normal distribution with the mean and standard deviation equal to those of the sample. Then the tests compare this distribution with the sample distribution. When the tests show insignificance, the distribution is not significantly different from a normal distribution and parametric statistics can be applied. These tests however, are influenced by the sample size because a large sample will results in more deviations (Field, 2005). Field (2005) therefore argues that samples including approximately 200 participants are likely to create significant test values without deviating much from the normal distribution. Since the sample used in this research contains 169 subsidiaries, caution is needed when interpreting the results. According to Field (2005) the values of the tests need to be used in combination with histograms in order to determine whether the distributions approach normality.

Variable	Skewness	Kurtosis	Kolmogorov-Smirnov significance	Shapiro-Wilk significance
Knowledge flows to the headquarter	0.322	-0.835	0.000	0.000
Knowledge flows from the headquarter	-0.078	-0.390	0.065	0.398
Knowledge flows to other subsidiaries	0.290	-0.744	0.014	0.001
Knowledge flows from other subsidiaries	0.464	-0.553	0.005	0.000
Language capabilities (reflected & inversed)	0.498	-1.424	0.000	0.000
MNC size (log)	-0.197	-0.358	0.200	0.020
MNC experience (log)	-0.438	-0.120	0.200	0.382
Subsidiary size (log)	0.668	1,286	0.000	0.004
Subsidiary age (square root)	0.512	0.884	0.200	0.218
Subsidiary completeness (square root)	0.129	-1.135	0.000	0.000
Work inflow	-0.012	-1.540	0.000	0.000
Work outflow (inversed)	0.585	-1.559	0.000	0.000
Centralization of decision making (square root)	0.025	-0.932	0.036	0.005

Table 8: normality tests

Looking at the table the levels of skewness and kurtosis seem to indicate that the variables are normally distributed. Although the normality tests do not indicate normality for all variables, the corresponding histograms seem to indicate a normal distribution. Since the

sample size is likely to influence the Kolmogorov-Smirnov and Shapiro-Wilk test, the histograms, in combination with the levels of skewness and kurtosis, indicate that the variables approach a normal distribution.

A4.2 Homogeneity of variance

In order to test whether the numerical variables violate the assumption of homogeneous variance Levene's test has been performed (Glass, 1966; Field, 2005). When these values show a significance level of 0.05 or lower the assumption of homogeneous variance is violated. The table below shows that none of the variables violates this assumption. Although the first table only shows the significance levels based on the median[10], the requirement remains valid when based on other measures as can be seen in table 10.

Levene's test however, does not take co variances into consideration when performing these tests (Field, 2005). Therefore, Box's tests have to be performed where insignificance indicates homogeneity of variance. Performing this test shows a significance level of 0.329 indicating that the assumption of homogeneous variance is not violated.

Variable	Significance
Knowledge flows to the headquarter	0.869
Knowledge flows from the headquarter	0.131
Knowledge flows to other subsidiaries	0.500
Knowledge flows from other subsidiaries	0.792
Language capabilities (reflected & inversed)	0.397
MNC size (log)	0.393
MNC experience (log)	0.426
Subsidiary size (log)	0.883
Subsidiary age (square root)	0.057
Subsidiary completeness (square root)	0.789
Work inflow	0.909
Work outflow (inversed)	0.257
Centralization of decision making (square root)	0.538

Table 9: Levene's test based on median

[10] The results of Levene's test based on the median are displayed because many statisticians believe that the results are most robust when based on the median (e.g. Schultz, 1985; Field, 2005)

	Significance level based on			
Variable	**Median**	**Mean**	**Median with adjusted df**	**Trimmed mean**
Knowledge flows to the headquarter	0.869	0.505	0.869	0.530
Knowledge flows from the headquarter	0.131	0.128	0.131	0.128
Knowledge flows to other subsidiaries	0.500	0.511	0.500	0.506
Knowledge flows from other subsidiaries	0.792	0.868	0.792	0.951
Language capabilities (reflected & inversed)	0.397	0.082	0.397	0.090
MNC size (log)	0.393	0.222	0.393	0.230
MNC experience (log)	0.426	0.419	0.427	0.438
Subsidiary size (log)	0.883	0.809	0.883	0.844
Subsidiary age (square root)	0.057	0.072	0.057	0.063
Subsidiary completeness (square root)	0.789	0.640	0.789	0.627
Work inflow	0.909	0.901	0.909	0.900
Work outflow (inversed)	0.257	0.071	0.257	0.074
Centralization of decision making (square root)	0.538	0.605	0.538	0.587

Table 10: Levene's test based on multiple measures

A4.3 Interval data and independence

The final two requirements of parametric tests concern interval data and independence of the gathered data. These two requirements concern the method of measurement rather than characteristics of the gathered data, as was the case for the first two assumptions.

In order to perform parametric tests data should be measured at least at the interval level. This means that ordinal data should be measured on a scale with equal distance between the scores (Manski & Tamer, 2002; Field, 2005). Almost all numerical variables of this research comply with this requirement. Only the intra-firm knowledge flows and language capabilities are measured on a 7-point Likert scale and many articles have been written on the debate whether these Likert-scales can be treated as interval data or if this results in significant biases (e.g. Rasmussen, 1989; Jamieson 2004; Wu, 2007). Although consensus still has to be reached, in practice most researchers seem to be in favour of

treating Likert-scales as an interval variable when it contains five or more levels. Clason and Dormody (1993) demonstrated this by a sample showing that parametric statistics were used 2.6 times more often than non-parametric statistics when Likert-scale variables were to be tested. Next to that they state that the reliability of these tests will depend on specifics of the variables of interest and the sample in general, arguing that there can be multiple appropriate ways of analysis. Although the interval requirement does not seem to be violated, special attention will be paid to the descriptive characteristics of the sample in paragraph 5.4 in order to detect any possible biases.

The final assumption states that the data gathered from different participants should be independent in the way that behaviour of one subsidiary does not influence the behaviour of another subsidiary in the sample (Field, 2005). Looking at the sampling method described in the previous chapter violations of this assumption are very unlikely. Although some subsidiaries are part of the same MNC, only six MNCs are represented by five subsidiaries. Since all the other MNCs in the sample are represented by fewer subsidiaries it is very unlikely that firm effects will influence the gathered data.

A4.4 Conclusion

As indicated in the beginning of this paragraph, four assumptions have to be confirmed in order to be able to conduct parametric statistics properly. Based on the tests in this paragraph we can conclude that parametric tests are not a perfect fit with the data but are still a good option when the transformed data are used. With close attention to the sample descriptives it seems unlikely that the statistics will bias the results of the analyses and the respective interpretations.

Appendix 5: Correlation among model variables

The correlation matrix of the model variables is displayed on the next page. Since the language capabilities could only be measured on the level of the subsidiary and the headquarter, the correlations between this moderator and the knowledge flows between the subsidiary and other subsidiaries of the MNC are excluded from the correlation matrix. For each cell the first number indicates the Pearson correlation, the second number the significance based on a two-tailed test and the third number N.

	1	2	3	4	5	6	7	8	9	10
1 total knowledge and skills (K&S) provided to the headquarter	1 169									
2 total K&S received from the headquarter	0.303** 0.000 169	1 169								
3 total K&S provided to other subsidiaries	0.652** 0.000 169	0.120 0.119 169	1 169							
4 total K&S received from other subsidiaries	0.213** 0.005 169	0.375** 0.000 169	0.329** 0.000 169	1 169						
5 subsidiary used one language in its daily communication	-0.036 0.647 164	0.086 0.275 164	-0.065 0.405 164	-0.041 0.601 164	1 164					
6 subsidiary used two languages in its daily communication	-0.031 0.694 164	0.011 0.892 164	-0.118 0.134 164	0.009 0.906 164	-0.477** 0.000 164	1 164				
7 subsidiary used three languages in its daily communication	0.066 0.404 164	-0.023 0.766 164	0.154* 0.049 164	0.125 0.110 164	-0.364** 0.000 164	-0.395** 0.000 164	1 164			
8 subsidiary used four or more languages in its daily communication	0.011 0.890 164	-0.106 0.177 164	0.064 0.417 164	-0.117 0.135 164	-0.247** 0.001 164	-0.268** 0.001 164	-0.205** 0.009 164	1 164		
9 most constraining language capability	0.030 0.723 141	-0.043 0.616 141	- 	- 	0.344** 0.000 140	-0.254** 0.002 140	-0.088 0.301 140	-0.024 0.782 140	1 141	
10 expatriate dummy (0=no, 1=yes)	0.192* 0.013 166	0.077 0.324 166	0.066 0.396 166	-0.080 0.306 166	-0.163* 0.038 162	0.010 0.900 162	0.063 0.429 162	0.132 0.093 162	-0.226** 0.008 139	1 166

***. Correlation is significant at the 0.05 level (2-tailed).**

****. Correlation is significant at the 0.01 level (2-tailed).**

Table 11: correlation matrix model variables

Appendix 6: Regressions

Below the two tables of the regression analyses have been displayed including the coefficients of the control variables.

	Dependent variable: transfer of knowledge and skills from the subsidiary to the headquarter				*Dependent variable: transfer of knowledge and skills from the headquarter to the subsidiary*			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
(Unstandardized Constant)	13.792®	13.227®	12.732	13.574	10.507®	11.837*	12.040*	12.026*
MNC size (log)	-0.034	-0.038	-0.036	-0.051	0.143	0.150	0.141	0.143
MNC Strategy:								
- multidomestic	0.124	0.131	0.134	0.107	-0.093	-0.158	-0.161	-0.152
- global	0.037	0.036	0.034	0.057	-0.256*	-0.285*	-0.277*	-0.282*
- transnational	0.088	0.094	0.095	0.081	-0.011	-0.088	-0.087	-0.081
MNC experience (log)	0.100	0.116	0.117	0.115	-0.065	-0.108	-0.103	-0.101
Subsidiary size (log)	0.061	0.052	0.053	0.051	0.029	0.086	0.083	0.083
Subsidiary age (square root)	-0.236®	-0.246®	-0.251®	-0.242®	0.095	0.080	0.068	0.061
Industry in which the subsidiary operates:								
- motor	0.243®	0.256®	0.260®	0.283®	-0.138	-0.156	-0.158	-0.170
- food and beverages	-0.134	-0.124	-0.122	-0.096	-0.131	-0.140	-0.144	-0.157
- chemical	-0.069	-0.067	-0.061	-0.056	-0.144	-0.121	-0.117	-0.120
- electronics	-0.045	-0.046	-0.042	-0.029	-0.194	-0.197	-0.195	-0.202
Entry mode	0.070	0.070	0.077	0.096	-0.067	-0.087	-0.076	-0.083
Subsidiary completeness (square root)	-0.125	-0.133	-0.136	-0.107	-0.162	-0.165	-0.168	-0.181
Work inflow	0.434**	0.430**	0.432**	0.454**	0.372*	0.369*	0.368*	0.358*
Work outflow (inversed)	-0.318**	-0.301*	-0.303*	-0.324*	-0.047	-0.093	-0.104	-0.098
Centralization of decision making (square root)	0.046	0.052	0.056	0.036	0.101	0.122	0.132	0.143
Upstream function	0.216	0.235	0.234	0.216	0.238	0.241	0.225	0.227

Number of languages used in daily communications:								
- Two languages	-	0.011	0.019	0.033	-	-0.141	-0.126	-0.130
		(0.923)	(0.880)	(0.790)		(0.225)	(0.289)	(0.279)
-Three languages	-	0.079	0.086	0.077	-	-0.161	-0.158	-0.156
		(0.499)	(0.484)	(0.526)		(0.162)	(0.173)	(0.181)
- Four or more languages	-	-0.007	-0.003	-0.023	-	-0.170	-0.163	-0.153
		(0.951)	(0.977)	(0.844)		(0.137)	(0.157)	(0.188)
Language capabilities moderator (reflected and inversed)	-	-	0.024	-0.002	-	-	-0.067	-0.095
			(0.847)	(0.989)			(0.526)	(0.412)
Expatriate moderator	-	-	-	0.158	-	-	-	-0.068
				(0.130)				(0.539)
R^2	0.289	0.294	0.294	0.314	0.296	0.324	0.327	0.331
Delta R^2	0.289	0.005	0.000	0.020	0.296	0.028	0.003	0.003
F-statistic (significance)	2.004*	1.685®	1.587®	1.646®	2.078*	1.941*	1.855*	1.774*
	(0.020)	(0.053)	(0.074)	(0.057)	(0.015)	(0.020)	(0.026)	(0.034)

®. Significant at the 0.10 level (2-sided).

***. Significant at the 0.05 level (2-sided).**

****. Significant at the 0.01 level (2-sided).**

Table 12: regression on the transfer of knowledge and skills between the subsidiary and the headquarter (including control variables)

	Dependent variable: transfer of knowledge and skills from the subsidiary to other subsidiaries			*Dependent variable: transfer of knowledge and skills from other subsidiaries to the subsidiary*		
	Model 9	**Model 10**	**Model 11**	**Model 12**	**Model 13**	**Model 14**
(Unstandardized Constant)	17.210*	14.978*	15.165*	16.672**	15.896**	15.887*
MNC size (log)	-0.040	-0.007	-0.008	0.061	0.067	0.067
MNC Strategy						
- multidomestic	0.071	0.105	0.095	-0.076	-0.090	-0.090
- global	0.063	0.053	0.055	-0.101	-0.108	-0.108
- transnational	-0.008	-0.012	-0.018	-0.014	-0.037	-0.037
MNC experience (log)	-0.080	-0.056	-0.056	-0.128	-0.113	-0.113
Subsidiary size (log)	0.193®	0.167	0.165	0.053	0.055	0.055
Subsidiary age (square root)	-0.135	-0.177	-0.174	-0.034	-0.052	-0.052
Industry in which the subsidiary operates						
- motor	0.052	0.114	0.123	-0.030	-0.012	-0.013
- food and beverages	-0.042	-0.016	-0.009	-0.056	-0.050	-0.050
- chemical	0.098	0.124	0.134	0.120	0.132	0.132
- electronics	-0.167	-0.165	-0.160	-0.050	-0.051	-0.051
Entry mode	0.033	0.029	0.034	-0.144	-0.150	-0.151
Subsidiary completeness (square root)	-0.054	-0.083	-0.076	-0.082	-0.094	-0.094
Work inflow	0.364*	0.337*	0.343*	0.205	0.180	0.179
Work outflow (inversed)	-0.317**	-0.350**	-0.359**	-0.182	-0.185	-0.184
Centralization of decision making (square root)	-0.036	0.009	0.001	-0.108	-0.079	-0.079
Upstream function	0.136	0.191	0.179	0.073	0.095	0.095
Number of languages used in daily communications						
- Two languages	-	-0.149	-0.143	-	-0.038	-0.038
		(0.199)	(0.222)		(0.758)	(0.758)
-Three languages	-	0.166	0.166	-	0.065	0.065
		(0.136)	(0.136)		(0.579)	(0.581)
- Four or more languages	-	-0.013	-0.016	-	-0.087	-0.087
		(0.899)	(0.876)		(0.434)	(0.438)
Expatriate moderator	-	-	0.050	-	-	-0.003
			(0.602)			(0.978)
R^2	0.163	0.222	0.225	0.097	0.111	0.111
Delta R^2	0.163	0.059	0.002	0.097	0.014	0.000
F-statistic	1.179	1.430	1.365	0.652	0.622	0.586
(significance)	(0.294)	(0.126)	(0.155)	(0.842)	(0.888)	(0.919)

®. Significant at the 0.10 level (2-sided).

***. Significant at the 0.05 level (2-sided).**

****. Significant at the 0.01 level (2-sided).**

Table 13: regression on the transfer of knowledge and skills between the subsidiary and other subsidiaries (including control variables)

Appendix 7: Alternative regressions and correlation matrix

The alternative regressions include the categorical variable instead of the dummy series of language diversity. The regressions have been performed exactly the same as the regressions shown in paragraph 6.3 and the results are displayed at the end of this appendix. Comparing the results of those regressions with the results below shows that the main conclusions of the research remain unchanged when the language diversity variable is altered. The main differences are outlined at beginning of this appendix. For completeness the alternative correlation matrix has also been included.

Starting with the statistics of the overall model, displayed in table 14 and 15, the horizontal knowledge flows between the subsidiaries show even lower values for R^2 and the F-statistic than the regression in paragraph 6.3. Next to that, the F-statistic decreases with every step in the models. However, two positive changes occur considering the vertical communication. First, the language capabilities moderator creates an increase in the F-statistic from 1.880 to 1.938, with an significance level of 0.022, considering the transfer of knowledge and skills to the headquarter. Second, language diversity increases the F-statistic from 2.078 to 2.189 at a significance level of 0.009 considering the knowledge and skills the subsidiary receives from the headquarter. Although these results seem more positive towards the fit between the model and the data, it has to be kept in mind that the F-statistic is negatively influenced by the number of variables entered into the model. Looking at the respective R^2 changes, this seems to be the only reason behind the increase of the F-statistic since the original model showed a higher increase in R^2 than the alternative regression above.

Having discussed the fit of the overall model, a closer look at the coefficients is needed. Applying the categorical operationalization of language diversity instead of the dummy series does not seem to alter the results al lot. For the models concerning the knowledge flows from the subsidiary to the headquarter the coefficient of the language capabilities moderator increases a bit while the expatriate coefficient decreases a bit. But both moderators remain insignificant. One interesting change however, did occur; model 20 and 21 show a negative correlation between language diversity and the transfer of knowledge and skills from the headquarter to the subsidiary, in line with the first hypothesis.

The results are significant at the 10% level, but turn insignificant (0.107) when both moderators are added to the model.

Based on these changes, the main conclusions of this research remain unaltered. This conclusion remains the same when the correlation matrix below is taken into account. (For each cell the first number indicates the Pearson correlation, the second number the significance based on a two-tailed test and the third number N.)

		1	2	3	4	5	6	7
1 number of languages, 1-2-3-at least 4	Correlation Significance N	1 164						
2 total knowledge and skills provided to the headquarter	Correlation Significance N	0.051 0.513 164	1 169					
3 total knowledge and skills received from the headquarter	Correlation Significance N	-0.119 0.129 164	0.303** 0.000 169	1 169				
4 total knowledge and skills provided to other subsidiaries	Correlation Significance N	0.137 0.080 164	0.652** 0.000 169	0.120 0.119 169	1 169			
5 total knowledge and skills received from other subsidiaries	Correlation Significance N	-0.005 0.950 164	0.213** 0.005 169	0.375** 0.000 169	0.329** 0.000 169	1 169		
6 most constraining language capability	Correlation Significance N	-0.211* 0.012 140	0.030 0.723 141	-0.043 0.616 141	-	-	1 141	
7 expatriate dummy (0=no, 1=yes)	Correlation Significance N	0.189* 0.016 162	0.192* 0.013 166	0.077 0.324 166	0.066 0.396 166	-0.080 0.306 166	-0.226** 0.008 139	1 166

***. Correlation is significant at the 0.05 level (2-tailed).**

****. Correlation is significant at the 0.01 level (2-tailed).**

Table 14: correlation matrix between model variables (categorical language diversity)

	Dependent variable: transfer of knowledge and skills from the subsidiary to the headquarter				*Dependent variable: transfer of knowledge and skills from the headquarter to the subsidiary*			
	Model 15	**Model 16**	**Model 17**	**Model 18**	**Model 19**	**Model 20**	**Model 21**	**Model 22**
(Unstandardized Constant)	13.792®	13.218**	13.838®	13.994®	10.507®	12.642*	12.856*	12.787*
MNC size (log)	-0.034	-0.035	-0.054	-0.056	0.143	0.147	0.138	0.139
MNC Strategy								
- multidomestic	0.124	0.139	0.137	0.127	-0.093	-0.168	-0.169	-0.163
- global	0.037	0.042	0.061	0.070	-0.256*	-0.284*	-0.275*	-0.280*
- transnational	0.088	0.104	0.106	0.099	-0.011	-0.091	-0.090	-0.086
MNC experience (log)	0.100	0.108	0.116	0.111	-0.065	-0.103	-0.099	-0.096
Subsidiary size (log)	0.061	0.048	0.039	0.037	0.029	0.094	0.090	0.091
Subsidiary age (square root)	-0.236®	-.0234®	-0.267*	-0.256*	0.095	0.087	0.072	0.065
Industry in which the subsidiary operates								
- motor	0.243®	0.249®	0.253®	0.274®	-0.138	-0.167	-0.166	-0.178
- food and beverages	-0.134	-0.130	-0.132	-0.109	-0.131	-0.151	-0.152	-0.166
- chemical	-0.069	-0.072	-0.056	-0.049	-0.144	-0.132	-0.124	-0.128
- electronics	-0.045	-0.043	-0.035	-0.022	-0.194	-0.204	-0.201	-0.209
Entry mode	0.070	0.074	0.101	0.113	-0.067	-0.090	-0.078	-0.084
Subsidiary completeness (square root)	-0.125	-.0125	-0.136	-0.116	-0.162	-0.163	-0.168	-0.180
Work inflow	0.434**	0.436**	0.436**	0.454**	0.372*	0.365*	0.365*	0.354*
Work outflow (inversed)	-0.318**	-0.311*	-0.342**	-.0353**	-0.047	-0.082	-0.097	-0.090
Centralization of decision making (square root)	0.046	0.043	0.072	0.055	0.101	0.116	0.129	0.139
Upstream function	0.216	0.217	0.189	0.187	0.238	0.230	0.217	0.218
Number of languages used in daily communications	-	0.037 (0.729)	0.050 (0.638)	0.039 (0.717)	-	-0.186® (0.079)	-0.180® (0.091)	-0.174 (0.107)
Language capabilities moderator (reflected and inversed)	-	-	-0.161 (0.124)	-0.116 (0.311)	-	-	-0.074 (0.469	-0.101 (0.372)
Expatriate moderator	-	-	-	0.106 (0.332)	-	-	-	-0.063 (0.563)
R^2	0.289	0.290	0.310	0.318	0.296	0.322	0.326	0.329
Delta R^2	0.289	0.001	0.020	0.008	0.296	0.026	0.004	0.003
F-statistic	2.004* (0.020)	1.880* (0.029)	1.938* (0.022)	1.888* (0.024)	2.078* (0.015)	2.189** (0.009)	2.090* (0.012)	1.986* (0.017)

®. Significant at the 0.10 level (2-sided).

***. Significant at the 0.05 level (2-sided).**

****. Significant at the 0.01 level (2-sided).**

Table 15: regression on transfer of knowledge and skills between the subsidiary and the headquarter (categorical)

	Dependent variable: transfer of knowledge and skills from the subsidiary to other subsidiaries			*Dependent variable: transfer of knowledge and skills from other subsidiaries to the subsidiary*		
	Model 23	**Model 24**	**Model 25**	**Model 26**	**Model 27**	**Model 28**
(Unstandardized Constant)	17.210*	15.968*	16.260*	16.672**	16.912**	16.902**
MNC size (log)	-0.040	-0.040	-0.041	0.061	0.062	0.062
MNC Strategy						
- multidomestic	0.071	0.095	0.083	-0.076	-0.082	-0.081
- global	0.063	0.065	0.068	-0.101	-0.101	-0.102
- transnational	-0.008	0.013	0.006	-0.014	-0.019	-0.018
MNC experience (log)	-0.080	-0.062	-0.065	-0.128	-0.132	-0.132
Subsidiary size (log)	0.193®	0.176	0.173	0.053	0.057	0.057
Subsidiary age (square root)	-0.135	-0.134	-0.131	-0.034	-0.034	-0.034
Industry in which the subsidiary operates						
- motor	0.052	0.064	0.078	-0.030	-0.032	-0.033
- food and beverages	-0.042	-0.040	-0.030	-0.056	-0.056	-0.056
- chemical	0.098	0.090	0.104	0.120	0.122	0.122
- electronics	-0.167	-0.167	-0.160	-0.050	-0.050	-0.050
Entry mode	0.033	0.037	0.045	-0.144	-0.146	-0.146
Subsidiary completeness (square root)	-0.054	-0.057	-0.048	-0.082	-0.081	-0.082
Work inflow	0.364*	0.363*	0.372**	0.205	0.205	0.205
Work outflow (inversed)	-0.317**	-0.300**	-0.316**	-0.182	-0.186	-0.185
Centralization of decision making (square root)	-0.036	-0.047	-0.057	-0.108	-0.106	-0.105
Upstream function	0.136	0.144	0.128	0.073	0.071	0.072
Number of languages used in daily communications	-	0.093 (0.345)	0.090 (0.367)	-	-0.021 (0.837)	-0.021 (0.839)
Expatriate moderator	-	-	0.069 (0.481)	-	-	-0.003 (0.978)
R^2	0.163	0.170	0.174	0.097	0.097	0.097
Delta R^2	0.163	0.007	0.004	0.097	0.000	0.000
F-statistic	1.179 (0.294)	1.163 (0.306)	1.123 (0.341)	0.652 (0.842)	0.612 (0.883)	0.574 (0.917)

®. Significant at the 0.10 level (2-sided).

***. Significant at the 0.05 level (2-sided).**

****. Significant at the 0.01 level (2-sided).**

Table 16: regression on transfer of knowledge and skills between the subsidiary and other subsidiaries (categorical)

Appendix 8: Regression of expatriates on knowledge flows

	Dependent variable: transfer of knowledge and skills from the subsidiary to the headquarter		*Dependent variable: transfer of knowledge and skills from the headquarter to the subsidiary*	
	Model 29	**Model 30**	**Model 31**	**Model 32**
(Unstandardized Constant)	8.975®	9,194*	8.678**	8.781**
MNC experience (log)	0.039	0.039	-0.673	-0.673
Subsidiary age (square root)	-0.240*	-0.235*	0.081	0.084
Entry mode	0.079	0.091	0.033	0.041
Subsidiary completeness (square root)	0.043	0.027	0.001	-0.009
Work inflow	0.261*	0.266*	0.331**	0.334**
Work outflow (inversed)	-0.117	-0.111	0.030	0.034
Centralization of decision making (square root)	0.140	0.109	0.220*	0.201*
Upstream function	0.135	0.142	0.199®	0.203®
Expatriate deployment	-	0.113 (0.178)	-	0.073 (0.372)
R^2	0.132	0.144	0.185	0.189
Delta R^2	0.132	0.012	0.185	0.004
F-statistic	2,547 (0.013)	2,481 (0.012)	3.792 (0.000)	3.455 (0.001)

®. Significant at the 0.10 level (2-sided).

***. Significant at the 0.05 level (2-sided).**

****. Significant at the 0.01 level (2-sided).**

Table 17: regression of expatiates on the transfer of knowledge and skills between the subsidiary and the headquarter

	Dependent variable: transfer of knowledge and skills from the subsidiary to other subsidiaries		*Dependent variable: transfer of knowledge and skills from other subsidiaries to the subsidiary*	
	Model 33	**Model 34**	**Model 35**	**Model 36**
(Unstandardized Constant)	14.919**	14.914**	16.537**	16.394**
MNC experience (log)	-0.038	-0.038	-0.090	-0.090
Subsidiary age (square root)	-0.086	-0.086	0.002	-0.002
Entry mode	0.034	0.034	-0.092	-0.102
Subsidiary completeness (square root)	0.014	0.014	-0.059	-0.045
Work inflow	0.225®	0.225®	0.262*	0.258*
Work outflow (inversed)	-0.194*	-0.194*	-0.168®	-0.174®
Centralization of decision making (square root)	-0.018	-0.017	-0.090	-0.063
Upstream function	0.188	0.188	0.136	0.130
Expatriate deployment	-	-0.003 (0.974)	-	-0.098 (0.264)
R^2	0.068	0.068	0.062	0.070
Delta R^2	0.068	0.000	0.062	0.008
F-statistic	1.215 (0.295)	1.072 (0.383)	1.099 (0.368)	1.119 (0.354)

®. Significant at the 0.10 level (2-sided).

***. Significant at the 0.05 level (2-sided).**

****. Significant at the 0.01 level (2-sided).**

Table 18: regression of expatiates on the transfer of knowledge and skills between the subsidiary and the other subsidiaries of the MNC

Appendix 9: Country representation within the sample

The table on the next page shows the division of subsidiaries and headquarters over the different countries included in the sample. The table has been sorted descending based on the number of subsidiaries located in a specific country. When no subsidiaries or headquarters are located in a country this in indicated by the minus sign.

Country of location	Number of subsidiaries	% of total subsidiaries	Number of headquarters	% of total headquarters
Australia	46	27.2%	7	4.1%
Netherlands	18	10.7%	14	8.3%
New Zealand	13	7.7%	-	-
UK	12	7.1%	19	11.2%
Portugal	11	6.5%	-	-
Japan	8	4.7%	20	11.8%
Sweden	6	3.6%	3	1.8%
Canada	5	3.0%	1	0.6%
Spain	5	3.0%	-	-
Argentina	3	1.8%	-	-
Belgium	3	1.8%	4	2.4%
Brazil	3	1.8%	2	1.2%
China	3	1.8%	1	0.6%
Germany	3	1.8%	30	17.8%
Mexico	3	1.8%	-	-
USA	3	1.8%	44	26.0%
Egypt	2	1.2%	-	-
Slovenia	2	1.2%	-	-
Turkey	2	1.2%	-	-
Chile	1	0.6%	-	-
Czech Republic	1	0.6%	1	0.6%
Denmark	1	0.6%	1	0.6%
Hong Kong	1	0.6%	-	-
Hungary	1	0.6%	-	-
Ireland	1	0.6%	-	-
Luxembourg	1	0.6%	-	-
Pakistan	1	0.6%	-	-
Philippines	1	0.6%	-	-
Poland	1	0.6%	-	-
Singapore	1	0.6%	8	4.7%
Slovakia	1	0.6%	-	-
South Korea	1	0.6%	-	-
Switzerland	1	0.6%	5	3.0%
Taiwan	1	0.6%	-	-
Thailand	1	0.6%	-	-
Tunisia	1	0.6%	-	-
Vietnam	1	0.6%	-	-
France	-	-	9	5.3%

Table 19: country frequencies

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Spread the word: Language matters

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