Dyad vs. Triad

A comparative case study on the quality of transferred tacit knowledge

Tilburg University

Faculty of Social and Behavioral Sciences

Master Organization Studies

Roel Verhagen

Master thesis Organization Studies 2013-2014

Dyad vs. Triad

A comparative case study on the quality of transferred tacit knowledge

Roel Verhagen
ANR: 126677

Tilburg University

Faculty of Social and Behavioral Sciences

Master Organization Studies

Master circle: (Breakthrough) Innovations,

corporate entrepreneurship and external collaboration

First reader: Prof. Dr. Ir. Victor Gilsing

Second reader: Prof. Dr. Leon Oerlemans

MTO evaluator: Dr. John Gelissen

Tilburg, August, 2014

Abstract

The transfer of tacit knowledge entails a complex process and is important for the production of innovations. This study examines to what extent and in what way the quality of transferred tacit knowledge is influenced by affective commitment and goodwill trust. Furthermore this study made a comparison between a dyadic and a triadic cooperation among these relationships. Therefore the following research question is formulated: *To what extent and in what way do affective commitment and goodwill trust influence the quality of the transferred tacit knowledge in R&D cooperations, and how do these relationships differ between a dyad and triad?* The data is collected at a large multinational organization among five independent business units. First, a questionnaire was distributed among the employees of these business units, which resulted in 66 unique observations. These quantitative findings were complemented with interviews held with the managers of these business units. The quantitative data supported the positive effect of affective commitment and goodwill trust on the quality of transferred tacit knowledge. However, only the influence of affective commitment is found to be significant. Furthermore, there are no significant differences noticeable between the investigated dyadic and triadic cooperative structures. Explanations can be found in the statistical power problem of this study and a lack of a triadic structure in reality. Further interpretations of these results are provided in the discussion section. Despite of a few limitations, this study contributes to the literature of Social Exchange Theory. At the end of this study managerial recommendations and directions for future research are provided.

Keywords: Tacit knowledge transfer, affective commitment, goodwill trust, quality of transferred tacit knowledge, dyad, triad.

Preface

This master thesis forms the final part of my master program of Organization studies, at Tilburg University. I've perceived the road towards this final master thesis as having many ups and downs. Looking back, I can say that I am proud of the progress I've made during the two years at this university, which eventually resulted in the realization of this master thesis. Therefore I would like to thank the following people:

First of all, I would like to thank my parents for their unconditional support and encouragements. Furthermore, I would like to thank my supervisor Victor Gilsing for his patience, knowledge and positive attitude, and also my second supervisor Leon Oerlemans for his constructive feedback. In particular I would like to thank Rens Rugebregt to put me in contact with the R&D manager of BU 1, from which this study is conducted. I would also like to thank my study mates, Ate, Jonathan and Martijn, for their support, feedback and enjoyable distraction during writing my thesis. At last, I would like to thank my master circle colleagues and all of those who participated in this research.

Thank you all and I hope you will enjoy reading this thesis!

With kind regards,

Roel Verhagen

Table of contents

Introduction

The following section provides a short introduction to this study. First, the research problem is presented, which is the starting point of this study. This research problem results in the formulation of the research question. At the end of this section, the scientific and practical relevance of this study are given.

1.1 Research problem

R&D cooperations are built to achieve a common goal; develop new and improved innovations (Becker & Dietz, 2004). Tacit knowledge, which is also known as the "know-how", has a key role in the process of the development of innovations. The importance of tacit knowledge stems from its implicit character, which makes it hard to assimilate and imitate by other organizations (Nonaka, Toyama & Konno, 2000; Reagans & McEvily, 2003, Howells, 2002). On the other hand, this type of knowledge is also difficult to transfer towards partner organizations. Derived from the literature, affective commitment and goodwill trust influence the transfer of tacit knowledge in a positive way. Where affective commitment increases the willingness to perform extra effort in the interest of the partner, goodwill trust lowers the fear of opportunistic behaviour performed by the partnering organization. This will in return result in a higher quality of transferred tacit knowledge, in terms of its timeliness, accuracy, relevance, objective, completeness and usefulness (Chiu, Hsu & Wang, 2006).

However, the cooperative structure of the R&D cooperation seems to moderate the relationship between affective commitment and goodwill trust on the quality of transferred tacit knowledge as exposed by Simmel (1964), Das & Teng (2002) and Yoon, Thye & Lawler (2013). Within this study a dyadic cooperation will be compared with a triadic cooperation. Derived from the literature, dyads represent higher levels of interdependency and therefore higher levels of affective commitment towards each other (Yoon, Thye & Lawler, 2013; Meyer & Allen, 1990, 1991). While in the triad, with the addition of a third party, intimacy and affective commitment are lower (Simmel, 1964). Furthermore, Parkhe (1993) argues that by exceeding the amount of two partners, the level of trust lowers. The accountability and opportunities for free riding are more difficult to detect in comparison to dyads. However, Simmel (1964) argues an opposite direction. He argues that in triads it is easier to form a two against one social pressure which in return prevents freeriding and thus increases the trust level. With this reasoning the cooperative structures express different mechanisms and the expectation is therefore that the quality of

transferred tacit knowledge will also differ between these two structures. Conclusively, the following research question is postulated:

1.2 Research question

To what extent and in what way do affective commitment and goodwill trust influence the quality of the transferred tacit knowledge in R&D cooperations, and how do these relationships differ between a dyad and triad?

1.3 Research relevance

1.3.1 Scientific relevance

This study makes five key contributions. *First*, Provan, Fish & Sydow (2007) state that there is more need for inter-organizational research beyond the dyadic level. Although more recent studies put their focus on the network level, only a few studies have tried to combine or compare two levels in one research setting. In this study the analysis of two different levels is applied. The study includes the dyadic level, which represents a relationship between two partners, and the triadic level, which exists of a relationship between three partners and represents the smallest form of a network. The theory of Simmel (1964) has proven that dyads are qualitative different from triads, particularly on how they generate order and stability. With this research approach, this study places the comparison in the larger context of Social Exchange Theory, by conducting research at two levels.

Second, Das & Teng (2002) argue that the literature on constellations, which is represented in this study as the triad, is based on economic perspectives such as game theory. In this study, the triad is examined on the mechanisms affective commitment and goodwill trust on the quality of transferred tacit knowledge, which include a social behavioural perspective. Furthermore, this study may give further insights on a future direction proposed by Das & Teng (2002), to explore and explain possible performance differences between dyads and constellations.

Third, this study is conducted at a large multinational organization with a global approach. It includes four different countries; the Netherlands, Germany, China and India. The expectation is that the results may differ, as each country differs in culture. Therefore cultural differences are taken into account in this study as a control variable.

Fourth, van Wijk, Jansen & Lyles (2008) state that most of the studies on knowledge transfer investigated knowledge transfer as an unidimensional construct. The disadvantage is that these studies provide no insight in the actually transferred knowledge. The measurement of quality of transferred tacit knowledge, which is applied in this study, provides insight in the usefulness of the transferred knowledge and provides a more comprehensive understanding of the antecedents and consequences of the knowledge transfer.

The quality of transferred tacit knowledge is in this study tested by the scale of Chiu, Hsu & Wang (2006) which research was applied within virtual communities. This scale will be tested in this study in an inter-organizational research setting. These two settings are very different from each other. The main differences is the absence of real, face-to-face contact with the exchange partner in virtual communities. Therefore, the *fifth* contribution is investigating whether this scale is also applicable in this particular research setting.

1.3.2 Practical relevance

This study investigates the influence of affective commitment and goodwill trust on the quality of transferred tacit knowledge. Results derived from this relationship provide insight in the levels of affective commitment and goodwill trust among each participating organization. Furthermore, it reveals the quality of transferred tacit knowledge between the partners. With the inclusion of the cooperative structure as a moderator, a comparison can be made between a dyadic and triadic cooperation. Results will show how dyadic and triadic cooperations operates in real life and how they differ on the investigated relationship. The findings of this study may be important for the organizations as it further improves the collaboration success and the transfer of tacit knowledge with the exchange partners.

1.4 Structure of the thesis

In the following section, the *theory* and its concepts will be described. The expected relationships of these concepts are formulated as hypotheses. At the end of this section the conceptual model of this study is shown. In the third section, the *method*, the research design is explained, followed by the data collection and sample strategy. Furthermore, the measurements of the variables and data analysis are given. This section ends with the data quality indicators of this study. The *results* are presented in section four, followed by the *discussion* section which includes theoretical implications, limitations and provides recommendations and directions for future research. The master thesis will *conclude* with the answer to the research question.

2. Theory

This section provides the theoretical foundation for this study. First, the dependent variable and independent variables are described below. Furthermore, features of the case design, included as a moderator, are added in this chapter as well. At the end of this section, the conceptual model is provided.

2.1 Dependent variable: quality of transferred tacit knowledge

Reciprocal tacit knowledge transfer between the source and the recipient, contributes to organizational performance, alliance performance and innovativeness. The achieved benefits however, depends on the quality of transferred tacit knowledge. In order to understand what the quality of transferred tacit knowledge entails, the concepts of knowledge and knowledge transfer will be explained first.

Knowledge is defined by Grant (1996) as "that what is known". As this definition is still broad and rather vague, Polanyi (1967) distinguished knowledge into two constructs, explicit knowledge and tacit knowledge. This distinction is applied by many well-known scholars (for e.g. Nonaka, 1994 & Grant, 1996). Explicit knowledge, or in other words codified knowledge, can be transmitted into formal systematic language or representations like documents, manuals and procedures (Nonaka, Toyama & Konno, 2000). This kind of knowledge can be easily articulated and transferred towards others. Tacit knowledge, also described as "the know-how", is highly personal, rooted in individual's skills, routines, actions, ideas and values within a specific context (Nonaka, 1994; Nonaka, Toyama & Konno, 2000). Tacit knowledge is also characterized as implicit and therefore difficult to transfer. A quote from Polayni (1967: 4) acknowledge the difficulty of transferring tacit knowledge by saying: *"we know more than we can tell"*.

Knowledge transfer can be defined as the transmission and receipt of knowledge from one organization to another (Grant, 1996; Szulanski, 2000; Liyanage, et al., 2009). However, each type of knowledge needs a different approach of knowledge transfer. This study will further on focus on the transfer of tacit knowledge. As stated before, tacit knowledge is hard to codify and therefore difficult to transfer. The transfer of tacit knowledge requires open means of communication (Nonaka, 1994) and is most easily shared when the source and the recipient share a common practice (Boland and Tenkasi, 1995). Nonaka (1994) identified face-to-face

communication as the most appropriated way to transfer tacit knowledge. In additional Hoof & De Ridder (2004) state consulting others in order to learn what they need to know is another approach of transferring tacit knowledge. Moreover, acquiring tacit knowledge needs to be done by learning by doing. This however, can only be achieved when the transferred tacit knowledge is of high quality. The quality of transferred tacit knowledge refers to its timeliness, accuracy, relevance, objective, completeness and usefulness (Chiu, Hsu & Wang, 2006). Furthermore quality of transferred tacit knowledge often bring new ways of thinking and provides useful new insights (Sheremata, 2000).

2.2 Independent variable (1): affective commitment

Allen & Meyer (1991) conceptualized organizational commitment into three different components; affective commitment, continuance commitment and normative commitment. According to Mathieu & Zajac (1990) these components are also applicable for interorganizational relationships. With this perspective, affective commitment is the desire to continue the relationship with their partner because they want to. It displays emotional attachment to, identification with, and involvement in the relationship with another organizational partner. Continuance commitment refers to ones need to remain in the relationship with another organizational partner, based on the awareness of the costs associated with leaving the relationship. Finally, normative commitment calls the feeling to remain with the relationship with the partner organization and refers to the feeling of obligation to continue the relationship (Meyer & Allen, 1991). In this study the focus is on affective commitment, which is the desire of both organizations to continue the relationship with their partner.

Affective commitment and quality of transferred tacit knowledge.
Van den Hooff & de Ridder (2004) argue that affective commitment is most likely to have a positive influence on the knowledge transfer. It has the strongest influence on general attitudes and behaviours to overcome natural resistance of an organization to transfer knowledge (Allen & Meyer, 1996; Hislop, 2003). Individuals, groups or organizations who are affective committed to another are willing to perform an extra discretionary effort, aligning their interests with those of the partner and drives them to higher levels of knowledge transfer (O'Reilly & Chatman, 1986; Meyer and Allen, 1997; Coff & Rousseau, 2000; Storey & Quintas, 2001).

Affective commitment displays the highest degree of attachment towards the partner organization (Carmeli, 2005) and represents a prosocial atmosphere (Nonaka & Konno, 1998; von Krogh, 1998). Furthermore, scholars as Granovetter (1973), Nahapiet & Ghoshal (1998), Hansen (1999), Szulanski (2000), Reagans & McEvily (2003) have recognized that knowledge transfer is a sensitive process which requires engagement. Matzler et al. (2011) argues that high levels of commitment lead to engagement which results in an extra effort to transfer the knowledge of high quality, as it is beneficial to achieve relationship goals. Build on this reasoning, the following hypothesis is proposed:

H1: There is a positive relationship between affective commitment and the quality of the transferred tacit knowledge

2.3 Independent variable (2): goodwill trust

Trust is a multilevel phenomenon that includes personal, organizational and interorganizational levels. Within this study the focus will be on the interorganizational level. Mayer, Davis & Schoorman (1995: 712) define trust as "*the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party*". An important aspect in this definition is the willingness to be vulnerable, which implies that there is something of importance to be lost. Herewith, trust is about the willingness to take risk, which is not the same as risk taking (Mayer, Davis & Schoorman, 1995). However, the concept of trust remains disputed in the literature as many scholars have defined trust differently. Although, some constructs of trust appear often in the literature: ability and competence trust and benevolence and goodwill trust (Mayer, Davis & Schoorman, 1995). Ability and competence trust are interchangeably used within the literature and can be described as: "*the expectation that a party will perform its role competently*" (Barber 1983: 15). Also benevolence and goodwill trust are simultaneously used and means: the trustors' belief in good faith, good intentions and integrity of the trustee to fulfil its role in the relationship properly (Das & Teng, 2001). The trustor is the trusting partner in the relationship and places trust on the trustee, which is the party to be trusted and (often) acts in the best interest of the trustor (Wang, Emurian, 2005). Within this study the perspective of Das & Teng (2001) of goodwill trust will be followed, as this description is correlated the closest with the definition provided by Mayer, Davis & Schoorman (1995). Furthermore, the expectation is that goodwill trust in comparison to competence trust will differ in the specific context of this study.

*Goodwill trust and quality of transferred tacit knowledge.*

Goodwill trust facilitates the transfer of tacit knowledge by increasing the confidence of the predictability of each other's actions and therefore diminishing the risk of opportunistic behaviour and creating a sense of security that the transferred knowledge will be used properly (Dhanaraj, et al., 2004; Granovetter, 1985; Gulati & Gargiulo, 1999). Organizations who represents high levels of goodwill trust feel less vulnerable for opportunistic behaviour and are more willing to transfer and exploit their knowledge with high quality, as the prediction is that the transferred knowledge will be used properly. Therefore the following hypothesis is postulated:

H2: There is a positive relationship between goodwill trust and the quality of the transferred tacit knowledge

2.4 Moderator: Dyad vs. Triad

In this study the influence of the cooperative structure will be investigated on the relationship of affective commitment and goodwill trust on the quality of transferred tacit knowledge. This study defines two cooperative structures; a dyad and a triad. A dyad is represented by a relationship between two partners. Exceeding this amount of partners, Das & Teng (2002) speak of constellations. "*Constellations are alliances formed by at least three partner firms – or multiple-partner alliances*" (Das & Teng, 2002: 446). Simmel (1964) defines a relationship with three parties as a triad, which is examined in this study. At the figure below, the dyad and triad are displayed.

Figure 1. Dyad vs. triad
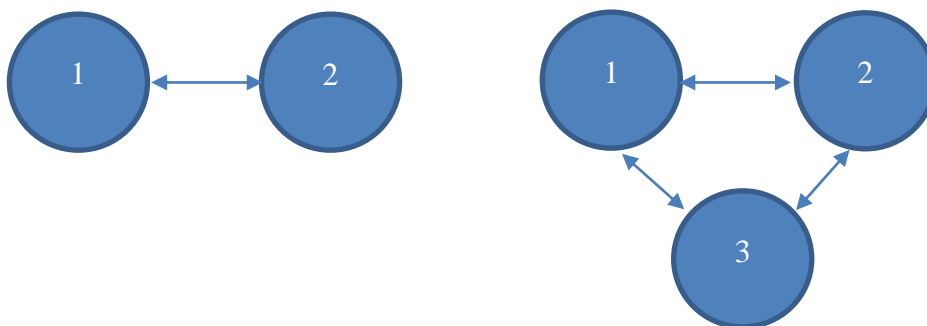
The reason for cooperation and the need for social exchange is created by the scarcity of resources (Levine & White, 1961). Social exchange is defined by Blau as an ongoing reciprocal process which represents "*voluntary actions of individuals that are motivated by the returns they are expected to bring and typically in fact bring from others*" (1964: 91). When alliances reach the amount of three parties, social exchanges become generalized (Das & Teng, 2002). This exposes an important difference between dyadic alliances and constellations. Within the dyad, two parties favours each other to exchange with, or as Simmel (1964) argues they have no other choice than to interact and to exchange with each other. This is called restricted social exchange. In a constellation, on the other hand, exchange takes place among a group of at least three parties, without direct reciprocity among them. This is called generalized social exchange (Das & Teng, 2002).

Both restricted social exchanges and generalized social exchanges have a significant risk of free riding (Das & Teng, 2002). Free riding can be described as obtaining benefits from the cooperation without bearing the full costs or by contributing to a less extent in the cooperation than compared to others (Albanese & Van Fleet, 1985). The definition of free riding is closely related to opportunistic behaviour, as Williamson defines opportunism as "*a condition of self-interest seeking with guile*" (1985: 30). Takahashi (2000) argues that the risk of free riding is more prevalent in generalized exchanges, when compared to restricted exchanges. Das & Teng clarify this as follows: "*In multiparty (or generalized) exchanges, where A gives to B, B to C, and then C to A, A often does not have information about reciprocity between B and C*" (2002: 448). While in the dyad the accountability is relatively high and free riding is easy to detect. This is caused by the direct reciprocity between the two parties (Das & Teng, 2002). However, this perspective is not fully supported by Simmel (1964) and Krackhardt (1990). They argue that an effective way to prevent free riding is creating a "two against one" coalition, which can only occur in a constellation. These "two against one" social pressures holds the group together by generating norms that solve coordination and social dilemma problems. In other words, these pressures leads to order and stability. In the dyad the power is equal distributed among the parties and no majority can be formed to outvote an individual party (Simmel, 1964; Krackhardt, 1990; Yoon, Thye & Lawler, 2013).

To further elaborate the differences between a dyad and triad, a distinction is made based on Das & Teng (2002) whom identified three major difficulties; norms of reciprocity, conflict, and coordination, in maintaining constellations, or in this case triads.

2.4.1 Norms of reciprocity:

In generalized social exchanges, trust is based on indirect reciprocal processes. A party benefits from a particular party and then pays back the favour to a different party in a subsequent period. This expresses levels of commitment and goodwill by making contributions with the expectation that the other reciprocate at a future time (Blau, 1964). Uehara (1990) argues that generalized reciprocity in comparison with restricted reciprocity can be more productive in trust building. However, Ekeh (1974) adds to this that generalized reciprocity connotes potential free riding. Simmel (1964) argues that exceeding the amount of two persons, it is easier to form an impersonal "supra individual entity". At the other hand, this relationship becomes less intimate as generalized reciprocity expose indirect reciprocity. Moreover, dyads represents direct reciprocity, accountability and therefore free riding is easily to detect (Das & Teng, 2002; Yoon, Thye & Lawler, 2013, Simmel, 1964).

2.4.2 Conflict:

Violations or inappropriate behaviour, like free riding, may results in conflicts and even lead to dissolution of the relationship. A conflict occurs in any relationship over time. However, exclusion as a result of a conflict seems to have a higher impact on the dyad when compared to the triad. Exclusion of one party does not directly lead to a dissolution of the relationship within the triad, as the relationship can be maintained by the other two parties. Leaving the relationship in the dyad, at the other hand, does result in termination of the relationship as there is no party left to exchange with (Yoon, Thye & Lawler, 2013; Simmel, 1964). As the exclusion of one party creates a common problem, each party is motivated to resolve the conflict. According to Hagen (1998) an approach for solving or prevent these problems are social sanctions. Social sanctions involve "*the mutual monitoring between the participants and the rapid dissemination of information about the credibility of the participating companies*" (Hagen, 1998: 595). Furthermore, social sanctions are also a mechanism against free riding, as sanctions may negatively influence a party's reputation (Das & Teng, 2002). Moreover, Das & Teng (2002) state that social sanctions are less effective in dyadic cooperations than compared to triads, as they lack a third party in the monitoring process. Violations or inappropriate behaviour can only be spread by one partner, without support of an additional party (Das & Teng, 2002).

2.4.3 Coordination:

Within the dyad no majority can be formed to outvote the individual. The majority can only be achieved by the addition of a third member (Simmel, 1964; Krackhardt, 1990). The dyad therefore, represents an equal distribution of power among the parties. One party can threat to dissolve the partnership when the demands are not met. While in a triad, this threat is less effective due to the fact that the remaining two parties can console each other and resulting in a "two against one" coalition, leaving the offending isolated from the group (Krackhardt, 1990). The "two against one" social pressure holds the group together by generating norms that solve coordination or social dilemma problems. These pressures leads to order and stability (Yoon, Thye & Lawler, 2013; Simmel, 1964). Emerson (1972) state that triads are in nature structural social units or groups, but not per se in real life. Simmel (1964) adds that with the addition of a third party, the relationship becomes less intimate. A relationship can be described as intimate, when the relationship is not purely based on the content, but when "*the whole affective structure is based on what each of the two participants gives or shows only to the one other person and to nobody else*" (Simmel, 1964, p. 126). Yoon, Thye & Lawler (2013) and Simmel (1964) state that, on the basis of intimacy, dyads leads to greater interdependence.

In sum, the above described comparison between dyads and triads have exposed fundamental differentiations which may influence the quality of transferred tacit knowledge. First of all, dyads represents higher levels of interdependency and therefore displays higher levels of intimacy and emotional attachment (Yoon, Thye & Lawler, 2013; Meyer & Allen, 1990, 1991). While the triad may be structural a social unit or group, this may not be the case in real life (Emerson, 1972). Simmel (1964) adds to this that when the amount of partners increases, the relationship becomes less intimate and the partners less committed. The willingness to put some extra effort in the relationship is less high compared to dyads. With this reasoning, the following hypothesis are formulated:

H3a: The dyadic cooperative structure positively moderates the relationship between affective commitment and quality of transferred tacit knowledge

H3b: The triadic cooperative structure negatively moderates the relationship between affective commitment and quality of transferred tacit knowledge

Parkhe (1993) argues that increasing the amount of partners may limit the level of trust between the partners. Das & Teng (2002) provides the following explanation: within dyadic cooperations the accountability is relatively high and free riding is easy to detect. Which is caused by the direct reciprocity between the two parties. In the triad free riding is more difficult to detect, as not every party has the information of what the others contributes to the triad, entailed by indirect reciprocity. Furthermore, identifying and realizing common interest have become more difficult in triads, which negatively influences the level of trust between the partners (Gulati & Singh, 2002). However, Simmel argues an opposite argument: "two against one" social pressures generates norms that prevent freeriding and thus increases trust. Which is not present at dyadic relationships, they lack bargaining power. Therefore the following hypothesis are postulated:

H4a: The dyadic cooperative structure negatively moderates the relationship between goodwill trust and quality of transferred tacit knowledge

H4b: The triadic cooperative structure positively moderates the relationship between goodwill based trust and quality of transferred tacit knowledge

2.5 Conceptual model

Figure 2: Conceptual model
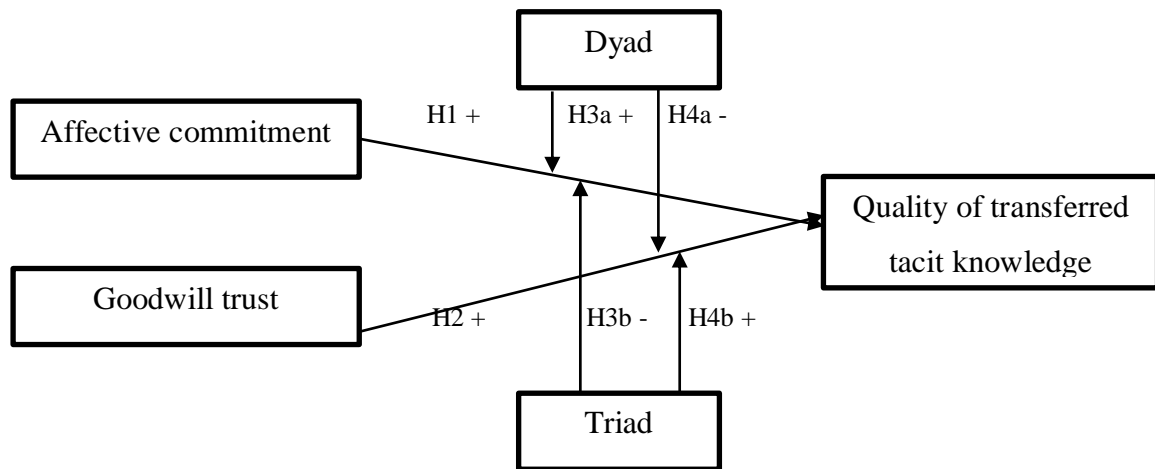
3. Method

In this section the methodological framework is provided. First the context of this study will be presented, followed by the research design. The methodological steps taken in this study are described in the data collection part, including the sample strategies of this study. In the next part the measurements of the variables are further enlightened. The analysis of these variables is explained in the data analysis part. The methodological framework ends with the research quality indicators of this study.

3.1 Research context

This study was conducted at a large multinational organization, where the relationships of affective commitment and goodwill trust on the quality of transferred tacit knowledge has been examined between independent business units, located across the world. Furthermore, this study included the comparison between a dyad and triad. In order to compare these two different cooperative structures, the dyad is represented by a pair of node between two business units. The triad includes three nodes with three ties, which represent a close triadic relationship (Wasserman & Faust, 1994; Coleman, 1988).

The research context of this study is shown in figure 3. Within this network Business Unit 1 (BU 1) is seated in both cooperative structures. BU 1 (Netherlands) forms a dyadic relationship with BU 2 (China) and a dyadic relationship with BU5 (Germany). Furthermore BU 1 forms a triadic relationship with BU 3 (Netherlands) and BU 4 (India). This study represents an inter-organizational approach, as these business units are operating independent of each other.

Figure 3: Research context
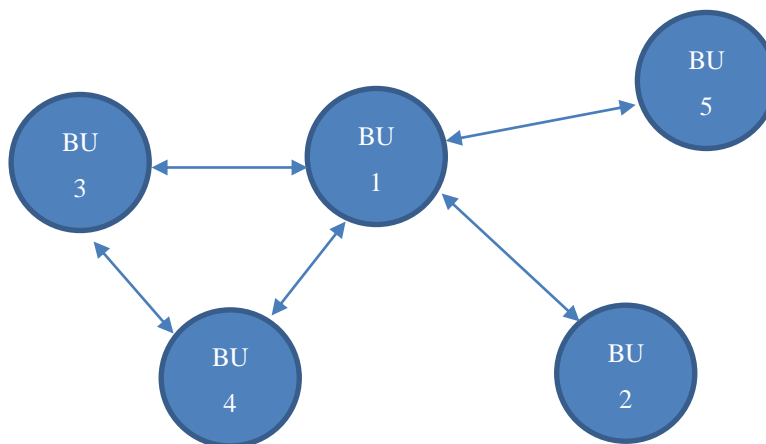
3.2 Research design

The design of this study was a comparative case study design. Three cases were investigated and compared with each other in their real life context (Dul & Hak, 2008). This design was chosen in order to obtain in-depth knowledge regarding the stated research question within this specific research context. Next to the case study design, this study included both a qualitative and quantitative approach. Yin (2003) and Gerring (2007) state that these two approaches provides a rich mix of data and ensures data triangulation. Furthermore, this study can be labelled as a cross-sectional design, as this study was conducted at one particular moment in time.

The general objective of this study was to contribute to the development of theory by testing hypotheses regarding the relationship between the dependent, independent and moderating variables (Dul & Hak, 2008). The practical contribution however, may lay in the explanation, robustness and generalizability of specific theoretical findings (Dul & Hak, 2008). Due to the small number of cases, the analysis of the moderator was done in a qualitative manner (Dul & Hak, 2008).

3.3 Data collection and sample strategy

The first step in the data collection was to find an organization which matched the specific context of this study. An explanation of this context was provided in a letter towards the organization. This letter can be found in Appendix B. After finding the host organization (BU 1), other business units were selected in cooperation with the R&D manager of BU 1. This selection was based on a between sample strategy. The business units were selected based on a dyadic and triadic relationship with BU 1. Furthermore, the scope was set on a particular kind of knowledge, to ensure that the same tacit knowledge was shared across the different business units. The initial contact with these business units was done by the R&D manager of BU 1. After confirmation of their participation, the researcher provided additional information of this study, which can be found in Appendix C. The data was collected at five different business units, the relationship between these units were the unit of analysis in this study.

The following step in the data collection included research at two different levels, at the individual and organizational level. This approach is by many researchers considered as the most comprehensive approach for inter-organizational research (Rousseau, 1985; Coleman, 1990; Sitkin & Roth, 1993; Ring & Van de Ven, 1994; Barney & Hansen, 1994). First, an e-

mail with the online link of the questionnaire was send to the managers of the each business unit. They further distributed the link among their employees, without filling in the questionnaire themselves. The questionnaire represents the individual orientation towards the partner organization and can be found in Appendix D. With the used snowballing sample strategy, 27 employees have completely filled in the questionnaire. In the following table, the distribution across the participating business units is presented.

Table 1: distribution across organizations

Location	Frequency	Percent
BU 1	11	40,8
BU 2	5	18,5
BU 3	5	18,5
BU 4	1	3,7
BU 5	5	18,5
Total	27	100

From the response of 27 employees, 66 unique observations were distillated. The people cooperating with multiple business units, were asked about the relationship with each unit. For example, BU 1 has four different relationships. Eleven people were asked about the relationship of four business units, which made a total of 44 unique observations. In order to test the independence or degree of similarity of these observations, a serial correlation test of Durbin-Watson has been performed. The score for this test was close to 2.0 which indicated no serial correlation. Hereafter, each business units was divided into the category: dyads or triads, based on the research context of this study. In table 2 the demographics of the observations are shown.

Table 2: Research demographics of the observations

Measure	Items	Frequency	Percent
Location	BU 1	44	66,7
	BU 2	5	7,6
	BU 3	10	15,2
	BU 4	2	3,0
	BU 5	5	7,6
	Total	66	100
Cooperative structure	Dyad	32	48,5
	Triad	34	51,5
	Total	66	100

After receiving the quantitative findings, interviews were held with the managers of each business unit. These interviews provided insight in the examined variables at the organizational level, and allowed the possibility to probe the quantitative findings and to elaborate on differences between the dyad and triad (Ritchie & Lewis, 2003). The topic list used for the interviews can be found in Appendix E. In Appendix F a scheme is given with the corresponding respondents. Appendix G displays the list of codes which is used for the coding matrices (Appendix H) and the transcripts (Appendix I).

With this two level approach, multiple sources of data were collected in order to reach data triangulation. The individual level was represented by the employees of each business unit and the organizational level by the managers. The units of observation were therefore the employees and their managers.

3.4 Measurements of the variables

3.4.1 Dependent variable: Quality of transferred tacit knowledge

Quality of transferred tacit knowledge was measured reciprocally between the source and the recipient, with a scale of Chi, Hsu & Wang (2006) on the quality of knowledge transfer. This original scale included six items; timely, accurate, relevant, objective, complete and useful, each rated on a seven-point Likert scale ranging from strongly disagree to strongly agree. In order to reduce the length of the questionnaire, the items: relevant and complete, were left out in this study beforehand, as they correlated high with the others. The complete operationalization is added in the appendix A.

3.4.2 Independent variable (1): Affective commitment

Affective commitment was measured reciprocally at the firm level between the focal firm and the partner firm. The scale of Monroy & Alzola (2005) was used to measure the level of affective commitment. Also this original scale included six items; loyalty, enjoy, positive feeling, replacing, continue and mistakes, each rated on a seven-point Likert scale ranging from strongly disagree to strongly agree. With the same reasoning as the construct of quality of transferred tacit knowledge, the items enjoy and replacing were left out beforehand. The complete operationalization is added in the Appendix A.

3.4.3 Independent variable (2): Goodwill trust

Goodwill trust was measured reciprocally between the trustor and the trustee, with the scale of Zaheer, McEvily & Perrone's (1998) on inter-organizational trust. The original scale included five items; evenhandend, opportunistic, reliable, trustworthy and hesitant, each rated on a seven-point Likert scale ranging from strongly disagree to strongly agree. With the same reasoning as the above two constructs, the item reliable was left out beforehand. The items opportunistic and hesitant were like in the scale of Zaheer, McEvily & Perrone negatively worded and therefore reversed in this study. The complete operationalization is added in the Appendix A.

3.4.4 Moderator: Dyad vs. Triad

The researcher divided the business units into dyads or triads, after the participants have filled in by which business units they are employed with. This distinction was based on the research context of this study.

3.4.5 Control variable (1): Tacit knowledge transfer frequency

High frequencies of tacit knowledge exchange may lead to higher levels of trust and commitment, which in return results in higher quality of the transferred tacit knowledge (Mohr & Sohi, 1995). Tacit knowledge transfer frequency was measured whether the transfer was: daily, 2-3 times a week, once a week, 2-3 a month, once a month, less than once a month and never.

3.4.6 Control variable (2): Previous R&D cooperation experience with the partnering organization. Previous R&D cooperation experience may positively or negatively influence the levels of trust and commitment and therefore affect the quality of tacit knowledge transfer (Kovacic, 2008). Previous R&D cooperation experience was measured in this study by the years of cooperation between the business units.

3.4.7 Control variable (3): Size

Small firms often lack the resources or expertise to fully exploit tacit knowledge. The transfer of tacit knowledge requires administrative, organizational, and monitoring support that tends to be only available to large firms (Cavusgil, Calantone, Zhao, 2003). The size in this study refers to the amount of employees in each business unit.

3.4.8 Control variable (4): Culture

"Culture consists of the unwritten rules of the social game. It is the collective programming of the mind that distinguishing the members of a group or category of people from others" (Hofstede & Hofstede, 2005: 3). Cultural differences are likely to have an influence on the quality of the transferred tacit knowledge, as the recipient and the source might have different values, norms and perceptions. The culture was questioned by which business unit they were employed at the moment.

3.5 Data analysis

3.5.1 Quantitative analysis

The quantitative data was analyzed by using SPSS 22. The first step in the quantitative analysis was organizing the SPSS file. The data file was ordered in such a way that 66 unique observations were retrieved, as respondents were asked regarding multiple business units. Next, two items; opportunities and hesitant, of the scale goodwill trust were mirrored, so that all items were asked in the same, positive direction as Zaheer, McEvily & Perrone's (1998). Furthermore, the questionnaire was set out digitally and did not allow any missing values. Items used within the questionnaire were based on tested scales, although factor analysis and reliability tests were conducted. The reason for conducting these tests, was that items were deleted from the scales used in this study and they were used in a different research context. In the next section the factor analysis has been provided, followed by the reliability tests.

3.5.2 Factor Analysis

A factor analysis has been performed in order to check construct validity and the amount of components of each variable. The dependent variable, quality of transferred tacit knowledge, was significant based on the Bartlett's Test of Sphericity (p = .000) (Bartlett, 1954) and the Kaiser-Meyer-Olkin value was .661, exceeding the recommend value of .6 (Kaiser, 1970, 1974). The factor analysis clearly displayed one component at the Screeplot and also the Eigenvalue of this component was 2.362. Only one component was extracted from this scale, so rotation was not needed. For the independent variables, affective commitment and goodwill trust, also one component was extracted. They both reached statistical significance (p = .000) according to the Bartlett's Test of Sphericity. But the KMO index did not exceed the lower bound of .6 for affective commitment (KMO = .512) and goodwill trust (KMO = .491). This indicates that the variables were not supported by the factorability of the correlation matrix and that the criteria's for conducting factor analysis were not met (Pallant, 2010). For the scale of

goodwill trust, however, it is noticeable that after the rotation, the item r_trust_oppor still negatively correlates with the others. Despite this result, data reduction cannot be carried out based on factor analysis, as it did not meet the required criteria of the KMO index.

3.5.3 Reliability test

This study made use of tested scales of quality of transferred tacit knowledge, affective commitment and goodwill trust. However, items were deleted beforehand from these scales to shorten the questionnaire. To check the reliability of each scale, the Cronbach's Alpha was calculated. For the constructs quality of transferred tacit knowledge and affective commitment the Cronbach's Alpha exceeded .7, which can be considered as reliable. The construct of goodwill trust, however, reached an Alpha of only .270. Deletion of the item r_trust_oppor would lead to an increase of the Cronbach's Alpha to .552. With the negative correlation for the variable r_trust_oppor at the factor analysis in mind, and despite of only four items at this scale, the item r_trust_oppor was deleted. At the table below the Cronbach's Alpha, number of items, means and standard deviations are provided for each construct.

Table 3: Cronbach's Alpha

Scale	Cronbach's Alpha	Number of items	Mean	Std. Dev.
Quality of transferred tacit knowledge	.760	4	4.80	.988
Affective commitment	.736	4	4.63	1.012
Goodwill trust	.552	3	4.76	.892

Pallant (2010) state that the Cronbach's Alpha values are sensitive to the number of items in the scale. As presented in table 3, each scale included only 3-4 items. Therefore, in some cases it is more appropriate to report the mean inter-item correlation for the items. According to Briggs & Cheek (1986) an optimal range for the inter-item correlation mean is between .2 and .4. The scales used in this study exceed the lower bound of this range, as shown in table 4.

Table 4: Inter-item correlation:

Scale	Mean	Number of items
Quality of transferred tacit knowledge	.441	4
Affective commitment	.402	4
Goodwill trust	.327	3

All constructs were measured by using a seven-point likert-scale, and scored all above average (> 4). Tacit knowledge is in general transferred with a quality above average (Mean = 4.80; SD

= .988). Furthermore, goodwill trust seems to be measured higher (Mean = 4.76; SD = .892) when compared with affective commitment (Mean = 4.63; SD = 1.012).

3.5.4 Hierarchical multiple regression (OLS)

In order to perform a hierarchical multiple regression, some criteria must be met to be sure whether the scores on the variables are normally distributed. First, as indicated before, there were 66 unique observations retrieved from 27 respondents. However, no serial correlation was indicated within this study. The Skewness, Kurtosis and Kolmogorov-Smirnov statistics showed for some variables violation of the assumption of normality of distributions. However, these tests are sensitive to the sample size. Therefore the Normal Probability Plot was assessed which suggested no major deviations from normality and therefore a normal distribution (Pallant, 2010). Furthermore, the VIF values stayed below 1.4, which indicates the lack of multicollinearity. With the above results, the hierarchical multiple regression may be performed in order to test the postulated hypotheses. This regression is used to control for possible influences of control variables on the dependent and independent variables (Pallant, 2010). The mean of these variables are used within the regression. In order to evaluate these relationships, the standardized coefficients are conducted.

3.5.5 Qualitative analysis

In order to analyze the interviews, the recordings were transcribed by the use of Microsoft Word. After completing the transcripts of each respondent, the data analysis program MAXQDA was applied for further analysis. For the data analysis, the steps described by Ritchie & Lewis (2013) were used. These steps includes: data management, descriptive accounts and explanatory accounts. In the data management part, open coding is applied. Raw data was divided into fragments and labelled, sorted and compared with each other. These codes were based on the operationalization table which can be found in Appendix A. In the following step, which included axial coding, relations between common themes were identified and codes were grouped together into categories. These themes and categories can be found in Appendix H, the coding matrices. These coding matrices were used in the explanatory accounts part to explore connections between the core concepts and in order to make sense of these concepts. The qualitative findings are used to receive deeper insights in the relationships between the core concepts, rather than confirming or rejecting the postulated hypotheses.

3.6 Research quality indicators

In order to ensure the quality of this study, several quality indicators were taken into account; reliability, construct validity, internal validity and the external validity of this study.

3.6.1 Reliability:

All the steps taken in this study are carefully documented and can be found in this methodological section. Furthermore, the reliability was tested with the Cronbach's Alpha on the scales of quality of transferred tacit knowledge, affective commitment and goodwill trust. Only the scale of goodwill trust did not exceed .7. However, a low Cronbach's Alpha may be caused by a small sample size. The inter-item correlation showed that these scale can be seen as reliable. The aim of this study was to get at a response least 30% of the sample to provide a good representation of the whole population. This was successful retrieved for four out of five business units. The limitation of the fifth business unit is notified in the discussion section.

3.6.2 Construct validity:

To ensure the construct validity, multiple sources of evidence were used. The items used in the questionnaire and semi-structured interviews were collected from existing questionnaires and are well tested on their validity. Furthermore, factor analysis has been performed on these items and they were also reviewed by the first and second reader, the peers from the master circle and also by the R&D manager of BU 1. In order to be sure that these constructs are well understood by the respondents, context specific examples were displayed in the questionnaire and within the semi-structured interviews the respondents were asked to explain the concepts in their own words.

3.6.3 Internal validity:

The internal validity was improved in several ways. First, as described above, the variables used in this study were derived from existing questionnaires. Furthermore, there was controlled for organizational influences by conducting the study at one large multinational organization among different business units. Next to this research context, control variables (tacit knowledge transfer frequency, previous R&D cooperation experience with the partnering organization(s), size and culture) were used to further ensure the internal validity. The study, however, was measured at one point in time, this may harm the internal validity.

3.6.4 External validity:

The external validity in this study may be described as being low, as this study has been performed in a specific context. The results are therefore less generalizable towards other contexts. However, the comparison between dyads and a triad on affective commitment and goodwill trust, may be generalized as they display network mechanisms. Also the inclusion of a global approach within this study and their findings may be generalizable towards different countries.

4. Results

This section will be divided into two parts: the quantitative results and the qualitative results. First the quantitative findings are given, which represent the individual level. Hereafter, the qualitative results are provided to get insight at the organizational level.

4.1 Quantitative results

First descriptive statistics and correlations of the quantitative findings are presented. The results of the hierarchical multiple regression are given next, followed by the hypothesis tests. At the end of the quantitative results, t-tests are performed to make a comparison between groups or business units.

4.1.1 Descriptive statistics

The descriptive statistics and correlations of each scale is given in table 5. Quality of transferred tacit knowledge is the dependent variable, affective commitment and goodwill trust are the independent variables and the control variables are location, size, collaboration years and transfer frequency. The results showed a strong significant correlation between affective commitment and the quality of transferred tacit knowledge, and a less strong, but significant correlation between goodwill trust and the quality of transferred tacit knowledge. These independent variables are also significantly correlated with each other, but stayed below .9, which indicates the absence of multicollinearity (Pallant, 2010). The control variables are not significantly correlated with the dependent and independent variables. However, the variables collaboration years and transfer frequency are significant correlated with each other.

Table 5: Correlation table

		M	Sd	1	2	3	4	5	6	7
1	Quality of transferred tacit knowledge	4.80	.988	1						
2	Affective commitment	4.63	1.012	.739 **	1					
3	Goodwill trust	4.76	.892	.415**	.424**	1				
4	Location	1.77	1.262	.173	.134	-.072	1			
5	Size	3.35	1.420	.020	.074	-.070	-.007	1		
6	Collaboration years	7.73	7.354	.201	.067	.004	.008	-.204	1	
7	Transfer frequency	3.64	1.974	-.130	.010	-.016	-.231	-.207	-.276*	1

Note. $N = 27$, 66 unique observations. Pearson Correlation *.$p<.05$ (2-tailed). Correlation **.$p<.01$ (2-tailed).

4.1.2 Influence on the dependent variable

The hierarchical multiple regression included three models. In the first model the control variables; tacit knowledge transfer frequency, previous R&D cooperation experience, size and culture were added to measure their influence on the dependent variable. The second model consisted of the addition of the independent variables, to test the main effects. And in the third and last model the interaction variables were added in the form of a dummy variable (0= dyad, 1 = triad), in order to look for difference between the dyadic and triadic R&D cooperations.

The first model was not significant (F = 1.223; p = .310) and included no significant effects of the control variables on the dependent variable. The adjusted R^2 of model 1 was .014. The second model is highly significant (F = 14.556; p = .000). The adjusted R² of this model was .556, compared to the first model it was a significant R² change. The independent variable affective commitment, had a significant effect (B = .648; β = .664; p = .000) on the dependent variable. However, goodwill trust showed a positive effect on the dependent variable, this relationship was not significant (B = .152; β = .137; p = .149). In the third model, with the inclusion of the moderator, a small positive but no significant effects were found (B = .016; β = .039; p = .661 – B = .015; β = .036; p = .674). This third model is also found to be significant (F = 12.329; p = .000), with only a small difference in the adjusted R². However, model 2 possessed the largest explanatory power, it explained 59,7 percent of the variance in the quality of transferred tacit knowledge. Further VIF values showed that there is no multicolinearity among the variables. There were also no outliers noticeable or major deviations noticeable from normality (Pallant, 2010). In table 6 the results of the OLS regression are given.

4.1.3 Hypothesis testing

Confirmation or rejection of the hypotheses can be derived from the hierarchical multiple regression. The first hypothesis, which indicated a positive effect of affective commitment on the quality of transferred tacit knowledge, is accepted with a positive influence of .664 on a significance level of .000. The second hypothesis, which states there is a positive effect of goodwill trust (β = . 137) on the quality of transferred tacit knowledge, cannot be confirmed as this effect is found to be not significant. The interaction hypothesis represents a very low or almost absent effect on the relationships between the independent and dependent variable ranging between β= .039 and β = .036. The interaction effects were also not found to be significant. With this reasoning the third and fourth hypothesis are also not supported.

Table 6: OLS regression

	Model 1	Model 2	Model 3
(Constant)	4.265	1.021	1.053
Location	.167	.074	.072
Size	.058	-.010	-.017
Collaboration years	.205	.130	.123
Transfer frequency	-.023	-.083	-.084
Affective commitment		.664***	.655***
Goodwill trust		.137	.137
Affective commitment interaction			.039
Goodwill trust interaction			.036
Model Significance (F-test)	.310	.000	.000
Adjusted R²	.014	.556	.550
ΔR²	.074	.597	.598
VIF values (Low/High)	1.067/1.252	1.126/1.315	1.072/1.315

Note. * p<.05; ** p<.005; *** p<.001, 1-tailed

4.1.4 T-test

An independent t-samples t-test was conducted to compare the self-esteem scores for the dyadic and triadic relationships on the quality of transferred tacit knowledge, affective commitment and goodwill trust independently. The t-test showed no significance difference between the scores for the dyad (M = 4.72, SD = 1.019) and the triad (M = 4.88, SD = .966; t (64) = -.670, p = .506, two-tailed) on the quality of transferred tacit knowledge. There were also no differences noticeable for affective commitment; dyad (M = 4.59, SD = .952) and the triad (M = 4.65, SD = 1.078; t (64) = -.242, p = .810, two-tailed), as also for goodwill trust; dyad (M = 4.76, SD = .985) and the triad (M = 4.75, SD = .809; t (64) = .025, p = .980, two-tailed).

As there could be differences among different locations, an independent t-test is also performed on the dependent and independent variables for each location. The groups are compared with one another (1 with 2, 1 with 3, 1 with 4, 1 with 5 and 3 with 4). To control for Type 1 errors, the Bonferroni adjustment has been conducted. The revised alpha for determining significance .05/5 = .01. There were three differences found with this alpha level between three locations. The differences are presented in table 7. Between BU 1 and BU 5, BU 1 and BU 3, and BU 3 and BU 4 no significant differences were noticeable.

Table 7: T-test location

Construct	Location	Mean	Std. Deviation	t	Sig. (2-tailed)	Mean difference
Affective commitment	BU 1	4.43	.895	(47) -2.950	.005	-1.218
	BU 2	5.65	.627			
Affective commitment	BU 1	4.43	.895	(44) -3.3037	.004	-1.943
	BU 4	6.38	.177			
Quality of tacit knowledge transfer	BU 1	4.61	.962	(44) -2.739	.009	-1.866
	BU 4	6.50	.354			

As table 7 shows, there are significant differences noticeable among three business units. The partners of BU 1, which are BU 2 and BU 4, seem to be more committed to BU 1, than the other way around. This seems also the case when comparing the relationship between BU 1 and BU 4 on the quality of transferred tacit knowledge. BU 4 perceives the transferred tacit knowledge with higher quality when compared to BU 1.

4.2 Qualitative results

The interviews with the respondents of different organizations provided insight into how they perceive their relationships with their partners at the organizational level. They were asked about affective commitment, goodwill trust and the quality of transferred tacit knowledge. Furthermore the interviews provided insight in why the quantitative study showed no statistical difference between a dyad and a triad. They clarified the quantitative differences further, as displayed by the t-test. In the upcoming section, the relationships will be shortly discussed first, followed by the influence of different cultures. Second, the constructs of affective commitment, goodwill trust and quality of transferred tacit knowledge are further explored. Hereafter the influences of the dyad and triad were exposed, mainly by respondent 1, as his organization is positioned in both the cooperative structures. In the end, a conclusion is presented about how affective commitment and goodwill trust influence the quality of transferred tacit knowledge. Due to some conditions, a respondent from BU 4 has not been interviewed. This is further clarified in the discussion section.

4.2.1 Relationship

The research context involved five business units. BU 1 is in this context connected in a triadic way with BU 3 and BU 4, and it has a dyadic relationship with BU 2 and BU 5. Each respondent

was asked about how they would describe the relationship. Within this context BU 1 acts as a knowledge base or interface for each business unit and can also be seen as a supplier, as BU 3 and BU 5 are the customers. BU 2 and BU 4 are more or less a foothold on the local market in China and India. A full description of the relationship is given by respondent 2: "*BU 1 acts as a knowledge base. Keeping the long-term. They are also a kind of supplier for the different sites*" (Respondent 2).

4.2.2 Culture

This study included a global approach with business units from the Netherlands, Germany, China and India. The assumption was that these cultural differences might influence the quality of transferred tacit knowledge. However, the quantitative results showed no statistical significant effect of culture on the quality of transferred tacit knowledge. Despite these results, the respondents were asked about the cultural differences in order to find possible cultural influences at the organizational level. Almost every respondent recognized different cultural aspects among the different business units. One respondent clarified the cultural differences as follows: "*Dutch people are more informal. In Germany there is a more hierarchical culture, less informal. ... The Chinese culture is very action oriented, just like India*" (Respondent 1).

The influence of these cultural differences on the knowledge transfer were perceived by two respondents, which have a direct relationship with a business unit located in Asia. As respondent 2 explains: "*I've been in China and saw that there is a lot of job rotation among people. I do not exactly know how this is applicable for India, but people move to competitors on a monthly basis. So I've been more careful with the transfer of knowledge*" (Respondent 2). This explanation does not expose directly the effect on the quality of transferred tacit knowledge, but rather on affective commitment and goodwill trust, which mechanisms will be further examined hereafter.

4.2.3 Affective commitment

As the perception might differ from the individual level compared to the organizational level, each respondent is asked about their perceived affective commitment on organization level. The quantitative results revealed a strong positive effect on the quality of transferred tacit knowledge. This positive influence of affective commitment seems also to be applicable on the organizational level. In general, the affective commitment is perceived as high. The affective commitment between BU 1 and BU 3 is perceived as high, represented by the long duration of

their relationship. Although the relationship from BU 1 with BU 2 and BU 4 are still in a start-up phase, the first overall impressions are good. The relationship between BU 3 and BU 4, despite they represent the triad, is not strong enough to represent any level of commitment. Finally, the relationship between BU 1 and BU 5 is perceived as being average. This is caused due to the changing relationship between them, which entails issues and conflicts. The cooperative set-up is such that they need to cooperate with each other. This perception is further clarified by the following quote: "*If you go higher up in the hierarchy, both business units got own different business interests. This makes it difficult for the middle management to have a very positive feeling towards the partner and in particular in time of conflicts, which we are right now. On working level this is not necessarily the case*" (Respondent 4).

Within the quantitative part, a t-test is performed to investigate different perception among the different locations. The results of the t-test are displayed below.

Table 8: T-test location on affective commitment

Construct	Location	Mean	Std. Deviation	t	Sig. (2-tailed)	Mean difference
Affective commitment	BU 1	4.43	.895	(47) -2.950	.005	-1.218
	BU 2	5.65	.627			
Affective commitment	BU 1	4.43	.895	(44) -3.3037	.004	-1.943
	BU 4	6.38	.177			

A disadvantage is that these results do not provide any insight in what causes the different perceptions of affective commitment. Therefore the respondents from BU 1 and BU 2 were confronted with these differences and asked whether they could explain these differences. Respondent 1 gave the following explanation: "*If we ask BU 2 and BU 4 a question, they will reply with that is fine. But I do not know if we can count on that. We know there are other things running. Maybe it's their culture, they always say yes, because they can't say no to their boss*" (Respondent 1).

Respondent 3 provided a different perception: "*This is a really small task. So we do not have a dedicated person. The large percentage of the work the people do at BU 1 is different from what we do here at BU 2. It's totally different*". (Respondent 3). They gave a different explanation, respondent 1 seeks the differences on the cultural aspects, while respondent 3 argues that the difference on operational level clarifies the differences regarding affective commitment.

4.2.4 Goodwill trust

Respondents were asked about this mechanism to explore the trust level on the organizational level and also to investigate if there is a positive effect of goodwill trust on the quality of transferred tacit knowledge as found in the quantitative part. The respondents replied that there is no perception of distrust or the feeling of opportunistic behavior. They're all operating under the same name of the multinational organization. Aspects of transparency and openness were frequently addressed as an expression of goodwill trust and factors that influence the transfer of tacit knowledge in a good way. This is illustrated by the following quote: "*We have to be aware that we have different objectives, deducted from this set up. But you have to be aware of it, you have to be transparent, that's good. We are very open on the working level, we deal very open to each other*" (Respondent 4).

4.2.5 Quality of transferred tacit knowledge

As said above, transparency and openness were frequently addressed as factors that influence the quality of transferred tacit knowledge. Affective commitment, culture and distance seems to be intercorrelated with each other. How further away the business unit, the higher the cultural differences and therefore a lower perception of commitment among these units exists, which in return influences the quality of transferred tacit knowledge. In general the quality is perceived as good, as respondent 3 defines: "*It's good. It worked, people know how to do it, tackle issues. So it's a complete transfer*" (Respondent 3).

However, the t-test showed significant differences between Organization 1 and 4 on the quality of transferred tacit knowledge as displayed below.

Table 9: T-test location on quality of transferred tacit knowledge

Construct	Location	Mean	Std. Deviation	t	Sig. (2-tailed)	Mean difference
Quality of transferred tacit knowledge	BU 1	4.61	.962	(44) -2.739	.009	-1.866
	BU 4	6.50	.354			

Respondent 1 was confronted with these differences and asked for an explanation of these differences. From the perspective of respondent 1, the differences can be explained by the following quote: "*For BU 4, I would expect the same for BU 2, they are still learning. Compared to BU 3, the competency level is a lot higher. BU 2 and BU 4 lack this knowledge.*

That will take a few more years" (Respondent 1). The reasoning for these perception is not found in differences of affective commitment, goodwill trust or culture per se, but more or less in the amount of collaboration years. These business units, as indicated by respondent 1, are still in a start-up phase and therefore still lack some knowledge.

4.2.6 Dyad and triad

In the quantitative part there was no statistical influence of the dyadic or triadic cooperative structure as a moderator on the relationship between affective commitment and goodwill trust on the quality of transferred tacit knowledge. The interviews were held to explore the lack of this moderating effect.

The investigated cooperative network showed a triadic relationship between BU 1, BU 2 and BU 3. But how is it possible that there were no significant differences found between the dyadic relationships and the triadic relationship? From the interview with respondent 1 and 2 it became obvious that, on paper there is a triad, but in reality it's not perceived as one. Respondent 1 clarifies: "*We have direct contact with our partners. For us it feels like dyadic relationships*" (Respondent 1). A lack of a triadic feeling is further acknowledge by respondent 2, which business unit is also positioned in the triad: "*The relationship between BU 3 and BU 4 is relative weak. That's why I've no insight in the relationship between BU 1 and BU 4. I've got no clue if there is any contact or how many times*" (Respondent 2).

5. Discussion

The results given in the previous section will be discussed here in depth. The qualitative results will be used to clarify the quantitative results and also to provide an insight in the mechanisms at the organizational level. Furthermore, the results will be linked with theory to receive a better understanding of these findings. At the end of this section, limitations and directions for future research are provided.

This study tried to investigate the influence of affective commitment and goodwill trust on the quality of transferred tacit knowledge at two different levels. The questionnaire provided insight in the perception at the individual level, filled in by the employees of the different business units. Semi-structured interviews were held with organizational representatives to reveal the relationships at the organizational level. Furthermore, the relationships are compared between dyadic relationships with a triadic relationship, as they differ in order and stability (Simmel, 1964). The results will be discussed for the relationships between affective commitment and goodwill trust on the quality of transferred tacit knowledge and also the influence of the dyadic and triadic cooperative structure on these relationships. For each subsection the results will be discussed at two levels and they will be linked with theory.

Affective commitment on the quality of transferred tacit knowledge. Derived from the literature, a positive effect on the quality of transferred tacit knowledge was expected (Reagans & McEvily, 2003; Meyer & Allen, 1997). The quantitative results supported this assumption with a strong positive effect (B = .648; β = .664; p = .000). Also on the organizational level this assumption is supported for most of the business units. Respondent 4 revealed in the interview a difference between the individual level and the organizational level. He perceived on the individual level high commitment, but on the organizational level the commitment was perceived as significant lower. This differentiation is clarified by the different business goals both business units have, which results in some issues and conflicts and in return lowers the commitment. A t-test performed on affective commitment revealed significant differences between BU 1 and BU 2 (mean difference of -1.218 on a significance level of .005) and also between BU 1 and BU 4 (mean difference of -.1943 on a significance level of .004). The respondents were confronted with these findings within the interviews. Respondent 1 sought an explanation within the cultural differences, which was also acknowledge by other respondents. The quantitative results, however, showed no statistical significant influence of culture on the

investigated mechanisms. *The cultural difference* were described as a more hierarchical culture in Germany and the culture in India and China were described as more action-oriented, with the following description that they do not want to lose face. This description is largely in line with the findings of Hofstede & Hofstede (2005) on culture and organizations, as described below.

Organizations of the Netherlands are divided in the so called "*network model*". Organizations within this model can be described as individualistic, acting in a feminine society, have a low power distance and everyone is supposed to be involved in decision-making. Germany is seen as a "*well-oiled machine*". Organizations are in a society of low power distance, high uncertainty avoidance, are well ordered, having clear procedures and rules. Despite the fact that respondent 1 postulated that Germany is characterized as highly hierarchical, Hofstede & Hofstede argue the opposite. China and India fall in the same category; "*the organization as a family*" and where loyalty and hierarchy are high on the agenda. There is a high power distance, collectivism and have powerful leaders (Hofstede & Hofstede, 2005).

As said before, the quantitative results showed no significant effect or correlation of culture on affective commitment, goodwill trust and the quality of transferred tacit knowledge. The respondents stated though that culture actually might have an influence. Respondent 3 took a different point of view. He argued, due to the different business goals, the people that are involved in BU 1 do different work than the people in BU 2, which negatively affect the affective commitment. Cultural differences were left out in his argumentation.

Goodwill trust on the quality of transferred tacit knowledge. The results of the quantitative findings showed a positive effect on the quality of transferred tacit knowledge. However, this positive effect is not significant. With this reasoning hypothesis 2, which assume a positive relationship, cannot be confirmed. A clarification for this result might be found in the empirical part of this construct. It is obvious that this empirical problem is not caused by multicolinearity, as the VIF values reject multicolinearity. An explanation can be found in the construction of the variable goodwill trust. Originally the scale included five items. This amount was reduced to four items beforehand, in order to shorten the questionnaire. The Cronbach's Alpha of goodwill trust presented an unreliable scale of .270. The factor analysis showed an inconsistency of this scale as the item R_Trust_oppor negatively correlated with the other variables. After deletion of this item, the Cronbach's Alpha of .552 was reached. This still

impedes an inreliable scale. Pallant (2010) argues that the Cronbach's Alpha is very sensitive to the amount of items in the scale. Briggs & Cheek (1986) state that for an amount of only 3 items, it is more appropriate to have a look on the mean inter-item correlation. With a value of .327 it exceeds the lower bound of this measurement. The low Cronbach's Alpha does not per se harm the outcome of the results directly, but probably indirectly through a statistical power problem. This scale may be subject to random measurement error, which reduces the precisions of the results and therefore reduces the power (Cohen, 2013). Another explanation is the influence of the sample size. The sample size is only 27 respondents, from which 66 unique observations are conducted. This amount might negatively influence the statistical power. When this is the case, the probability to detect a significant result will be lower (Cohen, 2013).

The description above could be a clarification from the empirical point of view. Another clarification could be the missing of some literature aspects which might influence the relationship between goodwill trust and the quality of transferred tacit knowledge. Within this study there is controlled for tacit knowledge transfer frequency, previous R&D cooperation experience with the partnering organization(s), size and culture. Derived from the qualitative results, another factor, namely common or different business goals, which was not foreseen beforehand, might influence the relationship between goodwill trust and the quality of transferred tacit knowledge. A respondent clarifies that on the individual level the trust is high, due to the openness and transparency at that level, but he perceived differences at the organizational level. An explanation can be found in the different business goals both business units have. This is clarified in the following quote: *"I think a lot is founded in the set up with organization X and BU 1, where we have these different business goals. And a lot of BU 1 is also funded in that organization X and the business wasn't performing that well from our perspective of the last years. We had a lot of issues with products from organization X. A lot of situations where we had the feeling that we were no customers at all. So on management level there is the perception we are not perceived as customers. The business goals are simplified, they don't care about our business goals, so this lowers the trust level for as well organization X as BU 1" (Respondent 4).* This quotation clearly acknowledges the role of business goals on the trust level. It is noticeable that the individual and organizational level differ from each other. There is a high trust level on the individual level and on this level the transfer of knowledge has its basis. So this outcome at the organizational level does not automatically lead to a lower quality of transferred tacit knowledge.

Tsai & Ghoshal (1998) argue that common values and shared visions encourage the development of trusting relationships. Barber adds to this that common goals and values bring and keep two parties together (1983). Related to goodwill trust, Ouchi argues that "*common values and beliefs provide the harmony of interests that erase the possibility of opportunistic behaviour*" (1980: 138). The expectation of collective goals is that they will not be hurt by any other parties' pursuit of self-interest. In other words, sharing collective goals or values will lead to higher levels of trustworthiness (Tsai & Ghoshal, 1998). With this reasoning, collective goals influence the level of goodwill trust. Different goals can lead to distrust as exposed by respondent 4. Another noteworthy aspect, is the recent announcement of moving some parts of BU 3 towards Asia at BU 4. In other words, BU 3 is losing some parts of their business and seems to be less willing to share their knowledge with BU 4, as they want to keep their knowledge for themselves.

Furthermore, a t-test showed a significant difference between two business units, BU 1 and BU 4, on the quality of transferred tacit knowledge (mean difference of -1.866 on a significance level of .009). Derived from the interviews, *Previous R&D cooperation experience with the partnering organization* seems to have an influence on this differentiation. A respondent explained this in a way that the relationship is in a start-up phase and with this reasoning, the other business unit lack a certain knowledge level. The cooperation experiences is significant correlated with transfer frequency. This may be applicable in this particular case, as BU 4 lacks some knowledge. This may reduce the frequency of the knowledge transfer.

Dyad vs. Triad. Within this study the moderation effect of the dyadic and triadic cooperative structure is investigated regarding the relationship between affective commitment and goodwill trust on the quality of transferred tacit knowledge. Despite the assumption that these structures will differ on the quality of transferred tacit knowledge, no significant influence is found. The influence of the moderation effect on the relationship of affective commitment (B = .016, β = .039, p = .661) and the interaction effect on the relationship of goodwill trust (B = .015, β = .036, p = .674), seems only to have a small impact. Also the t-test did not show any significant differences.

The reason for this can be found in the statistical power problem. The higher the power of a test, the higher the probability of detecting the phenomenon under test (Cohen, 2013). The analysis of the influences of the dyadic and triadic cooperative structure, showed that the

statistical power was too low to even find moderate effects. The dyad was represented by a n of 32 and the triad with a n of 34. Another explanation could be that the distribution of the respondents from different organizations is not equal. This study included 66 unique observations, where 66,7% (n = 44) of the observations are derived from BU 1. However, this might be rejected due to the serial correlation test which showed no serial correlation.

Besides the statistical power problem, another explanation can be derived from the qualitative results. Where a triad is formed between BU 1, BU 3 and BU 4 on paper, in the reality it seems to be perceived different. A respondent clarifies that in his eyes there is not a triad relation, he argues that his business unit operates on a dyadic basis. Another respondent adds to this that within the triad, the relationship with BU 4 is relatively weak. The feeling is that they are disconnected from them. This reveals a complete different perception than what is portrayed on paper. This might explain why there are no significant difference are found between a dyad and triad.

The qualitative results are in line with the literature about triadic relationships. Emerson (1972) argues that triads are not social units or groups per se. They might be structural in nature, but might be perceived in the reality as being different. Simmel (1964) adds to this that the higher the numbers of actors within a group, the less intimate the relationship becomes. Also the transfer of knowledge or other exchanges are not always obvious to each party according to Das & Teng (2002). "*In multiparty (or generalized) exchanges, where A gives to B, B to C, and then C to A, A often does not have information about reciprocity between B and C*" (Das & Teng, 2002: 448). This is underpinned by the following quote of respondent 2: "*The relationship between organization 3 and 4 is relatively weak. That's why I've no insight in the relationship between organization 1 and 4. I've got no clue whether there is any contact or how many times*" (Respondent 2). Also the opposite opposed by Simmel (1964) that organizations can form two-against-one formation to reduce opportunism, seems not directly applicable in this context. The accountability and free riding seems easy to detect within a dyadic relationship according the respondents and Das & Teng (2002).

Individual level and organizational level. As the literature predicted, there could be differences perceived between the individual level and the organizational level (Rousseau, 1985), which is the case in this study. On an individual level, each mechanism is perceived as above average. There are differences noticeable due to the t-test, which may be caused by cultural differences

or collaboration years. On organizational level, a different factor seems to influence the relationship. As stated before, different business goals seem to negatively influence the trust level at the organizational level, while on the individual level, the trust is perceived as high.

5.1 Limitations and future research directions

As every study, this study acknowledge some limitations. The limitations will be described below. At the end some managerial recommendations and directions for future research will be provided.

The study included two dyadic and one triadic relationship within the network of a large multinational organization. An advantage, which needs to be marked, is that there is controlled for organizational cultural differences by doing research within the multinational organization among different business units. All the participated organizations have business principles imposed from above and need to work regarding these principles. Also the cooperative structure in which the organization needs to work with each other, is imposed from above.

The *first limitation* can be found in this research context. As described before, this study included a comparison of a dyad with a triad as a moderator. The quantitative results revealed no significant effect of this moderation effect on the relationship between affective commitment, goodwill trust and the quality of transferred tacit knowledge. As the structure represented on paper to be a triad, the qualitative study revealed something different. One respondent clarifies that the relationships felt more like dyadic relationships. Another respondent adds that the triad was not felt as such, due to the weak relationship with BU 3, which was in his perception disconnected with his own business unit. So this would negatively influence the comparison between a dyad and triad, as the relationships can be seen as dyadic relationships.

The scope of this context can be argued as a *second limitation*. The study included only people who are involved regarding a particular kind of knowledge. These people represent only a small scope of the whole population of the business units. Results of this study can only be generalized for people within the same business. Despite of this small scope, almost for each business unit a sample of 30% of the total population is reached. Only the business unit from India did not reach this limit. Only one respondent has completely filled in the questionnaire. In this perspective, the results from this business unit are subjected to bias. The manager of this

unit also didn't participate in the qualitative part, the interviews. Therefore their perspective and explanation on organizational level is lacking. That might be seen as a true limitation for this research, as it could have provided more insight in the quantitative results.

The following *third limitation* may be related to the latter limitation. The questionnaires were distributed through the managers. So the researcher lacked the opportunity to control for the people who filled in the questionnaire and was furthermore not in direct contact with the sample. Which might negatively influenced the response rate. However, a pro-argument can also be given for this approach. When managers asked to fill in the questionnaire, the motivation could be higher. But that discussion will be disregarded and recorded as a possible limitation.

Fourth, a limitation is the design of this study, which was a comparative case study, where only two dyadic relationships were compared with one triadic relationship. The number of compared relationships is relatively low, which negatively influences the generalizability of this study. Furthermore, this study had a response of n = 32 for the dyadic relationship and for the triadic relationship n = 34. These numbers might have lowered the statistical power to find at least moderate effect of these moderation variables. Within this design, there is chosen for a cross-sectional design, which lowers the internal validity, as only in one point of time the study is conducted.

Another limitation, which might have negatively influenced the results of this study, is the construction of the mechanism goodwill trust. The original scale included 5 items, in this study two items were deleted from this scale. With that reasoning, the results of this construct may be subjected to random measures and perhaps therefore the relationship between goodwill trust and quality of transferred tacit knowledge was not found to be significant.

Final, the study included four control variables; tacit knowledge transfer frequency, previous R&D cooperation experience with the partnering organization(s), size and culture. These control variables were added to control for influences on the relationship between affective commitment and goodwill trust on the quality of transferred tacit knowledge. However, as indicated by the qualitative results, the study has disregarded the influence of different business goals. As a respondent argues that this is applicable for his organization at the organization level, this can be seen as a limitation for this study. The influence of these different business goals is also acknowledged by the literature.

Directions for future research

Derived from this study some directions for future research can be formulated. *First*, in order to do a proper analysis and be able to receive results which represent the investigated relationships, a large sample is needed to retrieve enough statistical power. A wider scope for each business unit is recommended. In this study only two dyadic relationships and one triadic relationship are examined. Probably that resulted in low statistical power in order to receive useful results. Another argument to enlarge the sample is to make the results more generalizable. A *second* recommendation is perhaps to split the sample in separated dyads and triads to receive enough cases and also to be sure that these organizations are not indirect connected with each other, which might influence the results. *Thirdly*, as in this study different business goals affected the goodwill trust among some organizations, it is advised in future research to include this in the study as well. *Another direction for future research* is to focus on the triad. In particular how the triad works related to unintended knowledge spillover or opportunistic behaviour. In the literature there are still some contradictions noticeable about this phenomenon (Simmel, 1964; Das & Teng, 2002). Future research should provide more in depth insight. As in this study can be seen as pro-argument to conduct the research within a multinational among different business units with a global approach, it can also be a *recommendation* to do research among independent organizations, to fully expose cultural differences. This study was conduct only at one point in time, a *last recommendation* can be to do a longitudinal study to receive even more data.

Managerial recommendations

It is important to notice the benefits of whether cooperating in dyads or triads. Das & Teng (2002) argue that in a dyadic relationship you have direct insight in what the other does with your transferred knowledge and therefore lowers the chance of opportunistic behavior. In a triadic relationship this seems to be more difficult to indicate, because not every triad cooperates in practice as a full triadic relationship, as was the case in this study. Simmel (1964) at the other hand, argues that within the triad, two-against-one social pressures can be formed to reduce this chance of opportunistic behavior. Knowing the mechanisms of each cooperative structure, described in the literature review, will bring full advantage of the cooperative context and therefore even further increases the quality of transferred tacit knowledge.

Another recommendation, on organizational level as well as on the individual level, is to have a clear view on what every party adds to the relationship, or in this context in the network.

When this is the case, transparency and openness can be fully exposed. Derived from the interviews, these aspects were frequently addressed by the respondents.

Furthermore, this study addressed that perceptions on the organizational level are not per se the same at the individual level. When looking in terms of transparency and openness or in this case affective commitment and goodwill trust, they might differ for each level. It is important to notice these differences. The trust level at the organizational level might be not perceived as high, as long as the trust level at the individual level is perceived is as high. As the knowledge transfer has its basis on the individual level.

6. Conclusion

The aim of the study was to provide insight in the following research question: *To what extent and in what way do affective commitment and goodwill trust influence the quality of the transferred tacit knowledge in R&D cooperations, and how do these relationships differ between a dyad and triad?* In order to provide an answer to research question, the study has been conducted with a comparative case study design. The results of this study support the positive relationship of affective commitment and goodwill trust on the quality of transferred tacit knowledge. However, only affective commitment is found to have a significance influence. These findings were supported for both the quantitative as qualitative results. The moderation effect did not show any significant influence. As described in the discussion section, this might be caused by the absence of the triad in reality and also by the statistical power problem of this study. Therefore, further research is needed to expose differences between dyads and triads.

Separated from this research question, a t-test among the different locations provide insight in different perceptions of affective commitment and the quality of transferred tacit knowledge for some of the organizations. These differentiations are clarified through cultural differences, collaboration years and different business goals.

References

Albanese, R., & Van, F. D. D. (1985). Rational Behavior in Groups: The Free-Riding
Tendency. *Academy of Management Review, 10,* 2, 244-255

Allen, N. J., & Meyer, J. P. (1990). The measurement and antecedents of affective,
continuance and normative commitment to the organization. *Journal of Occupational
Psychology, 63*, 1-18

Allen, N. J., & Meyer, J. P. (1996). Affective, Continuance, and Normative Commitment to
the Organization: An Examination of Construct Validity. *Journal of Vocational
Behavior, 49,* 3, 252-276

Barber, B. (1983). *The logic and limits of trust*. New Brunswick, NJ: Rutgers University Press

Bartlett, MS. (1954). A note on multiplying factors for various chi-squared
approximations. *Joural of the Royal Statistical Society, 16 (Series B)*, 296-298

Barney, J. B., & Hansen, M. H. (1994). Trustworthiness as a Source of Competitive
Advantage. *Strategic Management Journal, 15,* 175-190

Becker, W., & Dietz, J. (2004). R&D cooperation and innovation activities of firms—
evidence for the German manufacturing industry. *Research Policy, 33,* 2, 209-223

Blau, P. M. (1964). *Exchange and power in social life*. New York: J. Wiley

Boland, R. J., & Tenkasi, R. V. (1995). Perspective Making and Perspective Taking in
Communities of Knowing. *Organization Science, 6,* 4, 350-372

Briggs, S. R. and Cheek, J. M. (1986), The role of factor analysis in the development and
evaluation of personality scales. *Journal of Personality, 54*, 106–148

Carmeli, A. (2005). Perceived External Prestige, Affective Commitment, and Citizenship
Behaviors. *Organization Studies, 26,* 3, 443-464

Cavusgil, S.T., Calantone, R.J., & Zhao, Y. (2003). Tacit knowledge transfer and firm
innovation capability. *Journal of Business & Industrial Marketing, 18,* 1, 6-21

Chiu, C.-M., Hsu, M.-H., & Wang, E. T. G. (2006). Understanding knowledge sharing in
virtual communities: An integration of social capital and social cognitive
theories. *Decision Support Systems, 42,* 3, 1872-1888

Coff, R., & Rousseau, D.J.V.I. (2000). 'Sustainable Competitive Advantage from Relational
Wealth,' *in Relational Wealth: The Advantages of Stability in a Changing Economy*.
eds. C.R. Leana and D.M. Rousseau. New York: Oxford University Press

Cohen, J. (2013). *Statistical power analysis for the behavioral sciences*. Routledge Academic.

Coleman, J.S. (1988) Social capital in the creation of human capital. *American Journal of Economic Sociology 94*, 95–119

Coleman, J. S. (1990). *Foundations of social theory*. Cambridge, Ma: Harvard University Press

Das, T.K. & Teng, B.S. (2001). Trust, control, and risk in strategic alliances: An integrated framework. *Organization Studies, 22, 2*, 251-283

Das, T. K., & Teng, B.S. (2002). Alliance Constellations: A Social Exchange Perspective. *Academy of Management Review, 27,* 445-456

Dhanaraj, C., Lyles, M. A., Steensma, H. K., & Tihanyi, L. (2004). Managing tacit and explicit knowledge transfer in IJVs : the role of relational embeddedness and the impact on performance. *Journal of International Business Studies, 35,* 5, 428-442

Dul, J., & Hak, T. (2008). *Case study methodology in business research*. Amsterdam: Butterworth-Heinemann/Elsevier

Ekeh, P. P., (1974). *Social exchange theory: Two traditions.* Princeton. NJ: Princeton University press

Emerson, R. M., (1972). Exchange theory part 1: a psychological basis for social exchange. In: Berger. J., Zelditch. M., Jr., & Anderson. B. (Eds.). *Sociological Theories in Progress, 2.* Houghton-Mifflin, Boston, 38-57

Gerring, J. (2007). *Case study research: Principles and practices*. Cambridge, UK: Cambridge University Press

Granovetter, M. (1973). *The strength of weak ties. American Journal of Sociology 78*, 1360–1389

Granovetter, M. (1985). Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology, 91,* 3

Grant, R. M. (1996). Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal, 17,* 109-122

Gulati, R., & Gargiulo, M. (1999). Where Do Interorganizational Networks Come From?. *American Journal of Sociology, 104,* 5, 1439-1438

Gulati, R., & Singh, H. (1998). The Architecture of Cooperation: Managing Coordination Costs and Appropriation Concerns in Strategic Alliances. *Administrative Science Quarterly, 43,* 4, 781-814

Hagen, J. M. (1998). Trust in Japanese interfirm relations: institutional sanctions matter. *Academy of Management Review, 23,* 3, 589-600

Hansen, M. T. (1999). The Search-Transfer Problem: The Role of Weak Ties in Sharing

Knowledge across Organization Subunits. *Administrative Science Quarterly, 44,* 1, 82-111

Hislop, D. (2003). Linking human resource management and knowledge management via commitment: A review and research agenda. *Employee Relations, 25,* 2, 182-202

Hofstede, G., & Hofstede, G. J. (2005). *Cultures and organizations: Software of the mind*. New York, N.Y: McGraw-Hill.

Hooff, . B., & Ridder, . J. A. (2004). Knowledge sharing in context: the influence of organizational commitment, communication climate and CMC use on knowledge sharing. *Journal of Knowledge Management, 8,* 6, 117-130

Howells, J. R. L. (2002). Tacit Knowledge, Innovation and Economic Geography. *Urban Studies, 39,* 871-884

Kaiser, H. F. (1970). A second generation little jiffy. *Psychometrika, 35,* 4, 401-415

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39,* 1, 31-36

Kelly, M. J., Schaan, J., & Joncas, H. (2002). Managing alliance relationships: key challenges in the early stages of collaboration. *R&D Management, 32, 1*, 11-22

Konovsky, M. A., & Cropanzano, R. (1991). Perceived fairness of employee drug testing as a predictor of employee attitudes and job performance. *Journal of Applied Psychology, 76,* 5, 698-707

Kovačič, H. (2008). The process of knowledge transfer: Applying situational and network data. *Managing Diversity*

Krackhardt, D. (1990). Assessing the Political Landscape: Structure, Cognition, and Power in Organizations. *Administrative Science Quarterly, 35,* 2, 342

Levine, S., & White, P. E. (1961). Exchange as a Conceptual Framework for the Study of Interorganizational Relationships. *Administrative Science Quarterly, 5,* 4, 583-601

Liyanage, C., Elhag, T., Ballal, T., & Li, Q. (2009). Knowledge communication and translation – a knowledge transfer model. *Journal of Knowledge Management, 13,* 3, 118-131.

McEvily, B., Perrone, V., & Zaheer, A. (2003). Trust as an Organizing Principle. *Organization Science, 14,* 1, 91-103

Mathieu, J. E., & Zajac, D. M. (1990). A review and meta-analysis of the antecedents, correlates, and consequences of organizational commitment.*Psychological Bulletin, 108,* 2, 171-194

Matzler, K., Renzl, B., Mooradian, T., von, K. G., & Mueller, J. (2011). Personality traits,

affective commitment, documentation of knowledge, and knowledge sharing. *The International Journal of Human Resource Management, 22,* 2, 296-310

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An Integrative Model of Organizational Trust. *The Academy of Management Review, 20,* 3, 709-734

Meyer, J. P., & Allen, N. J. (1991). A three-component conceptualization of organizational commitment. *Human Resource Management Review, 1,* 1, 61-89

Meyer, J. P., & Allen, N. J. (1997). *Commitment in the workplace: Theory, research, and application.* Thousand Oaks, CA. Sage Publications

Mohr, J. J., & Sohi, R. S. (1995). Communication flows in distribution channels: Impact on assessments of communication quality and satisfaction. *Journal of Retailing, 71,* 4, 393-415

Monroy, . M. F., & Alzola, . L. M. (2005). An analysis of quality management in franchise systems. *European Journal of Marketing, 39,* 585-605

Nahapiet, J., & Ghoshal, S. (1998). Social Capital, Intellectual Capital, and the Organizational Advantage. *Academy of Management Review, 23,* 3, 242-266

Nonaka, I. (1991). *The knowledge-creating company*. Boston: Harvard Business School Press, 96-104

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5*(1), 14-37

Nonaka, I., & Konno, N. (1998). The Concept of "Ba": Building a Foundation for Knowledge Creation. *California Management Review, 40,* 3, 40-54

Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation. *Long Range Planning, 33,* 1, 5-34

O'Reilly, C. A., & Chatman, J. (1986). Organizational commitment and psychological attachment: The effects of compliance, identification, and internalization on prosocial behavior. *Journal of Applied Psychology, 71,* 3, 492-499

Ouchi, W. G. (1980). Markets, Bureaucracies, and Clans. *Administrative Science Quarterly, 25,* 1, 129-141

Pallant, J. (2010). *SPSS survival manual: A step by step guide to data analysis using SPSS*. Maidenhead: Open University Press/McGraw-Hill

Parkhe, A. (1993). Partner Nationality and the Structure-Performance Relationship in Strategic Alliances. *Organization Science, 4,* 2, 301-324

Polanyi, M. (1967). *The tacit dimension*. Gardin City, NY: Anchor Books

Provan, K*.,* Fish, A*., &* Sydow, J. *(*2007*).* Interorganizational Networks at the Network Level:

A Review of the Empirical Literature on Whole Networks. *Journal of Management 33,* 3, 479–516

Reagans, R., & McEvily, B. (2003). Network Structure and Knowledge Transfer : The Effects of Cohesion and Range. *Administrative Science Quarterly, 48,* 2, 240-267

Ring, P. S., & Van, . V. A. H. (1994). Developmental Processes of Cooperative Interorganizational Relationships. *Academy of Management Review, 19,* 1, 90-118

Ritchie, J., & Lewis, J. (2003). *Qualitative research practice: A guide for social science students and researchers*. London: Sage

Rousseau, D. M. (1985). Issues of Level in Organizational Research: Multi-level and Cross-level Perspectives. In L. Cummings and B. Staw, (Eds), *Research in Organizational Behavior, 7*: 1-37. Greenwhich, CT: JAI Press

Sheremata, W. A. (2000). Centrifugal and Centripetal Forces in Radical New Product Development Under Time Pressure. *Academy of Management Review, 25,* 389-408

Simmel, G., & Wolff, K. H. (1964). *The sociology of Georg Simmel*. New York: The Free Press

Sitkin, S. B., & Roth, N. L. (1993). Explaining the Limited Effectiveness of Legalistic "Remedies" for Trust/ Distrust. *Organization Science, 4,* 3, 367-392

Storey, J., & Quintas, P. (2001). *Knowledge Management and HRM. Human Resource Management: A Critical Test*. London: Thomson Learning

Szulanski, G. (2000). The Process of Knowledge Transfer: A Diachronic Analysis of Stickiness. *Organizational Behavior and Human Decision Processes, 82,* 1, 9-27

Takahashi, N. (2000). The emergence of generalized exchange. *American Journal of Sociology*, 1105-1134

Tsai, W., & Ghoshal, S. (1998). Social capital and value creation: the role of intrafirm networks. *Academy of Management Journal, 41,* 4, 464-476

Uehara, E. (1990). Dual Exchange Theory, Social Networks, and Informal Social Support. *American Journal of Sociology, 96,* 3

von, Krogh. G. (1998). Care in Knowledge Creation. *California Management Review, 40,* 3, 133-153

Wang, Y. D., & Emurian, H. H. (2005). An overview of online trust: Concepts, elements, and implications. *Computers in Human Behavior, 21,* 1, 105-125

Wasserman, S., & Faust, K. (1994) *Social Network Analysis: Methods and application*, New York: Cambridge University Press

Wijk, van. R., Jansen, J. J. P., & Lyles, M. A. (2008). Inter- and Intra-Organizational

Knowledge Transfer: A Meta-Analytic Review and Assessment of its Antecedents and Consequences. *Journal of Management Studies, 45,* 4, 830-853

Williamson, O. E. (1985). *The economic institutions of capitalism: Firms, markets, relational contracting*. New York: The Free Press

Yin, R. K. (2003). *Case study research: Design and methods*. Thousand Oaks, CA: Sage Publications

Yoon, J., Thye, S. R., & Lawler, E. J. (2013). Exchange and cohesion in dyads and triads: A test of Simmels hypothesis. *Social Science Research, 42,* 6, 1457-1466

Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science, 9,* 2, 141-159

Appendices

Appendix A: Operationalization table

Appendix B: Letter host organization

Appendix C: Letter among business units

Appendix D: Questionnaire

Appendix E: Hierarchical multiple regression (OLS) + P-P plot

Appendix F: T-tests

Appendix G: Topic list interviews

Appendix H: Scheme corresponding respondents

Appendix I: List of codes

Appendix J: Coding matrices respondents

Appendix K: Transcripts with coding

Appendix A: Operationalization table

Concept	Definition	Indicator	Calculation of scores
Quality of transferred tacit knowledge	The quality of transferred tacit knowledge refers to its timeliness, accuracy, relevance, objective, completeness and usefulness Chiu, Hsu & Wang (2006).	- The transferred tacit knowledge is timely - The transferred tacit knowledge is accurate - The transferred tacit knowledge is objective - The transferred tacit knowledge is complete	Seven point Likert scale, ranging from 1 = strongly disagree, 4 = neither agree nor disagree, 7 = strongly agree
Affective commitment	A general positive feeling towards the exchange partner and expresses the extent to which an organization wants to maintain their relationship with that partner (Allen & Meyer, 1990; Konovsky & Cropanzano, 1991)	- I have a strong sense of loyalty in the relationship with BU X - My positive feelings towards BU X is the major reason to continue the relationship - Even if other organizations would offer us better conditions, I will continue the relationship with BU X - I am patient with BU X when it makes mistakes that cause us trouble	Seven point Likert scale, ranging from 1 = strongly disagree, 4 = neither agree nor disagree, 7 = strongly agree
Goodwill trust	A party's belief in the good faith, good intentions and integrity to fulfil his role in the relationship (Das & Teng, 2001).	- BU X has always been evenhanded in its negotiations with me - BU X may use opportunities that arise to profit at our expense	Seven point Likert scale, ranging from 1 = strongly disagree, 4 = neither agree nor disagree, 7 = strongly agree

Concept	Definition	Indicator	Calculation of scores
Goodwill trust	A party's belief in the good faith, good intentions and integrity to fulfil his role in the relationship (Das & Teng, 2001).	- I am hesitant to transact with BU X when the specifications are vague (tacit) - BU X is trustworthy	Seven point Likert scale, ranging from 1 = strongly disagree, 4 = neither agree nor disagree, 7 = strongly agree
Control variable (1): Tacit knowledge transfer frequency	Frequency of knowledge exchange	- My BU transfers ... tacit knowledge with BU X	Daily, 2-3 times a week, once a week, 2-3 a month, once a month, less than once a month, and never
Control variable (2): previous R&D cooperation experience with the partnering firm(s)	Cooperation experience with the current partners	- The partnership with BU X exists ... years	Dropdown ranging from <1 to >20.
Control variable (3): size	Amount of employees of the R&D departments	- How many employees does your BU employ?	<10, 10-14, 15-20, 21-25, 26-30, >30
Control variable (4): Culture	*"Culture consists of the unwritten rules of the social game. It is the collective programming of the mind that distinguishing the members of a group or category of people from others"* (Hofstede & Hofstede, 2005: 3)	- I am employed by ...	BU 1, BU 2, BU 3, BU 4, BU 5

Appendix B: First letter

Geachte heer/mevrouw,

Bent u geïnteresseerd in het verhogen van kennis overdracht tussen organisaties en het vergroten van de kans op succesvolle samenwerking? Lees dan vooral deze brief.

Mijn naam is Roel Verhagen en momenteel ben ik bezig met het schrijven van mijn thesis voor de master Organization Studies aan de Universiteit van Tilburg. De thesis focust zich op het kennis overdracht dilemma tussen samenwerkende organisaties. Succesvolle coöperaties staan bekend om de vrije overdracht van kennis. Echter, is er altijd de kans dat deze kennis voor andere doeleinden wordt gebruikt. Is het daardoor nog wel verstandig om de kennis met hoge kwaliteit te transfereren? De vergelijking tussen een samenwerkingsverband tussen twee organisaties (dyad) en drie organisaties (triad), biedt inzicht in dit dilemma. Beiden samenwerkingsstructuren hebben verschillende mechanismes die een invloed hebben op de kwaliteit van kennis overdracht. De vraag in dit onderzoek is daarbij, leidt een dyad of triad tot een hogere kwaliteit van kennis overdracht en dus tot een succesvollere samenwerking?

Voor mijn thesis ben ik op zoek naar een organisatie met één dyad en één triad. Het doel is om per organisatie een enquête uit te zetten onder de R&D medewerkers en een interview te houden met de R&D manager. De thesis wordt verder ondersteund door Prof. Dr. Ir. V.A. Gilsing en Prof. Dr. L. Oerlemans vanuit de Universiteit van Tilburg. Bij afronding van mijn thesis wil ik u graag mijn onderzoeksresultaten en conclusie voorleggen.

Ik hoop dat deze korte introductie een duidelijk beeld creëert over mijn thesis en wat de voordelen kunnen zijn voor uw organisatie. Graag hoor ik van u of er een mogelijkheid is om mijn master thesis bij uw organisatie uit te kunnen voeren. Ik ben meer dan bereid om verdere informatie over het onderzoek toe te lichten in een persoonlijk gesprek.

Ik kijk uit naar uw reactie.

Met vriendelijke groet,

Roel Verhagen

Appendix C: Letter among business units

Dear …,

My name is Roel Verhagen, and currently I am following the Master Organizations Studies at Tilburg University the Netherlands. Finishing my master thesis is the last hurdle I have to take for graduation. This thesis will be conducted in conjunction with R&D manager of BU 1, and will be mentored by Prof. Dr. Ir. V.A. Gilsing and Prof. Dr. L. Oerlemans from the Tilburg University.

The focus point of this thesis is at the knowledge transfer dilemma between cooperating organizations. Successful cooperations are well known of their free transfer of knowledge between the partners. However, there is always the chance of unintended knowledge spill over towards other parties, which may harm the organization its competitive advantage. Should the organization, with this reasoning, still transfer their core knowledge with high quality? The comparison between a cooperation between two partners (dyad) and three partners (triad), provides insight in this dilemma. Both cooperative structures have different mechanisms which influence the quality of the transferred knowledge. With this thesis, I try to provide an answer on which cooperative structure, the dyad or the triad, leads to higher quality of the transferred knowledge. Insight in the quality of transferred knowledge may further increase the inter-organizational knowledge transfer and the chance of collaboration success.

Together with the manager of BU 1, I selected two dyadic relationships for this study: BU 1 – BU 2, and BU 1 – BU 5. And one triadic relationship: BU 1 – BU 3 – BU 4. That is the reason why I conduct you for cooperating within this study. The study will be conducted at two levels, a questionnaire among the employees, which will only take ten minutes of their time. In a later stage I would like to interview you as well, in order to get insight at the organizational level.

I hope this short introduction of my thesis provides a clear overview and emphasizes the importance for the large multinational organization. In the next mail, I would like to provide you further instructions and the link of the questionnaire. If you want some more background information or have some further question, I am more than willing to provide you the answers. Thanks in advance for your cooperation. With kind regards, Roel Verhagen

Appendix D: Questionnaire

Introduction

Hi,

My name is Roel Verhagen, as part of the graduation for my Master Organization Studies at Tilburg University, I am conducting a study at a large multinational organization on the quality of the transferred tacit knowledge between two (dyad) and three cooperating organizations (triad). Insight in the quality of the transferred tacit knowledge will may further increase inter-organizational knowledge transfer and increase the chance of collaboration success.

Tacit knowledge is knowledge that's difficult to write down, visualize or transfer from one person, group or organization towards another. Tacit knowledge is described as "the know-how" or "personal knowledge". The knowledge is rooted in the individual's skills, routines, actions, ideas and values. Examples of tacit knowledge are:
- Car driving
- Throwing a ball

These examples may serve as a tool to answer the question that are related to tacit knowledge. Please read the questions and statements carefully. The answers are divided in a scale ranging from strongly disagree to strongly agree.

Your anonymity will be guaranteed and the answers will be kept strictly confidential. Completing the questionnaire will take only 10 minutes of your time.

Thanks in advance for your cooperation.

With kind regards,

Roel Verhagen

General information

At the moment, I am employed by

○ BU 1

○ BU 2

○ BU 3

○ BU 4

○ BU 5

How many people does your department employ?

○ <10

○ 10-14

○ 15-20

○ 21-25

○ 26-30

○ >30

The following questions needs to be filled in by BU 5

The partnership with **BU 1** exist ... years
Years [　　　　　▼]

Dropdown list from 0 to > 20

My organization transfers ... tacit knowledge towards **BU 1**

○ Daily

○ 2-3 Times a Week

○ Once a Week

○ 2-3 Times a Month

○ Once a Month

○ Less than Once a Month

○ Never

I am in direct contact or transfer tacit knowledge directly with **BU 1**

○ Yes

○ No

The following statements are regarding the partnership with **BU 1**

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is timely	○	○	○	○	○	○	○
I am patient with BU 1 when it makes mistakes that cause us trouble	○	○	○	○	○	○	○
BU 1 may use opportunities that arise to profit at our expense	○	○	○	○	○	○	○
The transferred tacit knowledge is accurate	○	○	○	○	○	○	○
I have a strong sense of loyalty in the relationship with BU 1	○	○	○	○	○	○	○
The transferred tacit knowledge is useful	○	○	○	○	○	○	○
BU 1 has always been evenhanded in its negotiations with me	○	○	○	○	○	○	○
My positive feeling towards BU 1 is the major reason to continue the relationship	○	○	○	○	○	○	○
The transferred tacit knowledge is objective	○	○	○	○	○	○	○
BU 1 is trustworthy	○	○	○	○	○	○	○
I am hesitant to transact with BU 1 when the specifications are vague	○	○	○	○	○	○	○
Even if other organizations would offer us better conditions, I will continue the relationship with BU 1	○	○	○	○	○	○	○

The following questions needs to be filled in by BU 1

The partnership with **BU 2** exist ... years

Years ⬚ ▼

My organization transfers ... tacit knowledge towards **BU 2**

○ Daily

○ 2-3 Times a Week

○ Once a Week

○ 2-3 Times a Month

○ Once a Month

○ Less than Once a Month

○ Never

I am in direct contact or transfer tacit knowledge directly with **BU 2**

○ Yes

○ No

The following statements are regarding the partnership with **BU 2**

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is timely	○	○	○	○	○	○	○
I am patient with BU 2 when it makes mistakes that cause us trouble	○	○	○	○	○	○	○
BU 2 may use opportunities that arise to profit at our expense	○	○	○	○	○	○	○
The transferred tacit knowledge is accurate	○	○	○	○	○	○	○
I have a strong sense of loyalty in the relationship with BU 2	○	○	○	○	○	○	○
The transferred tacit knowledge is useful	○	○	○	○	○	○	○
BU 2 has always been evenhanded in its negotiations with me	○	○	○	○	○	○	○
My positive feeling towards BU 2 is the major reason to continue the relationship	○	○	○	○	○	○	○
The transferred tacit knowledge is objective	○	○	○	○	○	○	○
BU 2 is trustworthy	○	○	○	○	○	○	○
I am hesitant to transact with BU 2 when the specifications are vague	○	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
Even if other organizations would offer us better conditions, I will continue the relationship with BU 2	○	○	○	○	○	○	○

The partnership with **BU 5** exist ... years

Years [▼]

My organization transfers ... tacit knowledge towards **BU 5**

○ Daily

○ 2-3 Times a Week

○ Once a Week

○ 2-3 Times a Month

○ Once a Month

○ Less than Once a Month

○ Never

I am in direct contact or transfer tacit knowledge directly with **BU 5**

○ Yes

○ No

The following statements are regarding the partnership with **BU 5**

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is timely	○	○	○	○	○	○	○
I am patient with BU 5 when it makes mistakes that cause us trouble	○	○	○	○	○	○	○
BU 5 may use opportunities that arise to profit at our expense	○	○	○	○	○	○	○
The transferred tacit knowledge is accurate	○	○	○	○	○	○	○
I have a strong sense of loyalty in the relationship with BU 5	○	○	○	○	○	○	○
The transferred tacit knowledge is useful	○	○	○	○	○	○	○
BU 5 has always been evenhanded in its negotiations with me	○	○	○	○	○	○	○
My positive feeling towards BU 5 is the major reason to continue the relationship	○	○	○	○	○	○	○
The transferred tacit knowledge is objective	○	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
BU 5 is trustworthy	○	○	○	○	○	○	○
I am hesitant to transact with BU 5 when the specifications are vague	○	○	○	○	○	○	○
Even if other organizations would offer us better conditions, I will continue the relationship with BU 5	○	○	○	○	○	○	○

The partnership with **BU 3** exist ... years

Years [▼]

My organization transfers ... tacit knowledge towards **BU 3**

○ Daily

○ 2-3 Times a Week

○ Once a Week

○ 2-3 Times a Month

○ Once a Month

○ Less than Once a Month

○ Never

I am in direct contact or transfer tacit knowledge directly with **BU 3**

○ Yes

○ No

The following statements are regarding the partnership with **BU 3**

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is timely	○	○	○	○	○	○	○
I am patient with BU 3 when it makes mistakes that cause us trouble	○	○	○	○	○	○	○
BU 3 may use opportunities that arise to profit at our expense	○	○	○	○	○	○	○
The transferred tacit knowledge is accurate	○	○	○	○	○	○	○
I have a strong sense of loyalty in the relationship with BU 3	○	○	○	○	○	○	○
The transferred tacit knowledge is useful	○	○	○	○	○	○	○
BU 3 has always been evenhanded in its negotiations with me	○	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
My positive feeling towards BU 3 is the major reason to continue the relationship	○	○	○	○	○	○	○
The transferred tacit knowledge is objective	○	○	○	○	○	○	○
BU 3 is trustworthy	○	○	○	○	○	○	○
I am hesitant to transact with BU 3 when the specifications are vague	○	○	○	○	○	○	○
Even if other organizations would offer us better conditions, I will continue the relationship with BU 3	○	○	○	○	○	○	○

The partnership with **BU 4** exist ... years

Years [▼]

My organization transfers ... tacit knowledge towards **BU 4**

○ Daily

○ 2-3 Times a Week

○ Once a Week

○ 2-3 Times a Month

○ Once a Month

○ Less than Once a Month

○ Never

I am in direct contact or transfer tacit knowledge directly with **BU 4**

○ Yes

○ No

The following statements are regarding the partnership with **BU 4**

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is timely	○	○	○	○	○	○	○
I am patient with BU 4 when it makes mistakes that cause us trouble	○	○	○	○	○	○	○
BU 4 may use opportunities that arise to profit at our expense	○	○	○	○	○	○	○
The transferred tacit knowledge is accurate	○	○	○	○	○	○	○
I have a strong sense of loyalty in the relationship with BU 4	○	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is useful	○	○	○	○	○	○	○
BU 4 has always been evenhanded in its negotiations with me	○	○	○	○	○	○	○
My positive feeling towards BU 4 is the major reason to continue the relationship	○	○	○	○	○	○	○
The transferred tacit knowledge is objective	○	○	○	○	○	○	○
BU 4 is trustworthy	○	○	○	○	○	○	○
I am hesitant to transact with BU 4 when the specifications are vague	○	○	○	○	○	○	○
Even if other organizations would offer us better conditions, I will continue the relationship with BU 4	○	○	○	○	○	○	○

The following questions needs to be filled in by BU 2

The partnership with **BU 1** exist ... years

Years [▼]

My organization transfers ... tacit knowledge towards **BU 1**

○ Daily

○ 2-3 Times a Week

○ Once a Week

○ 2-3 Times a Month

○ Once a Month

○ Less than Once a Month

○ Never

I am in direct contact or transfer tacit knowledge directly with **BU 1**

○ Yes

○ No

The following statements are regarding the partnership with **BU 1**

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is timely	○	○	○	○	○	○	○
I am patient with BU 1 when it makes mistakes that cause us trouble	○	○	○	○	○	○	○
BU 1 may use opportunities that arise to profit at our expense	○	○	○	○	○	○	○
The transferred tacit knowledge is accurate	○	○	○	○	○	○	○
I have a strong sense of loyalty in the relationship with BU 1	○	○	○	○	○	○	○
The transferred tacit knowledge is useful	○	○	○	○	○	○	○
BU 1 has always been evenhanded in its negotiations with me	○	○	○	○	○	○	○
My positive feeling towards BU 1 is the major reason to continue the relationship	○	○	○	○	○	○	○
The transferred tacit knowledge is objective	○	○	○	○	○	○	○
BU 1 is trustworthy	○	○	○	○	○	○	○
I am hesitant to transact with BU 1 when the specifications are vague	○	○	○	○	○	○	○
Even if other organizations would offer us better conditions, I will continue the relationship with BU 1	○	○	○	○	○	○	○

The following questions needs to be filled in by BU 3

The partnership with **BU 1** exist ... years

Years   [▼]

My organization transfers ... tacit knowledge towards **BU 1**

○   Daily

○   2-3 Times a Week

○   Once a Week

○   2-3 Times a Month

○   Once a Month

○   Less than Once a Month

○   Never

I am in direct contact or transfer tacit knowledge directly with **BU 1**

○ Yes

○ No

The following statements are regarding the partnership with **BU 1**

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is timely	○	○	○	○	○	○	○
I am patient with BU 1 when it makes mistakes that cause us trouble	○	○	○	○	○	○	○
BU 1 may use opportunities that arise to profit at our expense	○	○	○	○	○	○	○
The transferred tacit knowledge is accurate	○	○	○	○	○	○	○
I have a strong sense of loyalty in the relationship with BU 1	○	○	○	○	○	○	○
The transferred tacit knowledge is useful	○	○	○	○	○	○	○
BU 1 has always been evenhanded in its negotiations with me	○	○	○	○	○	○	○
My positive feeling towards BU 1 is the major reason to continue the relationship	○	○	○	○	○	○	○
The transferred tacit knowledge is objective	○	○	○	○	○	○	○
BU 1 is trustworthy	○	○	○	○	○	○	○
I am hesitant to transact with BU 1 when the specifications are vague	○	○	○	○	○	○	○
Even if other organizations would offer us better conditions, I will continue the relationship with BU 1	○	○	○	○	○	○	○

The partnership with **BU 4** exist ... years

Years [▼]

My organization transfers ... tacit knowledge towards **BU 4**

○ Daily

○ 2-3 Times a Week

○ Once a Week

○ 2-3 Times a Month

○ Once a Month

○ Less than Once a Month

○ Never

I am in direct contact or transfer tacit knowledge directly with **BU 4**

○ Yes

○ No

The following statements are regarding the partnership with **BU 4**

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is timely	○	○	○	○	○	○	○
I am patient with BU 4 when it makes mistakes that cause us trouble	○	○	○	○	○	○	○
BU 4 may use opportunities that arise to profit at our expense	○	○	○	○	○	○	○
The transferred tacit knowledge is accurate	○	○	○	○	○	○	○
I have a strong sense of loyalty in the relationship with BU 4	○	○	○	○	○	○	○
The transferred tacit knowledge is useful	○	○	○	○	○	○	○
BU 4 has The always been evenhanded in its negotiations with me	○	○	○	○	○	○	○
My positive feeling towards BU 4 is the major reason to continue the relationship	○	○	○	○	○	○	○
The transferred tacit knowledge is objective	○	○	○	○	○	○	○
BU 4 is trustworthy	○	○	○	○	○	○	○
I am hesitant to transact with BU 4 when the specifications are vague	○	○	○	○	○	○	○
Even if other organizations would offer us better conditions, I will continue the relationship with BU 4	○	○	○	○	○	○	○

The following questions needs to be filled in by BU 4

The partnership with **BU 3** exist ... years

Years [▼]

My organization transfers ... tacit knowledge towards **BU 3**

○ Daily

○ 2-3 Times a Week

○ Once a Week

○ 2-3 Times a Month

○ Once a Month

○ Less than Once a Month

○ Never

I am in direct contact or transfer tacit knowledge directly with **BU 3**

○ Yes

○ No

The following statements are regarding the partnership with **BU 3**

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is timely	○	○	○	○	○	○	○
I am patient with BU 3 when it makes mistakes that cause us trouble	○	○	○	○	○	○	○
BU 3 may use opportunities that arise to profit at our expense	○	○	○	○	○	○	○
The transferred tacit knowledge is accurate	○	○	○	○	○	○	○
I have a strong sense of loyalty in the relationship with BU 3	○	○	○	○	○	○	○
The transferred tacit knowledge is useful	○	○	○	○	○	○	○
BU 3 has always been evenhanded in its negotiations with me	○	○	○	○	○	○	○
My positive feeling towards BU 3 is the major reason to continue the relationship	○	○	○	○	○	○	○
The transferred tacit knowledge is objective	○	○	○	○	○	○	○
BU 3 is trustworthy	○	○	○	○	○	○	○
I am hesitant to transact with BU 3 when the specifications are vague	○	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
Even if other organizations would offer us better conditions, I will continue the relationship with BU 3	○	○	○	○	○	○	○

The partnership with **BU 1** exist ... years

Years [▼]

My organization transfers ... tacit knowledge towards **BU 1**

○ Daily

○ 2-3 Times a Week

○ Once a Week

○ 2-3 Times a Month

○ Once a Month

○ Less than Once a Month

○ Never

I am in direct contact or transfer tacit knowledge directly with **BU 1**

○ Yes

○ No

The following statements are regarding the partnership with **BU 1**

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
The transferred tacit knowledge is timely	○	○	○	○	○	○	○
I am patient with BU 1 when it makes mistakes that cause us trouble	○	○	○	○	○	○	○
BU 1 may use opportunities that arise to profit at our expense	○	○	○	○	○	○	○
The transferred tacit knowledge is accurate	○	○	○	○	○	○	○
I have a strong sense of loyalty in the relationship with BU 1	○	○	○	○	○	○	○
The transferred tacit knowledge is useful	○	○	○	○	○	○	○
BU 1 has always been evenhanded in its negotiations with me	○	○	○	○	○	○	○
My positive feeling towards BU 1 is the major reason to continue the relationship	○	○	○	○	○	○	○
The transferred tacit knowledge is objective	○	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
BU 1 is trustworthy	○	○	○	○	○	○	○
I am hesitant to transact with BU 1 when the specifications are vague	○	○	○	○	○	○	○
Even if other organizations would offer us better conditions, I will continue the relationship with BU 1	○	○	○	○	○	○	○

Appendix E: Hierarchical multiple regression (OLS) + P-P plot

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,272[a]	,074	,014	,981
2	,773[b]	,597	,556	,658
3	,773[c]	,598	,550	,663

a. Predictors: (Constant), Transfer, Employees, Location, Years

b. Predictors: (Constant), Transfer, Employees, Location, Years,

Total_trust, Total_aff

c. Predictors: (Constant), Transfer, Employees, Location, Years,

Total_trust, Total_aff, Interaction_aff, Interaction_trust

d. Dependent Variable: Total_tacit

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4,710	4	1,178	1,223	,310[b]
	Residual	58,729	61	,963		
	Total	63,439	65			
2	Regression	37,862	6	6,310	14,556	,000[c]
	Residual	25,577	59	,434		
	Total	63,439	65			
3	Regression	37,941	7	5,420	12,329	,000[d]
	Residual	25,499	58	,440		
	Total	63,439	65			

a. Dependent Variable: Total_tacit

b. Predictors: (Constant), Transfer, Employees, Location, Years

c. Predictors: (Constant), Transfer, Employees, Location, Years, Total_aff Total_trust

d. Predictors: (Constant), Transfer, Employees, Location, Years, Total_aff, Total_trust,

Interaction_aff, Interaction_trust

Model		Unstandardized Coefficients		SD Coefficients			95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	4,265	,590		7,226	,000	3,085	5,446		
	Location	,130	,100	,167	1,310	,195	-,069	,330	,938	1,067
	Employees	,040	,091	,058	,440	,661	-,143	,223	,878	1,139
	Years	,028	,018	,205	1,533	,130	-,008	,064	,847	1,181
	Transfer	-,011	,069	-,023	-,165	,869	-,149	,127	,798	1,252
2	(Constant)	1,021	,630		1,620	,111	-,240	2,281		
	Location	,058	,069	,074	,842	,403	-,080	,195	,888	1,126
	Employees	-,007	,063	-,010	-,109	,913	-,132	,118	,847	1,181
	Years	,018	,012	,130	1,437	,156	-,007	,042	,830	1,205
	Transfer	-,042	,047	-,083	-,889	,377	-,135	,052	,781	1,280
	Total_aff	,648	,093	,664	7,003	,000	,463	,833	,761	1,315
	Total_trust	,152	,104	,137	1,462	,149	-,056	,359	,781	1,281
3	(Constant)	1,039	,636		1,633	,108	-,234	2,312		
	Location	,057	,069	,073	,828	,411	-,081	,196	,888	1,126
	Employees	-,011	,064	-,015	-,167	,868	-,138	,117	,830	1,205
	Years	,017	,012	,124	1,333	,188	-,008	,042	,806	1,241
	Transfer	-,042	,047	-,084	-,887	,379	-,136	,053	,781	1,280
	Total_aff	,647	,093	,663	6,944	,000	,461	,834	,760	1,315
	Total_trust	,145	,105	,131	1,381	,173	-,065	,356	,766	1,305
	Interaction_aff	,016	,036	,039	,441	,661	-,055	,087	,879	1,137
	Interaction_trust	,015	,035	,036	,423	,674	-,055	,084	,933	1,072

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: Mean_tacit
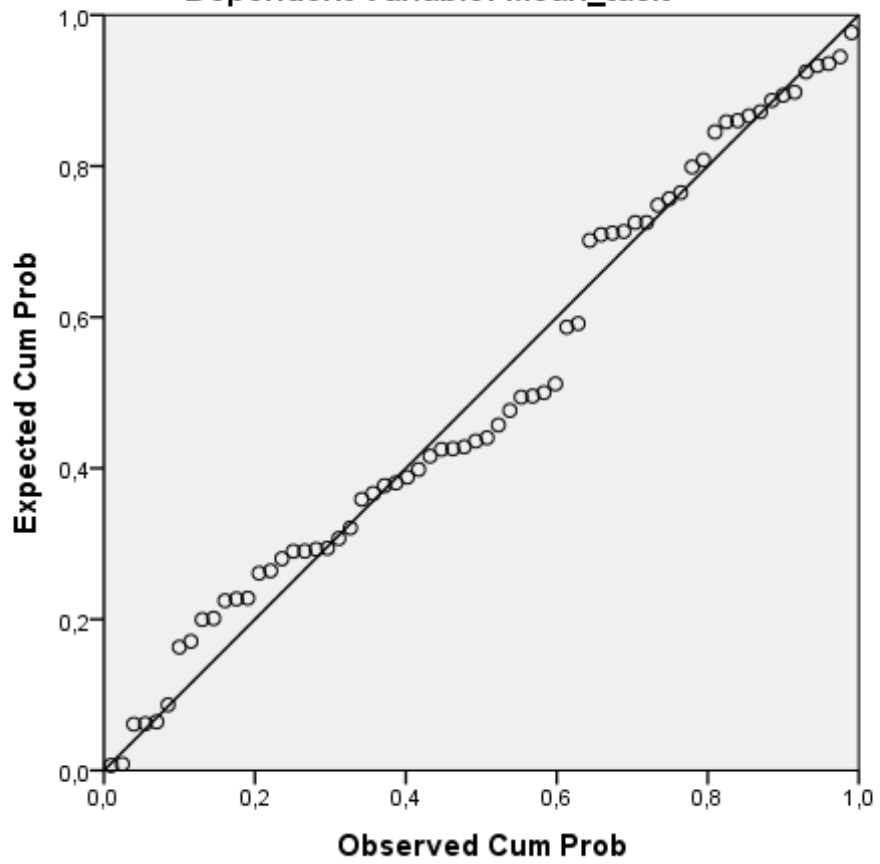
Appendix F: T-tests

Group Statistics

	Dummy_dyadtriad	N	Mean	Std. Deviation	Std. Error Mean
Total_tacit	Dyad	32	4,72	1,019	,180
	Triad	34	4,88	,966	,166

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Total_tacit	EVA	,039	,844	-,670	64	,506	-,164	,244	-,652	,325
	EVNA			-,668	63,157	,506	-,164	,245	-,653	,326

*Equal variance assumed

** Equal variance not assumed

Group Statistics

	Dummy_dyadtriad	N	Mean	Std. Deviation	Std. Error Mean
Total_aff	Dyad	32	4,59	,952	,168
	Triad	34	4,65	1,078	,185
Total_Trust	Dyad	32	4,76	,985	,174
	Triad	34	4,75	,809	,139

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		Lower	Upper
Total_aff	EVA	,069	,794	-,242	64	,810	-,061	,251		-,562	,441
	EVNA			-,243	63,748	,809	-,061	,250		-,560	,439
Total_Trust	EVA	,610	,438	,025	64	,980	,006	,221		-,437	,448
	EVNA			,025	60,129	,980	,006	,223		-,440	,451

Group Statistics

	Location	N	Mean	Std. Deviation	Std. Error Mean
Total_tacit	BU 1	44	4,61	,962	,145
	BU 2	5	5,50	,810	,362
Total_aff	BU 1	44	4,43	,895	,135
	BU 2	5	5,65	,627	,281
Total_Trust	BU 1	44	4,70	,859	,130
	BU 2	5	5,53	1,095	,490

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
							Mean	Std. Error		
		F	Sig.	t	df	Sig. (2-tailed)	Difference	Difference	Lower	Upper
Total_tacit	EVA	,472	,495	-1,977	47	,054	-,886	,448	-1,788	,016
	EVNA			-2,271	5,372	,069	-,886	,390	-1,869	,096
Total_aff	EVA	,580	,450	-2,950	47	,005	-1,218	,413	-2,049	-,387
	EVNA			-3,913	6,032	,008	-1,218	,311	-1,979	-,457
Total_Trust	EVA	,725	,399	-2,010	47	,050	-,836	,416	-1,673	,001
	EVNA			-1,651	4,577	,165	-,836	,507	-2,176	,503

Group Statistics

	Location	N	Mean	Std. Deviation	Std. Error Mean
Total_tacit	BU 1	44	4,61	,962	,145
	BU 3	10	5,08	,866	,274
Total_aff	BU 1	44	4,43	,895	,135
	BU 3	10	4,83	1,185	,375
Total_Trust	BU 1	44	4,70	,859	,130
	BU 3	10	5,00	,916	,290

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Total_tacit	EVA	,698	,407	-1,392	52	,170	-,461	,332	-1,127	,204
	EVNA			-1,488	14,513	,158	-,461	,310	-1,124	,201
Total_aff	EVA	1,223	,274	-1,180	52	,243	-,393	,333	-1,062	,276
	EVNA			-,987	11,444	,344	-,393	,398	-1,265	,479
Total_Trust	EVA	,000	,997	-,995	52	,324	-,303	,305	-,914	,308
	EVNA			-,955	12,849	,357	-,303	,317	-,989	,383

Group Statistics

	Location	N	Mean	Std. Deviation	Std. Error Mean
Total_tacit	BU 1	44	4,61	,962	,145
	BU 4	2	6,50	,354	,250
Total_aff	BU 1	44	4,43	,895	,135
	BU 4	2	6,38	,177	,125
Total_Trust	BU 1	44	4,70	,859	,130
	BU 4	2	4,50	,707	,500

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Total_tacit	EVA	3,381	,073	-2,739	44	,009	-1,886	,689	-3,274	-,498
	EVNA			-6,526	1,782	,030	-1,886	,289	-3,288	-,485
Total_aff	EVA	2,287	,138	-3,037	44	,004	-1,943	,640	-3,233	-,654
	EVNA			-10,567	4,541	,000	-1,943	,184	-2,431	-1,456
Total_Trust	EVA	,562	,457	,318	44	,752	,197	,619	-1,050	1,444
	EVNA			,381	1,139	,762	,197	,517	-4,749	5,143

Group Statistics

	Location	N	Mean	Std. Deviation	Std. Error Mean
Total_tacit	BU 1	44	4,61	,962	,145
	BU 5	5	4,55	,908	,406
Total_aff	BU 1	44	4,43	,895	,135
	BU 5	5	4,20	,942	,421
Total_Trust	BU 1	44	4,70	,859	,130
	BU 5	5	4,13	,558	,249

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Total_tacit	EVA	,152	,699	,141	47	,889	,064	,452	-,846	,973
	EVNA			,148	5,077	,888	,064	,431	-1,040	1,167
Total_aff	EVA	,046	,831	,546	47	,587	,232	,424	-,622	1,085
	EVNA			,524	4,857	,623	,232	,442	-,915	1,379
Total_Trust	EVA	2,342	,133	1,426	47	,161	,564	,395	-,232	1,359
	EVNA			2,005	6,404	,089	,564	,281	-,114	1,241

Group Statistics

	Location	N	Mean	Std. Deviation	Std. Error Mean
Total_tacit	BU 3	10	5,08	,866	,274
	BU 4	2	6,50	,354	,250
Total_aff	BU 3	10	4,83	1,185	,375
	BU 4	2	6,38	,177	,125
Total_Trust	BU 3	10	5,00	,916	,290
	BU 4	2	4,50	,707	,500

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Total_tacit	EVA	2,056	,182	-2,218	10	,051	-1,425	,643	-2,857	,007
	EVNA			-3,842	4,176	,017	-1,425	,371	-2,438	-,412
Total_aff	EVA	2,618	,137	-1,778	10	,106	-1,550	,872	-3,492	,392
	EVNA			-3,925	10,000	,003	-1,550	,395	-2,430	-,670
Total_Trust	EVA	,417	,533	,719	10	,488	,500	,695	-1,049	2,049
	EVNA			,865	1,762	,488	,500	,578	-2,337	3,337

Appendix G: Topic list interviews

General introduction:

- Introduction of the study
- Practical relevance
- Voice recorder
- Confidential, anonymous
- Duration of interview
- Question at this moment?

General questions

- Can you tell me something about the relationship with BU X?
- What is this relationship about?
- What is the goal of this relationship?
- How long does this relationship exists?
- Whom or how many are involved regarding BU X?

Affective commitment:

> *A general positive feeling towards the exchange partner and expresses the extent to which an organization wants to maintain their relationship with that partner*

- Are you known with the construct affective commitment? How would you describe affective commitment?
- How would you transfer this to BU X?
- How is this affective commitment expressed? Can you provide me with an example?
  How would you refer this towards; loyalty, positive feeling, mistakes, other organizations with better conditions
- What are the important factors for this affective commitment?
- What influences this level of affective commitment? How about distance? Culture? Or other factors? Why could this influence the level of commitment?

Goodwill trust:

> *A party's belief in the good faith, good intentions and integrity to fulfil his role in the relationship*

- Can you describe in your own words the definition of goodwill trust?
- How would you transfer this to your relationship with BU X?
- How is this goodwill trust expressed? Can you provide me with an example?
  How would you refer this to; evenhanded, use opportunities, hesitant, trustworthy
- Most important factors for goodwill trust?
- Do you think distance, culture or other factors influence goodwill trust and why do you think so?

Tacit knowledge:

> *Tacit knowledge is knowledge that's difficult to write down, visualize or transfer from one person, group or organization towards another. Tacit knowledge is described as "the know-how" or "personal knowledge". The knowledge is rooted in the individual's skills, routines, actions, ideas and values. Examples of tacit knowledge are: Car driving, Throwing a ball.*

- What is in your perception tacit knowledge?
- Can you provide me with some examples of tacit knowledge?
- What kind of knowledge do you exchange with BU X?
- How many times is the knowledge exchanged?
- How is this knowledge transferred? How long does it usually take to transfer this kind of knowledge?
- How would you describe the transferred knowledge? *Is it accurate, useful, objective and complete?*
- When this kind of knowledge is transferred, do you have insight in what is done with the knowledge by BU X?
- <u>In what way do you think affective commitment and goodwill trust have an influence on the quality of transferred tacit knowledge?</u>
- Opportunities of free riding with the knowledge you transferred? Are you hesitant? Are they trustworthy in your perception? And what causes this trustworthy?

Ending: Thank for cooperation. Results. Further questions or remarks.

Appendix H: Scheme corresponding respondents

Respondent	Function	Organization	#	Dyad/Triad/Ego
Respondent 1	R&D Manager	BU 1	1	Ego
Respondent 2	R&D Department Manager	BU 3	3	Triad
Respondent 3	R&D Director	BU 2	2	Dyad
Respondent 4	Group manager	BU 5	5	Dyad

Appendix I: List of codes

Category	Color	Code	Definition
Relationship	Red	Relationship	Content of the relationship
		Relationship objective	Objective of the relationship
		Relationship age	Age of the relationship
		Change in relationship	Changes within the relationship
		Need to cooperate	Cooperation structure
		Competition	Competition between the partners
Knowledge transfer	Pink	Knowledge transfer	The transfer of knowledge
		Knowledge spill over	Chance of unintended knowledge spillover
		Contact frequency	Frequency of knowledge transfer
Control variables	Orange	Size	Amount of employees involved
		Culture	Culture differences
		Distance	Distance between the partners
Affective commitment	Green	Affective commitment	A general positive feeling towards the exchange partner and expresses the extent to which an organization wants to maintain their relationship with that partner
		Expression	Expression of affective commitment
		Differentiation	Differentiation in affective commitment
		Explanation	Explanation of the differentiation
Goodwill trust	Turquoise	Goodwill trust	A party's belief in the good faith, good intentions and integrity to fulfil his role in the relationship
		Explanation	Explanation of the differentiation in trust
		Hesitant	Hesitant to transfer tacit knowledge
		Opportunities	Opportunities of free riding
		Openness	Being open, transparent to each other
Quality of tacit knowledge transfer	Yellow	Quality	Timeliness, accuracy, relevance, completeness, reliability and adequacy of the knowledge transfer
		Influences	Influences on the quality of knowledge
		Differentiation	Differentiation in the knowledge quality

Category	Color	Code	Definition
Dyad and triad	Blue	Dyad and triad	Influences of the cooperative structure
		Dyadic feeling	Feeling of dyadic relationships
		Communication	Communication within dyad or triad
		Conflict	Conflict resolution within dyad or triad

Appendix J: Coding matrices respondents

This information is left out due confidential issues.

Appendix K: Transcripts

This information is left out due confidential issues.