How Intra-firm Networks Create Value and Liabilities in Micro-level Processes of Global Virtual Teams

By

Pekka Vahtera

PhD Candidate

Leeds University Business School

Centre for International Business University of Leeds (CIBUL)

University of Leeds

Supervised by:

Professor Peter Buckley

Professor Jeremy Clegg

Mr. Adam Cross

Submitted in accordance with the requirements for the degree of Doctor of Philosophy

Submitted for examination on September 2013

The candidate confirms that the work submitted is his/her own and that appropriate credit has been given where reference has been made to the work of others.

Acknowledgements

This thesis has been completed with the help and support of many people.

My first acknowledgement goes to Jonna, my loving fiancée. She has supported me throughout my academic studies in Finland, Australia, and United Kingdom unconditionally for a long time. Her love, support, and encouragement have been my greatest assets in making this dissertation possible.

I would also like to extend my warmest thanks to my family. My Mom has always supported me in every way possible, and encouraged me to further pursue my academic studies. Her advice and assistance have formed the very basis upon which this dissertation is built on. I am also grateful to my sister, who has always been proud of my achievements and highly supportive of my studies.

People in CIBUL have had a remarkable impact on my studies throughout. I have been very proud to be supervised by Peter, Jeremy, and Adam, who have formed an excellent supervisory team. From the day one, I have been very impressed with the amount of time and dedication these academics place into supervising their PhD students. The help and guidance I have received from them has been immensely valuable. Moreover, it has been an absolute pleasure to work with other wonderful people in CIBUL, especially: Mario Kafouros, Hanna Gajewska-De Mattos, Hinrich Voss, Surender Munjal, Liz Mason, Hayley Smith, and Janet Wood.

I would also like to thank the Finnish Cultural Foundation as well as the Foundation for Economic Education (Finland) for their financial support. Scholarships obtained from these foundations have covered the main expenditures involved in crafting this dissertation and therefore made this study possible.

Finally, I would like to thank my colleagues and friends who have made my studies and my life in Leeds in general a fantastic experience. Especially, I would like to extend my gratitude to Conor McDonald, Charlotte Coleman, Jane Stoate, Adam Clenton, Ger Duff, Lucy McVay, Janja Trstenjak, Liang Chen, and Le Thai Phong.

Pekka Vahtera

Leeds, March 2014

Abstract

Research on organisational networks is abundant, yet understanding about the positive and negative effects of networks in global business settings remains relatively limited. This dissertation analyses the network mechanisms that add value to global virtual teams (GVTs). More specifically, it examines the role of (i) network structure, (ii) individuals' network position, and (iii) the types of relationships which people share as both value-adding mechanisms as well as sources of potential liabilities. Added value in this study refers to interpersonal benefits which may help GVTs realise their full potential, meaning an increased knowledge flow, decreased levels of conflict and a higher degree of integration among diverse team members, amongst other things. The theoretical underpinning of this study lies within the intersection of network theory, international business, and virtual team management. The empirical analysis is conducted within a social network data set collected from 160 GVT members from three multinational companies working in a high technology sector. Statistical analyses of these data suggest that network mechanisms such as the types of ties people share (i.e. friendship), reciprocity (i.e. two-way interaction), the structure of ties (i.e. cliques), and an individual's network positions (i.e. brokerage over structural holes) have important effects on knowledge sharing and potential for conflict. Surprisingly, the GVTs are found to show little tendency for homophily (tendency for similar others) and no support is found for the argument that cultural dissimilarities or geographical distance would negatively affect interpersonal interactions. It is concluded that network-based theories need to be more rigorously tested in global contexts in order to truly evaluate their generalisability for international business.

Table of Contents

VIII

List of tables

List of figures

Glossary of terms and abbreviations

Concept	Description
Access to resources	Facilitates value creation through the sharing of important information, exchange of favours, and coordination and combination of skills. Measured as "This person is a good source of information, ideas, resources and opportunities".
Bonding	Bonding relationships emphasises close relationships within impermeable group boundaries.
Bridging	Bridging ties/relationships underline connecting unconnected people.
Broker, Brokerage	Connecting unconnected actors. Can occur within and between groups.
Centrality	Central position within a network structure. Relates to superiour levels of access and control over valuable resources.
Closure	Network of strongly interconnected elements.
CMC	Computer-mediated communication.
Common method bias	Variance that is attributable to the measurement method rather than to the constructs the measures represent.
Co-location	Working in the same office.
Cultural distance	The degree to which actors have a difference in their cultural backgrounds. Also see Hofstede and GLOBE.
Density	Proportion of network ties that are actually present from the total number of potential connections.
Double Dekker semi-partialing method	QAP procedure at the dyadic level. Minimises collinearity.
E-I index	Procedure developed by Krackhardt and Stern (1988) for investigating the embedding of network ties within and between groups. E-I (external-internal) index ranges from -1 (all ties occur within the group) to 1 (all ties occur between groups).
Embeddedness	Degree to which actors are part of a social network

Geographical distance	Distance between physical working locations between actors. Calculated as direct distance (i.e. as the crow flies) with Google maps calculator.
GLOBE	A study about leader effectiveness and culture initiated by House, 2004. The GLOBE study included information on 62 Societies and about 17,300 middle managers from 951 organisations in the food processing, financial services, and telecommunications services industries.
GVT	Global Virtual Team.
Halo effect	A phenomenon investigated by Thorndike (1920), where a person's overall impression spills over to other characteristics. For example, we may assume that a person is good at A just because he or she is good at B. The halo effect is therefore a cognitive bias.
Hindrance (ties)	Ties that make it difficult for an actor to carry out their job responsibilities (i.e. by withholding information, opportunities, and resources).
Hofstede framework	Framework which systematically assesses differences of cultural dimensions between countries.
Homophily	Tendency to interact with similar actors (i.e. people with similar backgrounds, personalities, gender, religion etc.).
In-group reciprocity hypothesis	A hypothesis which states that discrimination of out-group members stems from the self-interest-based desire to maximise favourable in-group allocation of resources.
Intergroup bias	Tendency to favour in-group instead of out-group more favourably in evaluations and resource allocations.
MNE	Multinational enterprise.
Multiplexity	Bundle of different overlapping network relationships.
Network size	The sum of actor's incoming and outgoing network ties.
Network theory	"Network theory refers to the mechanisms and processes that interact with network structures to yield certain outcomes for individuals and groups" (Borgatti and Halgin, 2011).
Performance	The sum of perceived amount and quality of work.
Positive-negative asymmetry	Psychological tendency for negative information to have a stronger cognitive impact than positive ones.

QAP regression	Procedure which provides a robust indicator of unbiased significance levels and standard errors because it preserves the dependence in both the dependent and independent variables.
Reciprocity	Tendency towards two-way interaction in returning favours, advice, and numerous other types of beneficial human behaviour.
Redundancy	Unnecessary duplication of information.
Relational tension	Relational tension is manifested through feelings of discomfort when working with other people.
Self-interest	Perceptions of opportunistic behaviour, zero-sum games, and the pursuit of private benefits at the expense of the common good.
Shared identity	Sharing of similar values, ways of thinking, and understanding.
Social Capital	'the sum of the *actual* and *potential* resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit' (Nahapiet and Ghoshal, 1998, p. 243).
Social ledger	Totality of positive as well as negative network interactions.
Social Liability	Negative network effects stemming from negative ties such as conflict, tension, and dislike.
Social unit	Informal organisational structure where actors are connected by social ties rather than official team-structure.
Sociomatrix	Representation of matrix data where elements of the sociomatrices are social network ties between actors.
Structural hole	Lack of network connection between actors.
Tie strength	The strength of emotional intensity of a certain type of relationship between actors.
Trust	The extent to which an actor perceives to be able to rely on others in work-related issues.
UCINET 6	Software for analysing social network data. Developed by Borgatti *et al.,* 2002.
Whole-network approach	Method where all ties between all actors within a given population are collected and analysed.

1. Introduction to the dissertation

Human networks are at the core of our social interactions. Networks can include various types of interactions ranging from exchange of information and rumours with friends and relatives to the transfer of valuable resources and knowledge between multinational firms. These networks provide emotional support, access to new opportunities, and increase the amount of knowledge available to us. Consequently, our interconnectedness with others provides a foundation for the very existence of groups, teams, societies, cliques, and any other forms of configuration which consist of human beings. Today, globalisation and technological innovations have led to dramatic change in the ways by which we are connected to each other. Increasing global interconnectedness matters for one simple reason: it has the potential to contribute trillions of dollars to economic and non-economic development of nations and people (i.e. in fields of education, health, and environment) around the world (Global Trade Alert, 2012). In a modern society, networks (whether face-to-face, virtual, organisational, or family networks) permeate most aspects of our social and economic activities. Simultaneously this creates a need to analyse their effects on society and human behaviour.

The main objective of the present study is to combine international business/management, network, and virtual team management literatures to analyse intra-firm network mechanisms which can add value to global virtual teams (GVTs). More specifically, this study analyses (i) network structure, (ii) an individual's position within the organisational network, and (iii) the types of network relationships, which combine to help global virtual teams realise their full potential (i.e. improve information and knowledge flows or minimise the potential for

conflict). This introduction chapter begins with a discussion on the importance of formal and informal networks in organisations. The purpose is to first establish that networks are a critical part of organisations, but simultaneously complex to manage and understand. Subsequently, the chapter argues that networks are even more complex in international settings such as global virtual teams (GVTs). The following section will then position the present research within three streams of research: network theory, international business and management studies, and virtual team management. Research gaps in the current literature will then be discussed and the objectives of the present study identified. Finally, key contributions of this study and the structure of the dissertation will be explained at the end of this chapter.

1.1 Formal and informal networks in organisations

In organisations, people are linked through a need to combine various skills in order to create synergies and value. Organisational networks are imperative for managing the transfer of information, allocation of resources, shaping of organisational culture, and for creating an atmosphere where all employees share common values and goals. *Formal* and *informal* interactions among team members determine the structure of networks within which individuals, teams, groups, and sub-groups are embedded. Formal networks refer to interactions based on a pre-defined structure. These include formal teams, hierarchical levels, units, and subsidiaries, amongst other things. Effective communications and interactions between individuals embedded within these structures are necessary for organising work in organisations. Because of this networks are often conceptualised as pipes or conduits which facilitate and hinder flows of important organisational assets.

In these multifaceted webs of collaboration, organisational charts reveal only a part of a more complex picture. Official structures are needed to get the work done, but there are many types of relationships that are not reflected in purposefully designed structures (Casciaro and Lobo, 2005). While we only have a limited choice in who we work with (i.e. team members and supervisors), our choice for informal interactions with partners is largely unrestricted. For instance, employees in firms form friendships and social ties with colleagues and associates who may not be in any way related to officially structured work. It is often argued that the informal dimension involved in networks is a unique and important aspect of a firm's operations (i.e. Burt, 2001; Lin, 2000) because they enhance (and potentially hinder) opportunities for positive flows such as information, resources, references, and opportunities. This also makes unravelling the informal dimension more complex. For instance, do people choose who they interact with based on attributes such as status, expertise, likeability, or similarity? Considering the importance of these types of questions, it is not surprising that social networks have also been a thriving sociological research area from as early as the 1920s. Indeed, insights into structural perspectives provided by the network view of the organisation are theoretically important because research has consistently demonstrated that network structures provide more reliable explanations about organisational behaviour and outcomes than do more formal structures (i.e. Krackhardt and Hanson, 1993; Monge and Contractor, 1998). At the same time, harnessing these invisible networks for the benefit of the firm is an immense managerial challenge, and has been rightly described as a "murky and elusive undertaking" (Cross, *et al*., 2005). In order to perceive and understand organisational ties correctly, it is necessary to possess an accurate representation of various kinds of ties; friendship, kinship, advice, communication, and so on (Kilduff and Krackhardt, 2008). Burt (1992) provides an excellent example of the catastrophic consequences that misperception of network ties can have. Burt presents a vivid account of top management firing a lower

ranking manager who was a central actor of an informal network. Top management was unaware of this person's power (he was responsible for hiring friends, family and other contacts for the company over a 30-year period), and his dismissal led to the outrage of employees. The company's situation escalated into shootings, bomb threats, and leaking of confidential management documents, while top management was completely unaware of the cause.

The above case demonstrates the influence that networks can have on organisational outcomes. The formation and consequences of networks is even further complicated by some of the key features of a modern organisation, such as increasing diversity, global reach, cultural differences, utilisation of advanced technology, and the sheer complexity of managing organisations in international business environments. An excellent example of a complex form of international business which extensively relies on use of intra-firm networks is the global virtual team.

1.2 Defining global virtual teams

Whether a company is small or large, or multinational or domestic, most of the work is achieved through combining people's skills in teams, task-forces, committees, and operating groups. Diverse people from different cultural, linguistic, and geographical backgrounds work through inter-unit, cross-functional, cross-divisional, and inter-organisational networks in order for the company to achieve a competitive advantage through effective utilisation of physical, social, and human capital (Iles, 1995). Hence, groups should be able to accomplish more by working together than people could individually. The terms groups and teams are sometimes used interchangeably in the extant literature, and hence it is important to provide

an early definition on how they are applied in the present study. Indeed, the empirical chapters in this dissertation draw a clear theoretical as well as empirical distinction between officially defined groups (i.e. teams and units) and groups based on social relationships (i.e. cliques and social groups). In the present study, 'groups' refer to a collection of people working together (i.e. individuals working in the same unit), while 'teams' consist of two or more individuals who are interconnected by a more specific purpose and official work flow structure (for similar definitions, see Salas *et al.,* 1992; Lundby and Jolton, 2010). Hence, as defined in the present study, people within the same group (i.e. unit) are not necessarily team members because they are not connected by official work flow (i.e. reporting structure). Similarly, team members are not necessarily part of the same social group or a clique.

When teams operate in a global business environment, they are most commonly referred to as global virtual teams (Connaughton and Shuffler, 2007). More specifically, a GVT is defined as two or more individuals working towards long-term common goals across geographical, cultural, and linguistic boundaries, who interact mainly through computer-mediated communications (CMC). In general, extant studies have utilised multiple definitions of these types of teams. In fact, in their review of GVTs, Connaughton and Shuffler (2007) identified 14 varying combinations of terms (i.e. international, transnational, multinational, multicultural, cross-cultural, cross-national, distributed, geographical, virtual and so on) to describe such teams. However, the term "global virtual team" is most commonly used in the literature, and therefore this study also adopts this definition (for an in-depth overview of other global team attributes, see chapter 2). It is useful to note that the different use of terms regarding diversity, dispersion, and media utilisation may all carry somewhat different implications for variables and outcomes (Fiol and O'Connor, 2005). For instance, teams which are geographically dispersed within the boundaries of a single nation will most likely

face a completely different set of challenges than a team dispersed across the five continents. These observations give rise to a number of points. First, the definition adopted for the present study emphasises a high degree of geographical dispersion across temporal, linguistic, and cultural boundaries. Both global virtual and multicultural teams are similar in that they both involve team members who are likely to differ in their communication styles, norms, beliefs, and values. However, the main difference is that multicultural teams can exist within a single country setting, while a GVT is by definition spread across national boundaries, thus presenting a different (and arguably, more complex) set of challenges in terms of managing effects of culture, language, norms, and work behaviour. Second, GVTs are also global in terms of their tasks and strategy. Thus, they are driven by the need to integrate a firm's resources, customers, and market-based information while simultaneously striving to maintain local responsiveness (Bartlett and Ghoshal, 1989). Third, my definition of a GVT emphasises a combination of face-to-face and CMC. While some previous studies have used the term "virtual" to describe teams that never interact face-to-face (i.e. Jarvenpaa *et al.,* 1999), this is not the case in the present study. Instead, a definition which considers virtual teams to consist of individuals who *mostly* interact through technological means is adopted in this study (i.e. Townsend *et al.,* 1996). Hence, team members in the present study may interact face-to-face with others sharing the same location or when visiting other locations. However, most of the interaction with people in other geographic locations occurs through CMC such as email and intranet. As discussed in the concluding chapter (chapter 8) this definition may carry noteworthy implications on generalisability of GVT research and how they are compared with other organisational forms (i.e. co-located teams).

1.3 Social networks in global business environments

As Steger *et al.,* (2007) write, "…in social organizations where there are no natural/scientific/mathematical laws at play, it is all about human interaction". A key issue from both a theoretical and a managerial viewpoint is how to improve the coordination and management of physically, culturally, linguistically, and temporally distant units. For instance, cultural differences can have an immense impact on key organisational issues such as employee satisfaction, communication, and performance (Gibson, 1999). All cultures have certain rules about appropriate behaviour and these also affect verbal (i.e. tone, volume, and pace) and non-verbal (i.e. gestures, touch, and eye-contact) communication. Even when two people speak the same language, they may interpret a message differently depending on their cultural background. Indeed, communications and interpretations are likely to be further distorted by 'cultural noise' (i.e. differences in languages and values) caused by increasing cultural distance between a sender and receiver of messages across the network (Holden, 2002). Lack of effective communication can therefore make it difficult to cooperate with others and achieve organisational goals. Difficulties in communication, in turn, can have a significant negative impact on work satisfaction and performance (Luo and Shenkar, 2006). Not surprisingly, cultural differences can also increase levels of conflict, and make it difficult to establish common values and share information with other employees (Hinds and Mortensen, 2005). However, cultural differences can also be an important source of added value. Because individuals come from different backgrounds and think in different ways, they may have fresh and new ideas to contribute to their companies. When these ideas are brought together effectively, companies can benefit, for instance, from new innovations and improvements to existing products among other things (Stahl *et al.,* 2010). Therefore, one of the key challenges in international companies is how to minimise conflicts and negative

interactions while combining people's skills and ideas in ways that value creation is maximised.

International and global companies that organise work flow through GVTs also face an additional challenge in terms of technology. A large percentage of our everyday work is facilitated by technological innovations, and international organisations have been quick to integrate new advances in cutting-edge technology to their advantage. This is not particularly surprising as coordinating operations across large distances and national borders forces companies to constantly search for more efficient and cost-effective solutions for organising their internal and external communications. At the same time, CMCs create challenges in comparison to more traditional face-to-face interactions. For instance, establishing shared norms and common goals may be more challenging among team members if the individuals have never met and do not know each other on a personal level. Emails, conference calls, and intra-nets can be beneficial for sharing large amounts of information and data, but the impersonal nature of these communication channels may have a strong effect on how people build networks that are based on trust, shared values, and commonly held goals.

The discussion above provides strong support for an argument that firms which structure their work through global teams face additional challenges in comparison to companies choosing to organise work through co-located teams. Indeed, a growing amount of studies recognise that the underlying dynamics of GVTs differ greatly from those of co-located teams (Sidhu and Volberda, 2011; Gibson and Cohen, 2003; Maznevski and Chuboda, 2000). For instance, informal information may be difficult to transfer through technology-aided communications because there are far fewer social cues to help team members interpret meanings, norms, and

expectations (Finholt and Sproull, 1990). Also social psychologists have demonstrated that physical distance has a significant negative effect on social influence between spatially dispersed individuals (Latané *et al.,* 1995). At the same time, network benefits are *especially* important for international companies because relationships within teams might be more fragmented due to larger distances, both geographical and cultural. Consequently, one of the key arguments underpinning the present study is that co-located and GVTs are not only different in terms of their general dynamics but more specifically in the way their networks are formed (as also previously argued by Ahuja and Galvin, 2003). In addition to distance (namely, physical cultural, linguistic, and temporal) separating team members, it has been previously argued that network structures of *virtual* organisations will consist of a more rapidly changing set of relations among network participants, constantly adapting information processing capabilities to changing environmental needs (Ahuja and Carley, 1999). Hence, the combination of virtuality and distance is likely to affect how networks are formed and what their effects are in GVTs in comparison to traditional co-located teams in single country settings.

1.4 Positioning of the present study

The above discussion on the importance of networks and relationships in organisations, differences between co-located *versus* distributed teams, and the complexity of managing transnational companies, provides a foundation for positioning the current research. This study draws from three central areas of scholarship: network theory, international business and management, and virtual team management. The positioning of the study within these three areas of research is visualised in Figure 1 below.

Figure 1 Positioning of the present research
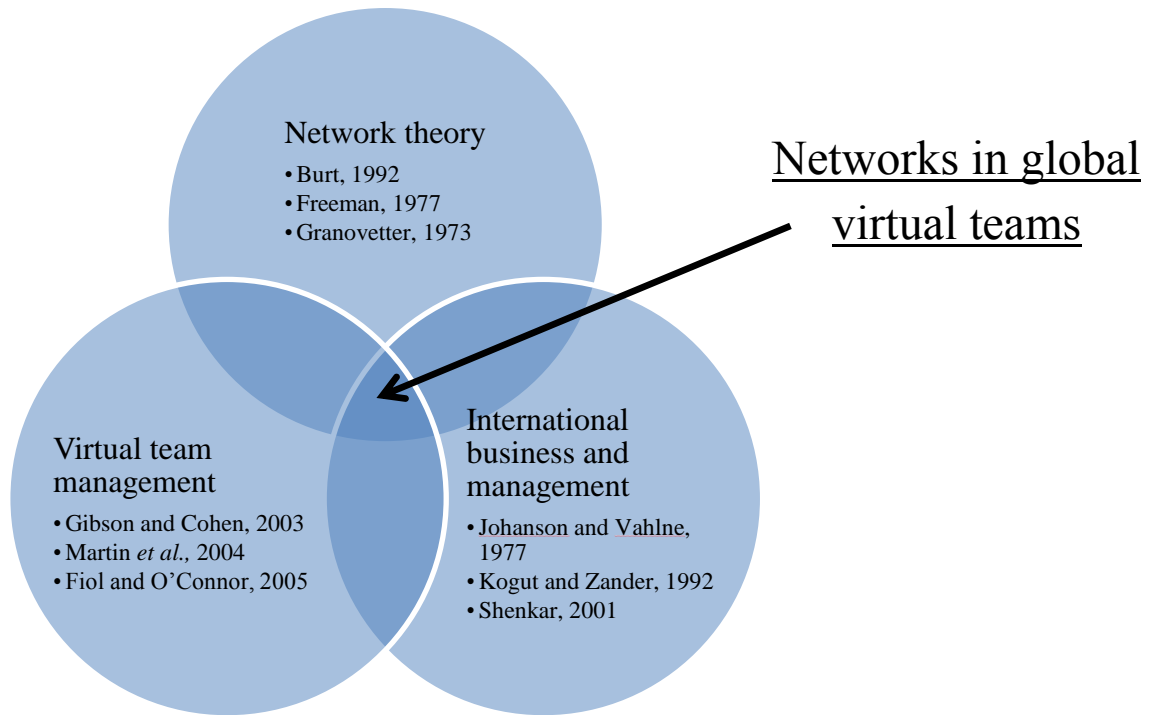
Figure 1 shows that there are classic studies in each of the three fields which highlight the importance of networks, global business environment, and the role of virtuality in managing teams across distances. It is argued here that the examination of networks in GVTs requires cross-disciplinary approaches that utilise theoretical and empirical insights from the three aforementioned disciplines. First, network theory provides a deep understanding of the importance of social structure and the ways in which individuals and groups interact with each other. For instance, important theoretical and empirical insights into how individuals gain access to valuable information has been gained through Burt's (1992) theory of structural holes, Freeman's (1977) centrality measures, and Granovetter's (1973) insights into properties of weak network ties. At the same time, international business and management perspectives are critical in providing understanding on how business operations are orchestrated at a global scale, and what difficulties organisations face in coordinating interactions across time, distance, and culturally diverse locations. For instance, the effect of

distance and culture in international business has been advanced by Johanson and Vahlne's (1977) insights into firm's internationalisation, Kogut and Zander's (1992) evolutionary theory of the multinational enterprise (MNE), and Shenkar's (2001) views on how we measure cultural differences. Finally, virtual team management is important for advancing our understanding of factors such as communication through technological means, effective team design, and task coordination across geographical distances (see Gibson and Cohen, 2003; Martin *et al.,* 2004; Fiol and O'Connor, 2005). Naturally, there has been overlap between these three areas of research, and significant theoretical and managerial insights have been drawn from a combination of these disciplines. Figure 2 below presents key examples of these types of studies.

Figure 2 Examples of important cross-disciplinary studies for the present research

❑ Ahuja and Carley, 1999
❑ Ahuja and Galvin, 2003
❑ Maznevski and Athassiou, 2006

❑ Batjargal, 2007
❑ Chua *et al.,* 2009
❑ Coviello, 2006

Network theory

Combination of all three disciplines virtually non-existent

Virtual team management

International business and management

❑ Van Ryssen and Godar, 2000
❑ Sidhu and Volberda, 2011
❑ Maznevski and Chuboda, 2000
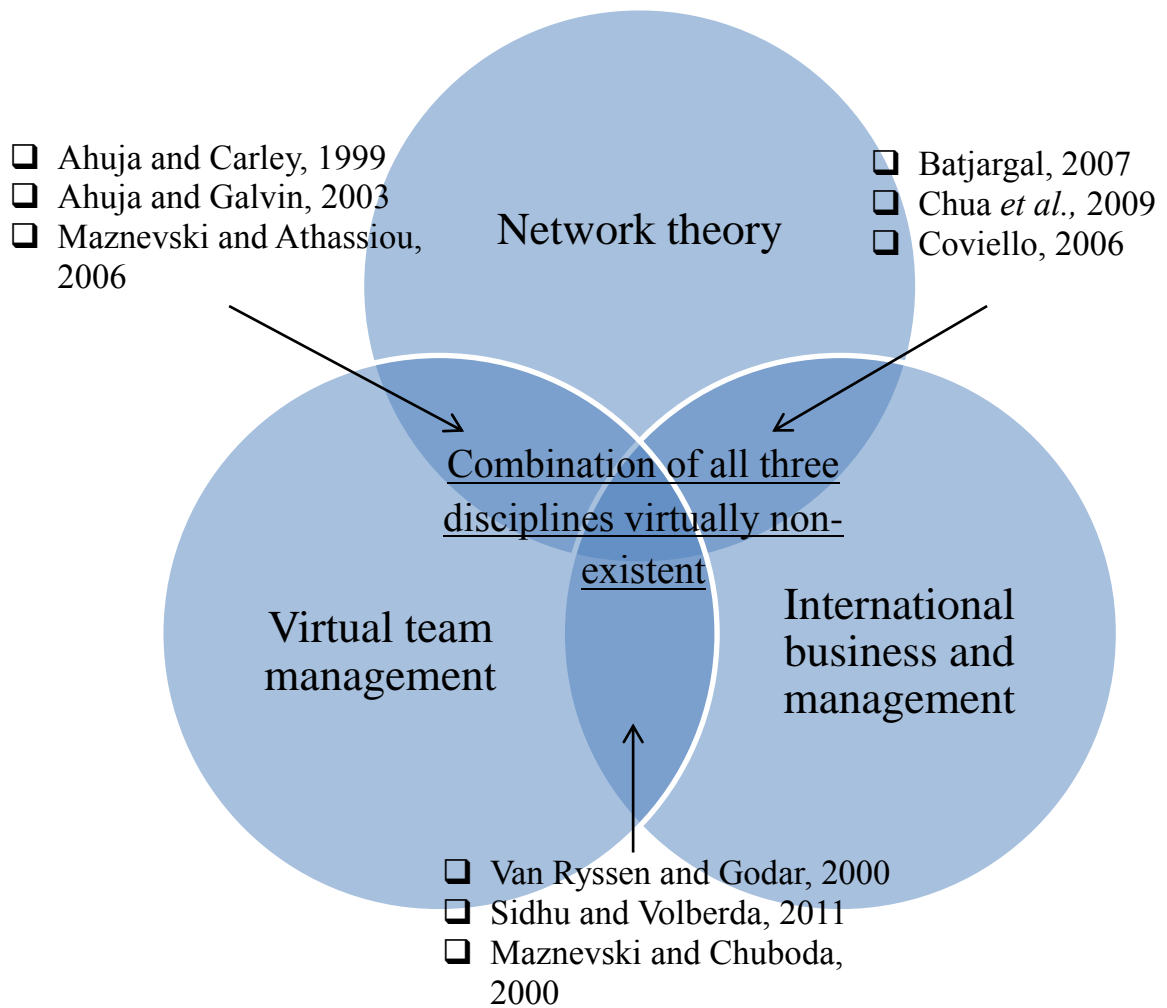
As Figure 2 shows, virtually no research has been conducted at the intersection of networks, virtual teams, and international business perspectives. While good examples can be found from a combination of any two of the disciplines, there is a lack of research that integrates all three perspectives. This lack of research on networks of GVTs has led to the principal research problem addressed in this study: *we do not know how a dynamic international business environment shapes social networks in global virtual teams, and what conditions underpin the development of positive and negative interpersonal interactions within such environments.*

A cross-cultural perspective has been largely missing from the organisational networking literature. The bulk of network research concentrates on various organisations that come from a single industry or single country settings and therefore ignore multinational corporations (or, neglect those attributes that make MNEs more complex). In contrast, international business studies which take a network perspective are largely concerned with particular types of business networks such as the relationship between subsidiaries, subsidiary-headquarter dyads, and networks between buyers and suppliers or between MNEs and customers. Indeed, the network approach has developed into an influential stream of research in analysing internal and external embeddedness of MNEs. For instance, Yamin and Ghauri (2010) argue that an increasing number of studies have demonstrated the importance of network perspective in diverse topics such as power, knowledge transfer, and the role of subsidiaries. It is asserted that through effective utilisation of network relationships international companies can create sustainable competitive advantages (Fock and Woo, 1998), bypass obstacles in internationalisation (Freeman and Sandwell, 2008), and increase the value of provided services (Syson and Perks, 2004). For instance, Johanson and Vahlne (2009, p. 1411) argue that insidership in relevant networks, along with with trust and commitment, are indeed necessary preconditions for successful internationalisation. Because the extended business network can create a considerable knowledge base and provide better access to resources, it should therefore be considered as an important source of competitive advantage.

Unfortunately, international business studies have tended to ignore networks at the individual, group, and team levels of analysis at the expense of macro-level attributes. It has been often argued that GVTs have surfaced so quickly that scholars have had little time to study them, and consequently, research on GVTs is lagging behind (Malhotra *et al.,* 2007; Zander *et al.,* 2012). The seriousness of this research gap is further exacerbated by the fact that GVTs are

expected to have exceedingly high failure rates. For instance, Govindarajan and Gupta (2001) found that 82 per cent of GVTs fell short of expected performance outcomes. Only by analysing the drivers of value-creating activities in GVTs are we able to learn how major impediments to team success and performance can be avoided. A key argument of this study is that networks must be considered as a key organisational asset because they underpin issues such as how negativity and people and liabilities can be avoided (see chapter 5), knowledge flows (see chapter 6), and connectedness of team members and groups (see chapter 7).

The fact that networks in the GVT context have rarely been investigated represents an important gap in knowledge because it is established that culture connects rules, beliefs, meanings and other behavioral correlates to networks (Dodd and Patra, 2002). For example, it has been argued that skilful networkers develop positive "social receivables" while minimising "social payables" (Batjargal, 2010). However, we do not know how cross-cultural settings where actors who possess diverse backgrounds, mind-sets, and cognitive schema are able to achieve this. Indeed, studies on virtual teams have rarely applied network perspectives to examine factors that underpin the creation of value (for exceptions, see Bell and Zaheer, 2007; Ahuja and Carley, 1999). Even though interpersonal processes have been studied as a factor underlying team design (i.e. through lack of conflict and commitment), lack of network perspective leaves issues such as structuring of these relationships, overlap between types of ties, and the connection between expressive (i.e. trust) and instrumental ties (i.e. access to resources) largely unexplored. This is surprising because it is well established that relationships and interpersonal interactions lie at the core of successful virtual teams (for a review, see Martin *et al.,* 2004). Furthermore, the bulk of research on virtual teams has focused on teams which are contained within a single nation. Consequently, a large amount

of studies have neglected international and global perspectives (i.e. language, culture, time differences, and an increased amount of miscommunications) when examining effectiveness of virtual teams. The few papers which do use a network approach pay insufficient attention to international perspectives of virtual teams, and therefore networks in GVTs remain relatively unexplored. The emphasis and lack of research focus of each discipline is summarised in the Table1 below.

Table 1 Emphasis and lack of research focus within three key disciplines

Discipline	Traditional emphasis	Unanswered questions
International business and management	MNEs, Macro-level factors, business networks, inter-firm networks, diversity	Micro-level factors (i.e. teams), interpersonal relationships, intra-firm networks, CMC communications
Virtual team management	IT factors, team design, interpersonal processes, team outcomes	MNEs, global business environment, networks, structure of relationships
Network research	Homogeneous settings (i.e. firms from a single nation and co-located teams)	Diversity, MNEs, global business environment, CMC communications

Finally, all three research streams have also focused attention primarily on structures and actor attributes that facilitate beneficial outcomes. Hence, negative effects and liabilities arising from network participation have generally been overlooked. These liabilities can include issues such as conflicts, overload of information, cost in terms of time and resources, and over-reliance on network participants, amongst other things. Although many studies recognise that networks can include unwanted effects (i.e. conflict and dislike) (e.g. Portes and Landolt 1996; Labianca and Brass 2006), little prior research has empirically investigated

the *sources and conditions* that induce such negativity (for an exception, see Labianca *et al.,* 1998; Huitsing *et al.,* 2012). This is an important knowledge gap since it is possible to envisage that negative effects in networks might outweigh the potential benefits of network participation, and thereby have a more profound impact on workplace outcomes (Labianca and Brass, 2006). Indeed, cross-cultural conflict is cited as one of the biggest challenges in international business (Dong and Liu, 2010; Hennart and Zeng, 2002). The lack of research on conditions under which networks are beneficial or destructive may have contributed to the overall mixed evidence reported on the effectiveness of multicultural groups (such as GVTs) (see Stahl *et al.,* 2010 for a recent meta-analysis).

1.5 Research objectives

One of the respondents in the present study argued that "An open minded person who takes care about respectful association could collaborate with all people in the world and it doesn't matter where he/they is/are located". The present study somewhat challenges this notion by examining the factors which may hinder and facilitate collaboration within intra-firm networks in GVTs. More specifically, the main objective of the present study is to combine international business/management, network, and virtual team management literatures to analyse intra-firm networks as both antecedents and outcomes of value added in GVTs. The broad research question underpinning the argumentation presented in this study is:

> *What network conditions underpin positive and negative outcomes in the intra-firm networks of global virtual teams?*

While the empirical chapters in this dissertation have their own specific research objectives (see Table 2 below for specific research questions addressed in each empirical chapter), they

all fundamentally contribute towards providing an answer to this key overarching research question. Taken together, these empirical chapters provide a theoretical as well as a practical understanding of how to maximise the beneficial interpersonal interactions while minimising potential liabilities in GVTs. Extending research on the network-based view of the multinational organisation, this study examines the notion that positive and negative interactions within GVTs are grounded upon two key factors: (i) the types of relationships actors share amongst each other, and (ii) the structure of the network. The interaction between these two key factors in combination with contextual factors of GVTs creates a puzzling complexity. Consequently, we know little about their effects in increasingly global and interconnected organisations. Both the role of structure and various types of ties in GVTs are addressed in this study.

The purpose of this study is *not* to create a universally applicable framework which dictates how relationships in GVTs ought to be arranged so that company performance can be maximised. Rather, the objective is to examine the positive and negative network interactions and their effects at the individual, dyad, and group levels of analysis. From these analyses, we can draw conclusions about the conditions which may maximise value creation (i.e. facilitate knowledge flows, minimise liabilities, or increase individuals' perceived performance) within the firm. Consequently, these interactions may affect performance of the organisation, but no empirical evidence can be provided on these types of effects. Instead of aiming for drawing performance implications of the findings at the organisational level, the purpose of this study is to provide empirical, theoretical, and practical insights into the complex ways that individuals are connected to each other in modern organisations, and how these affect knowledge and other flows, communication patterns, coordination of work, positive and negative perceptions of others, and trade-offs in organisational networks.

The key arguments discussed above with regards to why GVTs are important as a research topic, and why a network perspective is needed for their analyses, are summarised in Table 2 below. These arguments will be further substantiated and justified in chapters two and three.

Table 2 Key arguments underpinning the present research

Global virtual teams (GVTs)	Network perspective for GVTs
• Account for a large portion of workflow in international settings.	• Needed for unpacking the role of work and social structure.
• Are a key element in organising transnational operations, but little international business research has examined them.	• Essential for examining informal interactions in addition to official work flow.
• Carry high potential and high risk.	• Uncovers how organisational resources are accessed through relationships.
• Are complex and multifaceted organisational forms.	• Important for finding patterns from complex and multifaceted data.
• Rely on interpersonal relationships while there are substantial problems in developing them.	• Goes beyond analysis of demographic features as actor attributes.
• Are largely represented in the extant research by contradictory research findings and anecdotal evidence.	• Effectively identifies overlapping patterns across levels of analysis.

1.6 Research setting

In order to accomplish the objectives of the research, social network data were collected from four units in three knowledge-intensive companies. These units followed a globally distributed team-based work structure, and consisted of 37 teams in total. The survey was administered to 160 team members and the average response rate received was 82 per cent. These teams were geographically dispersed across 19 countries and 50 geographical locations. A considerable amount of interaction and coordination between team members therefore

occurred through virtual and computer-aided systems. Before the data collection, interviews and discussions took place with the Chief Executive Officers and managers of the companies. The executives stated that the formation of networks within their organisations had previously been a topic of interest (and one of some concern) during internal discussions. These conversations led to the inclusion of the value of relationships (and related challenges) between individuals and groups as a major focus of the present study (for more detailed description of the case companies and data, see chapter 4).

2.1   Methodological underpinning: methodological individualism

Social network research has emphasised the role of structure. As a structural approach to analysing social structure, network perspective questions the applicability and explanatory power of alternative approaches which do not take into account relational variables, such as interpretive sociology, phenomenology, and rational choice theory (Embirbayer and Goodwin, 1994, p.1416). Hence, methodological tools that draw attention away from patterns and structures of relationships are inherently in contrast to a network perspective. Indeed, it has been long argued that network analysis is strongly underpinned by methodological individualism (i.e. Haines, 1988; Mathien, 1988). Although individuals are inevitably affected by structure, they are also capable of taking action to ensure structure is suitable for their own needs, and that appropriate position within that structure is secured. One of the proponents of this view was Coleman (1986). His macro-micro-macro approach (see figure 3 below) emphasises individual action, but also draws our attention to the importance of social structure. Social concepts are defined and explained on the basis of individuals, their attributes, states, actions, interaction, social situation and physical environment (Udehn, 2002).

Figure 3 Coleman's macro-micro-macro scheme
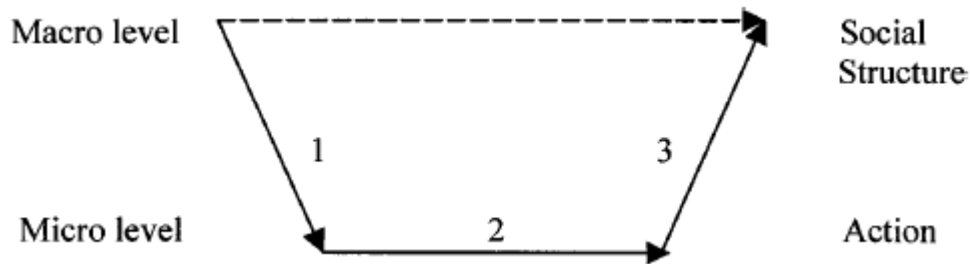
Source: Udehn, 2002

As figure 3 shows, "psychic states" are explained in terms of social structure (macro level). For example, the state of the network (size of network, density, amount of ties and so on) can affect how satisfied an actor is within that network. Individual behaviour (described as action in Figure 3) is explained through psychic states. For example, if an actor is unhappy with the current state of the network (e.g. by not getting enough information from co-workers), that actor might take action to incorporate changes. Finally, behaviour of individual actors (e.g. the action they take) affects the way that the social system is built. For example, by expressing their opinions in corporate meetings (e.g. need for improvement in communication), the actors shape the social system according to their own preferences. Thus, social institutions are considered an antecedent as well as a consequence for scientific explanation.

The methodological individualism approach suits this research well because it recognises that structure plays a significant role in influencing the way that society as a whole functions, as well as individuals within society interact with each other, and how social institutions act within the society. Simultaneously, it highlights that individual actors have certain attributes, mindsets and psychic states, which affect their behaviour. In line with theories of social

capital, and rational choice, it is assumed in this study that actors are driven by the innate need for survival, which is realised through accumulated resources (Lin, 2000). In other words, actors wish to maintain and expand their resources through utilities embedded in their networks. These issues are at the core of this study, and it can be seen to underpin the research questions, research design, hypotheses development, and data analysis.

1.7 Contribution to theory and practice

The present study fits well with two key issues in MNE literature. The first issue is how to organise international activities flexibly while maintaining reliable information, specialisation of activities, and flat hierarchical structures (Buckley, 2010; Mudambi and Navarra, 2004). The second issue concerns the extent to which networks and embeddedness plays a role in effective functioning of a global firm (Coviello, 2006; McDermott and Corredoira, 2010; Ellis, 2010). Consequently, this study contributes to recommended future directions of international business studies in three important ways: (i) by highlighting the role of relational assets as a source of competitiveness (Griffith *et al.,* 2008), (ii) by advancing exchange between disciplines (Buckley, 2002), and (iii) by analysing the interplay between culture and context in cross-border exchanges and collaboration (Brannen and Doz, 2010). Similar calls have been made in the virtual team management literature. For example, Maznevski and Athanassiou (2006) made a plea in their editorial in *International Management Review* for future research to include more network perspectives in global team research.

This study provides three key contributions to the current understanding of networks in GVTs. First, it extends research on GVTs by introducing key social network concepts into this stream of research (such as redundancy, multiplexity, clique participation, strong and weak

ties, and so on). Empirical analyses presented in the current study demonstrate that these concepts have significant explanatory power for teams operating in complex international business environments. Thus, this study provides new insights into the conceptual novelty of several key elements of variables affecting the effectiveness of GVTs. Conceptual novelty is demonstrated through conditions under which these elements can facilitate competitive advantage through (i) flows of information, resources, and knowledge, (ii) structure (brokerage and centrality), and types of ties, and (iii) shared values, trust, and friendship. To the best of my knowledge, this is the first study to combine all three above-mentioned factors when examining GVTs. Indeed, the present study draws on ideas and methods from several disciplines in order to advance a fundamental understanding of the *social* context of the multinational company, resulting in contribution that could not have been obtained through a single-disciplinary lens.

Second, this study is also a response in part to the call by scholars who claim that research on networks should strengthen a focus on potential liabilities and negative network effects (e.g. Maurer and Ebers, 2006; Coviello, 2006). It fits well with the major issue of under what circumstances negative ties can be a significant threat to the effective functioning of individuals and organisations (Labianca and Brass, 2006), and how negative interactions be minimised (Uzzi and Dunlap2012). This study adds to this discussion by analysing how in-group interactions and intergroup relationships can enhance and reduce negative intergroup bias. Hence, the results have implications for the conditions under which networks can have adverse consequences by analysing social and structural mechanisms behind both positive and negative interactions.

Finally, the results of this research have implications for managers. An important question is how factors positively affecting knowledge creation and sharing can be maximised. The present study examines several mechanisms which can facilitate these processes, and managers should strive to create an organisational environment and culture which makes it easy to structure interpersonal interaction accordingly. By identifying potential impediments for effective resource combination and utilisation within organisational networks, this study contributes towards finding new ways by which multicultural teams may realise their full potential.

1.8 Structure of the dissertation

This dissertation is structured as follows. Chapter two sheds light on the motivation for the present research. The first purpose of this chapter is to introduce the reader to definitions and main concepts used throughout the present study. The second purpose is to analyse the key factors which make a GVT a relatively unique organisational form (i.e. complexity of global business environment, virtuality, role of culture, and team composition) and therefore an interesting research context. Note that this chapter provides a somewhat general overview to the research topic, and more detailed and precise literature reviews will be provided in each empirical chapter. The purpose of Chapter Two is also to provide a more detailed account of the network theory. This chapter therefore includes levels of analysis, sub-theories, major criticisms, and future work needed for advancing the theory. Furthermore, Chapter Two justifies why network perspective is needed for analysing GVTs.

Chapter Three describes data collection procedures and the context of the empirical analyses. Specifically, this chapter discusses access to the participating case companies, background of the companies, and the survey and type of data that were collected. It also addresses validity

issues in the collected data (i.e. common method variance). The following chapters (chapters 5, 6, and 7) are the empirical analyses which form the main body of the dissertation. Empirical analyses are divided into three different chapters, because, as argued by Maznevski and Athassinou (2006, p.640), no single empirical study is able to effectively capture the complexity of GVTs. Even though these three empirical chapters draw upon the same data-set, they look at networks in GVTs from different theoretical and empirical perspectives. This creates a more logical and comprehensive analysis than imposing these viewpoints under a single empirical chapter. Hence, the empirical chapters are relatively independent in that they each address separate research questions based on a more detailed literature view, as well as presenting different analyses, and conclusions. The key research focus and contribution of each empirical chapter is briefly summarised in Table 3 below.

Table 3 Research focus and key contribution of empirical chapters

Chapter number	Chapter focus	Key research question	Theoretical focus	Key contribution
5	Intergroup bias	How actors' network position and ties within an identity group influence positive and negative perceptions of others within organisational networks.	Social identity theory.	Identifies explicit network mechanisms which can influence negative intergroup bias through cross-disciplinary lens combining insights from social identity and social network theories.
6	Knowledge flows	Which network factors facilitate the knowledge availability, and complementarity of information in GVTs?	Knowledge-based view of the firm.	Extends current conceptualisations of knowledge-based GVTs by identifying (i) structural and (ii) relational antecedents under which intra-firm information and knowledge flows are maximised
7	Strong and weak ties	How do individuals' network positions and similarity affect formation of strong and weak ties in GVTS, and what are the performance implications of strong and weak ties?	Theory of strong and weak ties	Sheds light on the role of intra-firm networks by delineating precursors (structural position and homophily) and effects (perceived performance) of strong and weak network ties within GVTs.

The final chapter (chapter 8) summarises the findings from all the empirical chapters and reviews their individual and collective contributions. Furthermore, it stresses the importance of the findings and evaluates the theoretical and empirical contribution of the present study to the academic literature, as well as the implications for managerial practice. Finally, recommendations for future research will be provided and limitations of the present study discussed. The structure of the dissertation is summarised in Figure 4 below.

Figure 4 Structure of the dissertation

Chapter 1	Introduction
Chapter 2	Previous research and context
Chapter 3	Over view of the network theory
Chapter 4	Research methods

Empirical chapters 5-7	Intergroup Bias and Networks	Knowledge Flows and Networks	Strong and Weak ties in GVTs

Chapter 8	Summary and conclusions
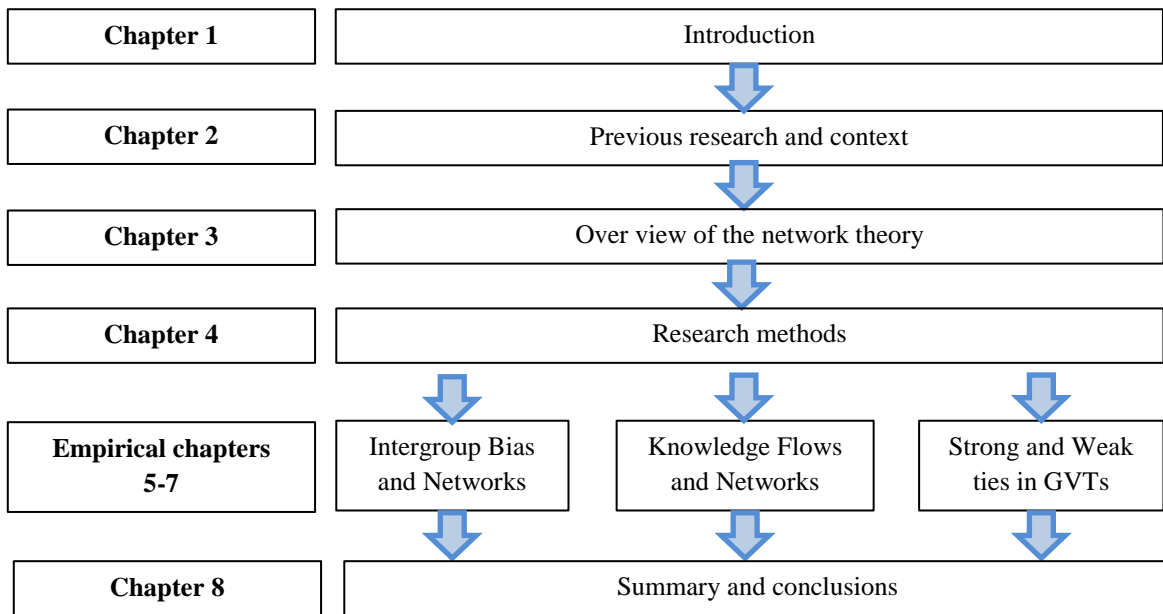
2 Previous research and context of the dissertation

This literature overview is divided into two parts: global virtual teams (GVTs) and network theory. It begins with an analysis of the key issues in organising business operations in global business environments, and then continues with a discussion of the use of groups, teams, and GVTs. Key components of GVTs (technology, diversity, culture, size, structure) will also be discussed in detail. These defining characteristics have been found to be relatively independent (Gibson and Gibbs, 2006), and have important implications in a wide array of organisational phenomena (i.e. innovation, performance, and conflict). All of these characteristics have benefits as well as costs, and these will be discussed in more detail. The second part of the literature overview introduces the reader to key network concepts and theory. It further analyses the main benefits and costs of networks in organisational settings. Finally, the literature overview of previous research will link networks and GVTs, and examine the main gaps evident in the extant literature.

2.2 Complexity of the global business environment

GVTs are often embedded within complex knowledge-based environments which underpin the creation of new products, handling of complex customer orders, or advancing effective work processes and structures (Kirkman *et al.,* 2004). The increasing complexity of the international business environment is driven by globalisation which is essentially eroding boundaries and facilitating the international flow of trade, goods, people, and knowledge. From an organisational perspective, there are multitudes of reasons behind "going global": including access to new markets and customers, learning, spreading of risk, economies of scale and scope, and forming complementary partnerships with other companies, among other things. While diminishing boundaries for conducting business across borders creates

opportunities, it simultaneously creates challenges. It has been argued in the extant research that diversity, interdependence, ambiguity, and flux are some of the key challenges facing organisations in a modern world (Steger *et al.,* 2007). First, increasing diversity is evident within and outside the international firm. As mentioned Chapter 1, internally, executives must have effective systems in place for facilitating cooperation among people from different cultures, backgrounds, religions, and so on. Outside the company, managers face diversity in terms of dissimilar customer needs, institutional actors, stakeholders, and legal environments. The second issue is the high interdependence between myriad factors affecting business operations on a global scale. For example, changes in the political environment or institutional regulations may have serious repercussions for global value chains or financial flows. Hence, managers need to be aware of non-local events that may affect their organisation. Global interconnectedness implies that everything is connected to everything, and small changes in a distant location can have a surprisingly large impact on business operations locally (Steger *et al.,* 2007, p.5). Third, ambiguity in the global business environment gives rise to an increasing amount of information, but potentially decreases capability to meaningfully interpret and utilise it. In other words, companies must manage information redundancy (i.e. duplication of similar information) and information overload (see chapter 6 for more detailed analysis on the effects of information redundancy). For instance, financial figures, customer surveys, legal proceedings, and accounting standards are just a few examples of information that may be relatively easily available, but simultaneously difficult to interpret and act upon due to differences between (and within) countries. Finally, flux refers to a tendency of the global business environment to change rapidly. Issues such as currency fluctuations, revisions in technological standards, and changes in employment law, amongst other things, can all complicate the management of a global organisation even if there are sound procedures in place for dealing with diversity, interdependence, and

ambiguous information. Hence, a good policy today may not work tomorrow. Complexity of the environment and highly accessible communication technologies, in turn, have introduced a shift away from centralised multinational corporations to more transnational forms where information is distributed more equally throughout the organisation (Stonehouse *et al.,* 2004). At the same time, the rapid pace of technological development is one of the main factors behind quickly changing business environments. For instance, a technology that is cutting-edge today may quickly become obsolete when new innovations emerge. Diversity, interdependence, ambiguity and flux, when taken together, create an increasingly complex business environment where there are no simple solutions for success. A global business environment, therefore, is highly different in comparison to a domestic single country setting. Consequently, GVTs face additional challenges in contrast to 'traditional' domestic teams.

2.3   Key benefits of virtuality and technology in GVTs

GVTs, and virtual teams in general, are powered by the internet revolution and the universal availability of ICT (information communications technology) applications (UNCTAD, 2005; Benkler, 2006). International organisations have been especially quick to adapt to new advances in cutting-edge technology for organising and managing work flows because of the larger distance between people than in domestic operations. Consequently, it has long been recognised that technology is a powerful converging force in the global economy, as it has critical implications for communication, transport, and travel (i.e. Levitt, 1983). Not surprisingly, technology has been argued to be one of the key factors underpinning internationalisation and globalisation of economic activities (Dicken, 1998). Computer-mediation-communications (CMC) can be effective in sharing large amounts of information speedily across vast distances (Maznevski and Johnsen, 2007). In general, CMCs include any form of communication that requires the use of a computer (Dietz-Uhler and Bishop-Clark,

2001). Naturally, teams often utilise a combination of face-to-face and CMCs (as is the case with the data collected for the present study – for more details see chapter 4). Indeed, the key to success in global markets has often been argued to reside in information communications technology applications (Stonehouse *et al.,* 2004; Stonehouse and Pemberton, 1999), which can even give rise to a competitive advantage (Stonehouse *et al.*, 2004). For instance, video-conferencing or instant messaging are forms of CMC which can be used for facilitating interaction among team members across vast distances and time zones. This type of effectiveness is further emphasised as the GVT is able to keep the workflow continuous. For instance, when a software developer in Finland has finished writing a specific code, it can be sent to a team member in India to be tested while the developer sleeps. Hence, temporal differences can be utilised to the firm's benefit (Rosen *et al.,* 2007). Similarly, CMCs allow GVTs to retain top talent who are willing to work virtually but are unable to relocate to the same physical location shared by other team members (Bergiel *et al.*, 2008). Indeed, employees embedded within various geographical locations may possess expert knowledge about local markets and business environments which may enhance a firm's innovation and creativity (Jarvenpaa and Leidner, 1999). Another key issue for GVTs is that the wages of highly skilled workers may be higher in domestic settings. GVTs not only allow firms to utilise talent wherever it is located, but also incorporate people who have a specific skill set at the best labour cost. Indeed, a global strategy allows a firm to integrate physical- and knowledge-based resources in an effective manner by identifying optimal world-wide locations for procuring them (Bartlett and Ghoshal, 1989).

Even though face-to-face communication has long been considered as the standard form of communication, virtual interaction has been noted to have a number of benefits in comparison to face-to-face interaction. For instance, research has suggested that minorities in

heterogeneous settings (i.e. multicultural teams) have difficulties in expressing their opinions and participating in group activities with other members (Krebs *et al.,* 2006; Lind, 1999). These types of negative effects are likely to be minimised in CMCs as extant research has shown that they eliminate non-verbal cues and power differences (Bower *et al.,* 2001) and enhance levels of minority participation in heterogeneous settings (Lind, 1999). Furthermore, CMC has been noted to decrease the salience of individual attributes such as role and status (Sproull and Kiesler, 1986). Consequently it has also been argued that age and race discrimination in the work place is also likely to be reduced as a consequence of a virtual environment (Bergiel *et al.,* 2008). Accordingly, Walther (1996) found that geographically dispersed (and also culturally diverse) individuals who utilised CMC (to the extent of never meeting face-to-face) reported a high degree of affection and intimacy in comparison to individuals who were co-located.

Considering these key advantages of GVTs, it is not surprising that it has been argued that it is virtually impossible for a multinational enterprise to take advantage of economies of scale and scope, to maximise knowledge transfer, and to facilitate the development of a global mindset without understanding how to organise workflow through and across global teams (Govindarajan and Gupta, 2001). Consequently, the use of GVTs has become increasingly common in today's globalising world (Kirkman *et al.,* 2002).

2.4   Key challenges of virtuality and technology in GVTs

Some of the most commonly cited problems in the use of technology in GVTs include scheduling, time delays, and issues with technology itself (i.e. software problems) (Bergiel *et al.*, 2008; Powell *et al.,* 2004). For instance, temporal distribution of team members can make

it difficult to schedule computer-based communications such as video conferences (Bergiel *et al.,* 2008). Previous studies have also found that temporal distance has a negative effect on coordination and scheduling of deliveries (Espinosa and Carmel, 2003; Saunders *et al.,* 2004). Even when the temporal differences and scheduling issues are resolved, a potential hindrance to technological communication is the team members' ability to use these communication methods. Indeed, team members often lack the necessary training and skills for navigating the technologies of a virtual environment (Bergiel *et al.,* 2008; Powell *et al.,* 2004). Furthermore, Bergiel *et al.* (2008) note that there may be a generational gap between people who are comfortable with technology and those who are not. Even though it is well established that CMC has a positive impact on sharing large amounts of information (i.e. Levitt, 1983), quality is more important than quantity. If the information received through databases or individuals' networks is not handled effectively, it can lead to 'information overload' (Rosen *et al.,* 2007; Mariotti and Delbridge, 2012). For instance, a firm's internal emails can be unnecessarily sent simultaneously to hundreds of recipients. Separating important messages from inconsequential data and information is likely to increase inefficiencies and reduce time which could be spent more effectively.

Another problem with the use of technology in GVTs relates to the formation of shared values, norms, and the feelings of similarity with others. For instance, belonging to the same "in-group" (i.e. social groups to which individuals perceive as to belonging to – see Tajfel, 1978, Tajfel and Turner, 1985) with other team members could be hindered by a reliance on technological communications such as emails, conference calls, and intranets, instead of face-to-face contact among key individuals. Research on communication has found that increasing geographical and physical distance has a negative effect on communication frequency as well as effectiveness (Van den Bulte and Monaert, 1998; Allen, 1984). Moreover, geographical

distance weakens the development of shared work context and decreases the amount of spontaneous communication needed for developing relationships (Kiesler and Cummings, 2002). Furthermore, distance and reliance on technological communication hinders spontaneous informal interactions (Rosen *et al.,* 2007). Indeed, communication and coordination within virtual teams has been argued to be dependent on the extent that computer-aided communications are able to generate trust and commitment between team members (Jarvenpaa and Leidner, 1999). Furthermore, Cramton (2001) found that differing task characteristics, unequal distribution of information across work sites, and ineffective use of computer-aided communications as opposed to face-to-face interactions can impede the development of a mutual knowledge base. This is partly because team members tend to lack knowledge of each other's situations and circumstances affecting their work. Indeed, research has found that members of the virtual team often make false assumptions about other members' meanings and intentions of written language (Dewar, 2006). These can potentially lead to misunderstandings and conflicts among team members (Stark and Bierly, 2009).

Even though the amount of available information has increased through technological communications (i.e. about markets, customers, and competitors), interpreting the volume and complexity of data is challenging. For example, a study by Kanawattanachai and Yoo (2002) found that 50 per cent of virtual teams fail to meet their operational or strategic challenges due to leadership challenges in integrating people and information from diverse and distributed workforces. In order for a firm to take advantage of available information and technology, it needs to be capable of transferring and applying these assets within the firm. The most commonly made distinction is between tangible and intangible resources. Tangible resources are relatively easy to transfer because they are codifiable (i.e. through blueprints and instructions), while intangible assets (i.e. ideas and know-how) are likely to reside in the

heads of a few key organisational members. Intangible resources may be especially difficult to transfer between team members because they lack the ability to provide non-verbal and contextual cues when communicating their messages (Hall and Hall, 1987). This may be one of the key disadvantages for GVTs because of their embeddedness in high technology environments.

The discussion above demonstrates certain inconsistencies in the extant research on the benefits and costs of CMC communications (these are summarised in Table 4 below). These discrepancies are further evident in the link between the use of technological communications and performance outcomes. For instance, Ocker *et al.* (1995) and Strauss (1996) found that teams using technologically aided communications performed better than face-to-face teams, while Hightower and Sayeed (1996) and Kanawattanachai and Yoo (2002) found opposite effects. Other studies reveal no significant differences between these types of teams (i.e. Farmer and Hyatt, 1994; Valacich *et al.,* 1993). While the relationships between these two variables remain unclear, it is relatively well established that how communication patterns and interpersonal interactions are arranged has significant implications for virtual team performance. For instance, Guo *et al.* (2009) found that virtual teams which specifically emphasise effective communication techniques may perform to a higher level than co-located teams. Importantly for a social network perspective, Lin *et al.* (2008) found that a team's social dimension (i.e. interconnections between team members) was the most important predictor of team members' performance, as well as work satisfaction.

Table 4 Summary of key benefits and challenges in technology utilisation in GVTs

Key benefits of technology utilization in GVTs	Key challenges of technology utilization in GVTs
• Allows managing of work across temporal and physical distance • Effective for sharing large amount of information • Access to global talent and resources • Cost-effectiveness • Benefits for recruitment • Elimination of salient individual differences	• Technical problems • Difficulties in scheduling • Difficulties in establishing shared values and trust • Hinders exchange of spontaneous information as well as intangible knowledge • Lack of non-verbal and contextual cues • Potential for information overload

2.5   Key benefits of diversity in GVTs

The composition of a team has major implications for the dynamics of its members. The present study focuses on three key types of diversity: cultural, goal, and functional (see Figure 5 below). These are somewhat intertwined, but simultaneously scholars have found that they induce several different outcomes for teams.

Figure 5 Three key dimensions of diversity
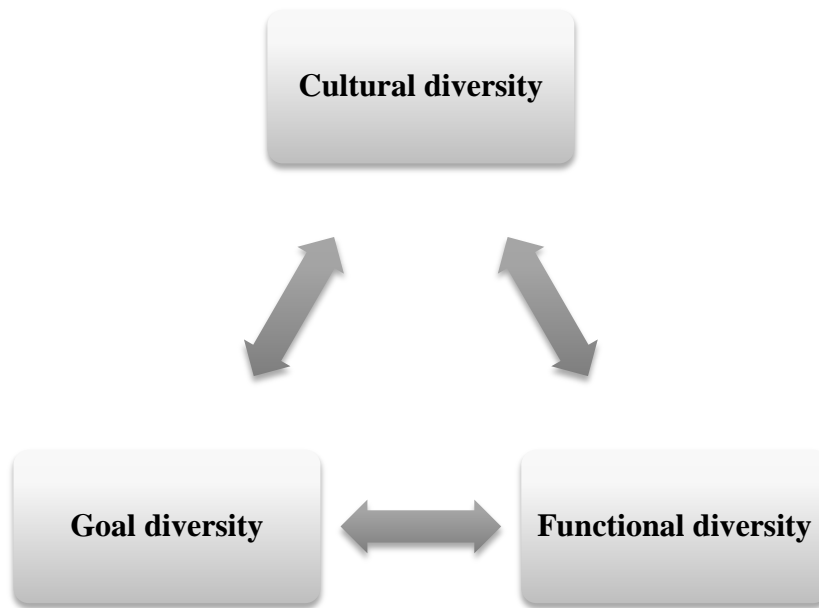
Managers face a big challenge in matching composition of the team so that personalities, skills, and team members' attributes are effectively combined. In general, if the task requirements are relatively routine and straightforward in nature, then there may not be a need for very heterogeneous teams (i.e. creativity and innovative capability may not be highly required for such routine work). However, as GVTs are most commonly reliant on specialist knowledge and development of complex products and innovations, diversity is an important aspect of GVT composition. Consequently, some authors (i.e. Gibson and Grubb, 2005) have argued that diversity between team members should be embraced rather than perceived as an obstacle which should be overcome. Diversity in general refers to the fact that individuals differ in many attributes; such as age, education, social class, culture, work skills and so on. Knight *et al.* (1999) argue that diversity in the extant literature is often portrayed as a positive phenomenon with the potential to increase ideas, creativity, and innovation. Their argument is well supported by earlier research (i.e. Cox, 1993; Jackson *et al.,* 1995) as well as more recent studies (i.e. Stahl *et al.,* 2010). Indeed, many authors have

voiced similar opinions for the beneficial effects of diversity for creativity. For instance, Govindarajan and Gupta (2001, p.67) argue that "cognitive diversity" (i.e. the sum of cultural, goal, and functional diversity) is "almost always a source of strength" because it enhances creativity and the ability to search alternative options so long as the team is capable of integrating the possibilities and reach a consensus. A view that multicultural groups are effective in searching alternative options and opinions is also supported by prior research. For instance, Paul *et al.* (2005) found that diverse teams (measured in terms of individuals' backgrounds, culture, skills, and affiliations) also had a more collaborative management style than non-diverse teams. The enhanced creativity argument also received strong support from Stahl *et al.* (2010) who demonstrated through an extensive meta-analysis that cultural diversity substantially increased creativity in teams. Indeed, extant studies have often emphasised the potential positive effect that diversity may have on information sharing and consequent decisions which are based on that information (van Knickenberg and Schippers, 2007; Williams and O'Reilly, 1998). Supporting this view, in a review of multicultural teams Connaughton and Shuffler (2007) argue that globally distributed teams can have excellent knowledge sharing capabilities as long as individuals learn the logic behind the cultural thinking of their team members. One of the key benefits of diversity, therefore, is likely to lie in non-redundant information possessed by team members coming from different educational, institutional, and cultural backgrounds.

It is also interesting to note that even though diversity brings about several challenges) there is strong evidence that it has a positive effect on satisfaction (defined by Stahl *et al.* (2010) as 'affective well-being with respect to team member interactions or performance'). Indeed, both a meta-analysis by Stahl *et al.* (2010) and a review by Zimmerman (2011) revealed that there is a positive relationship between cultural diversity and satisfaction with working in

multicultural teams. The authors suggest that a high degree of satisfaction may stem from increased cultural learning opportunities which have been demonstrated to increase satisfaction (Cramton, 2001). Despite these beneficial aspects of diversity, there is a substantial amount of research which questions the sum benefit and instead highlights a substantial trade-off between the benefits and costs of diversity, as is now discussed.

2.6   Key challenges induced by diversity

Extant scholars have observed various negative effects regarding diversity in teams and group-based work. For example, research has discovered that the development of global teams can include serious risks, such as increased levels of conflict (Mannix *et al.,* 2002), problems with knowledge transfer (Cramton, 2001), communication problems (Powell *et al.,* 2004), and difficulties in developing shared identity (Hinds & Mortensen, 2005). These problems are linked to diversity of teams in all of the studies mentioned above. Problems regarding diversity are often argued to stem from a similarity-attraction perspective (i.e. Williams and O'Reilly, 1998) which emphasises the positive aspects of similarity. For instance, research has consistently demonstrated that diversity brings about increasing salience of demographic differences which are tightly linked to psychological phenomena such as stereotyping and bias (Fiske & Taylor 1984; Shaw & Barrett-Power 1998). Indeed, even the interpretations of the *meaning* of teamwork as a concept may differ between cultures (i.e. between collectivist orientations and individualistic orientations) and, consequently, affect the norms and behaviours of team members (Gibson and Zeller-Bruhn, 2001). Furthermore, the interpretation of messages can be culturally biased, leading to leadership challenges (Kayworth and Leidner, 2001). From a network perspective, it has been argued that GVTs may experience additional difficulties in developing positive ties with diverse group members (Zimmerman, 2011). Similarly, Adler (1997) proposed that interpersonal

attraction between team members may be decreased because of salient cultural differences. This is not particularly surprising since individuals are likely to experience anxiety in environments where language, norms, and culture are diverse (Soldan and Bowyer, 2009). Indeed, relational tension and anxiety can be increased when cultural diversity affects their views on competition and cooperation over resources within organisations (Guzzo and Shea, 1992). An environment that stresses the pursuit of mutual benefits, common goals and sharing of resources admittedly generates numerous benefits (e.g. Stanko *et al.,* 2006), but actors stemming from different cultural backgrounds might not be able to take advantage of this when people clearly diverge in their views about how goals within business units should be reached. For example, actors from competitively oriented and individualistic cultures (e.g. Finland) might feel a lack of recognition when a team is rewarded as a whole, and individual outputs go unnoticed. Diversity therefore makes it especially difficult to develop a shared context where teams and team members share similar values, understanding, and ways of thinking. Divergent forces may be at the core of why diversity is often associated with negative outcomes. In their meta-analysis Stahl *et al.* (2010) provided evidence which strongly suggested that cultural diversity increases divergent group processes and decreases convergent processes. Thus, heterogeneous groups are likely to experience drawbacks in their efforts towards integration and effective communication. Similarly, Knight *et al.* (1999) found that top management team diversity negatively affects the team's ability to reach consensus in strategic decision-making.

Inconsistencies in diversity research are particularly evident between diversity and performance. For instance, Thomas (1999) and Iles and Hayers (1997) found that culturally homogeneous groups had a higher performance than diverse groups. Similarly, Bunderson and Sutcliffe (2002) found that diversity with regards to functional expertise within a team

has a negative association with information sharing and consequent unit performance. In contrast, both Boone and Hendriks (2009) and Bunderson and Sutcliffe (2002) found a positive relationship between diversity and team performance. However, three relatively recent meta-analyses have demonstrated that there is no statistically significant link between diversity and team performance. First, a meta-analysis by Horwitz & Horwitz (2007) found no significant relationship between a team's demographic diversity and performance. Second, a study by Stahl *et al.* (2010) failed to discover a direct link between cultural diversity and team performance. Finally, a study by Homberg and Bui (2013) analysed 53 empirical studies and found no support for a link between diversity and performance. When these three meta-analytical approaches are considered together, they raise serious doubts about whether diversity is a significant factor affecting performance. As Homberg and Bui (2013), and Ozbilgin (2009) both conclude, the benefits of diversity are unlikely to arise simply because employees are diverse. Rather diversity needs to be carefully managed through organisational policies and proactive attitudes towards multiculturalism (see section 2.6 below for more details on managing diversity).

In sum, extant research provides strong evidence that diversity can have both beneficial as well as negative effects. On the one hand, diversity enhances creativity, choice of direction, alternative opinions and non-redundant information. On the other, issues with integration can cause serious problems when sharing information, communication, and establishing shared norms of behaviour and common understanding. The key benefits and costs of diversity are summarised in Table 5 below.

Table 5 Benefits and costs of diversity in teams

Potential benefits relating to diversity	**Potential costs relating to diversity**
• Potential for enhanced creativity and innovation • Multiple skills and opinions in the workforce • Availability of diverse Information • High degree of satisfaction through cultural learning	• Lack of cohesion • Increased conflict • Decreased interpersonal attraction • Issues in communication • Difficulties in establishing common norms and rules of behaviour

2.7   Managing diversity

The above discussion with regards to key benefits and challenges (as well as inconsistencies in the extant research) has important implications on how diversity should be managed. Naturally, diversity creates tremendous challenges for managers who need to find effective ways to manage their teams in increasingly diverse settings. The capabilities of managers to lead, motivate, build social relationships and inspire their team members may therefore dictate the success or failure of global teams. Indeed, Joshi *et al.* (2009) found that these types of inspirational leadership positively predicted trust and performance in distributed teams. At the same time, 85 per cent of *Fortune* 500 companies have reported a shortage of global managers with the necessary skills to tackle these challenges (Javidan *et al.,* 2006). Maznevski and Jonesen (2007, pp.162-164) provide three key points for managing diversity. The first is to place greater emphasis on creating the right type of climate that thrives on diversity. For instance, the environment should encourage debate, dialogue, differences in opinions, and even task-related conflict. When the organisational culture emphasises these types of open communication procedures, it creates an inclusive climate where diverse views

are encouraged and discrimination curtailed. This is further supported by Gibson and Gibbs (2006), who found that these types of psychologically safe environments can mitigate the negative effects that dispersion, electronic dependence and diversity can have on innovation. Second, organisational processes and systems need to support the organisation's goals of managing diversity. For instance, official statements (i.e. equal opportunities), reward systems, promotions, and staffing policies need to be in line with the diversity plans. Finally, managers need to be effective communicators and capable of facilitating cooperation among people with different views and attitudes. Managers are required to solve conflicts and ensure that all team members have similar perceptions with regards to what the goals are and how they should be achieved. An environment which emphasises open communication in solving conflicts has been found to be especially important for GVTs (Moe and Smite, 2008) because their key advantage stems from integrating the diverse knowledge of team members for the benefit of the firm (Zimmerman, 2011). However, the creation of a supportive organisational climate, firm processes, and open communication channels may require a combination of regular face-to-face visits and extensive interpersonal interaction through virtual means. For instance, Oshri *et al.* (2008) found that frequent CMCs and short face-to-face visits were essential for establishing shared knowledge base (i.e. which team members are experts in specific area) in the context of GVTs. In addition, Powell *et al.* (2004) discovered that virtual teams which held early face-to-face meetings developed a higher degree of trust, respect, and understanding of the project. Thus, it could be argued that in order for effective social relationships to occur within virtual (or global virtual) teams, it is necessary to have a certain degree of face-to-face interaction. The role of actual and potential face-to-face interaction is further analysed in the empirical chapters of this dissertation.

2.8   The effect of group size for GVTs

In addition to the use of technology and diversity of its team members, the size of the team is an obvious factor which can have a significant influence on the outcomes of a GVT. For instance, large teams have more potential resources (West and Anderson, 1996). At the same time, larger teams may begin to experience coordination problems and process losses (West and Anderson, 1996). Thus, as postulated by Foo *et al.* (2005) there may be a curvilinear relationship between effectiveness of a team and its size. Govindarajan and Gupta (2001) provide a simple rule for configuring optimal size for a global business team: "one that can ensure the required knowledge and skill base with the smallest number of people". It is clear that very large teams can quickly become difficult to coordinate and integrating various viewpoints may turn into a tremendous challenge. Indeed, the study by Stahl *et al.* (2010) also revealed that group size was a significant factor in determining team effectiveness. Large groups with high cultural diversity were negatively associated with effective communication in comparison to smaller homogenous groups. Thus, the negative effects of diversity (as discussed above) become increasingly strong as the group size grows, and discussing and integrating various viewpoints may be severely hindered in these types of group structures.

2.9   Structure of a GVT: hierarchy and centralisation of decision-making

Organisational structures have critical implications for international business operations due to distances between various parts of the firm and the need to coordinate a wide array of activities between them. As mentioned before, one of the key differences between a GVT and a domestic virtual team is team structure, which underpins processes and issues relating to interpersonal interaction (i.e. communication), information technology (i.e. email and intranet), and task flow (i.e. coordination and shared understanding) (i.e. Maznevski and Chudoba, 2000). Hence, the structure of the GVT has important implications for the effectiveness and

flexibility of these organisational forms. Key structural elements in GVTs are de-centralisation and flat structures. De-centralisation refers to the extent to which decision-making processes are spread throughout the organisation instead of being centralised within a key function of the organisation (most commonly headquarters). Flat structures in turn depict the lack of many layers (i.e. supervisory levels) that are evident in the structure. Both types of structure have important implications for a firm's ability to respond to environmental changes and execute informed decisions. In general there is no 'right way' to structure economic activities; the appropriate structure depends on several factors such as organisational culture, geographical dispersion, global strategy, diversity of operations, technological capabilities, and industrial environment, amongst other things (Stonehouse *et al.,* 2004).

Modern organisations often arrange their operations towards 'flat' structures, and GVTs most commonly belong to this category (Amann and Steger, 2007). Flat structures tend to emphasise improvements in reporting procedures and sharing of responsibility. Gains can be realised from improvements in information flows because unnecessary layers are eliminated and responsibility is shared more equally among all employees. Consequently, information flows should be faster and less non-redundant as it can go directly from sender to final recipient (instead of travelling through unnecessary hurdles such as several hierarchical levels). An additional benefit of flatter organisation is that information (i.e. reports and completion of tasks) can be easier to track as there are fewer structures and processes to follow (Marchand and Hykes, 2007). Hence, decision-making processes can be accelerated as network members have access to timely and new information. Importantly, because decision-making is decentralised and shared among the firm's managers, information overload is reduced (see Mariotti and Delbridge, 2012y). Flat structures are also facilitated by a virtual

environment because it allows fast and more effective communication channels for sharing information between groups and management functions, thus creating value especially in terms of innovation and creativity (Marchand, Kettinger, and Rollins, 2001). On the other hand, decentralised flat structures often suffer from a lack of coordination and potential duplication of activities (Stonehouse *et al.,* 2004). The former point implies that even though units have a relatively high degree of authority to decide on the best way to create value, it does not follow that their activities are always aligned well with the core strategy of the company and headquarters. The latter point refers to the fact that each individual team or unit has the authority to decide on their own activities and this may result in similar ideas, products, and systems being developed in several parts of an organisation without anyone else being aware of it. Hence, activities can be unintentionally duplicated and those resources could have been more effectively utilised for another purpose (Stonehouse *et al.,* 2004).

The fact that GVTs tend towards non-hierarchical patterns of coordination can be considered to be beneficial in that it reduces somewhat the complexity of organising operations across the globe. Indeed, Maznevsky *et al.* (2007) argue that too much complexity can eventually make the firm implode on itself as the executives exhaust their time and energy in managing internal complexity instead of concentrating on generating value and creating competitive advantages. At the same time, the extent to which GVT members are satisfied with working in such flat structures may be influenced by their cultural background. For instance, Stonehouse *et al.* (2004, p. 376-377) argue that European businesses have long tended towards decentralised structures, while American and Japanese companies are more likely to adopt centralised systems. Consequently, GVT managers should possess a cultural awareness that people coming from other countries (i.e. cultures with a higher tendency for hierarchical

interactions) may need more guidance and structured work arrangements. Figure 6 below demonstrates a typical structure of a firm utilising GVTs.

Figure 6 Typical structure of a firm using GVTs
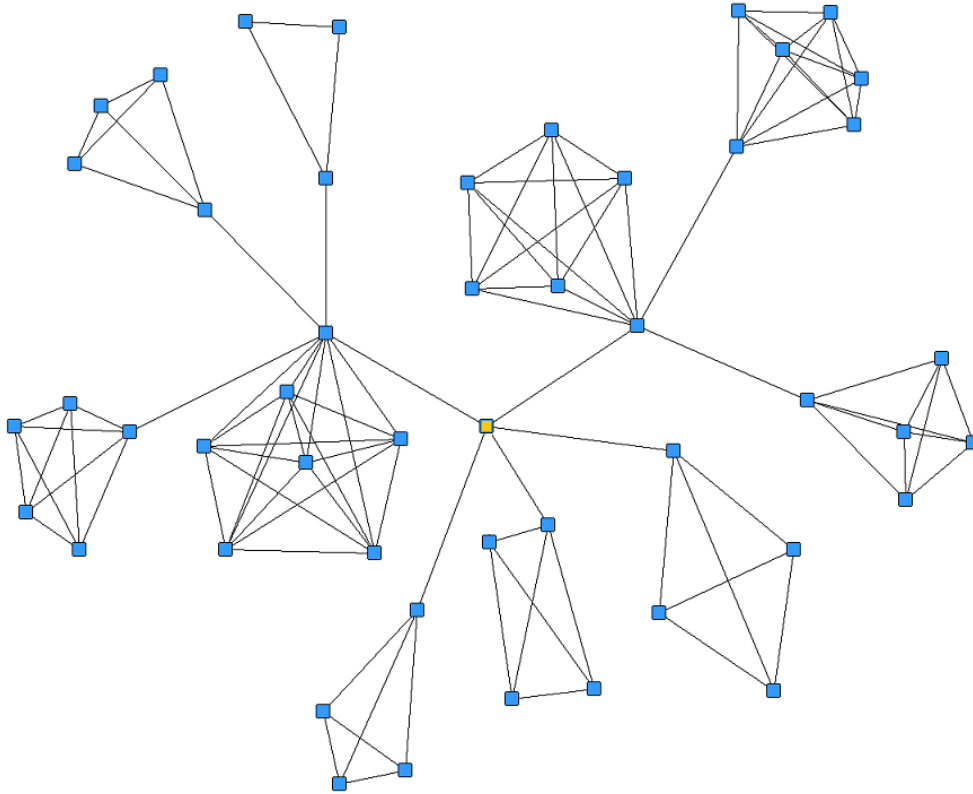
Figure 6 is a visualisation of the reporting structure in one of the case-companies participating into the present study. As can be seen, teams embedded within the larger unit structure are independent from each other. It is common for a supervisor or a manager to be responsible for the coordination of several teams. These managers, in turn, report to a single executive representing one step in the higher hierarchical level of the firm (in the case of the company below, the vice president of operations). From a social network perspective, Figure 6 represents a relatively typical visualisation of a social network where actors are connected by a certain type of tie (in this case a workflow tie).

In sum, examination of previous literature indicates that GVTs have specific features with regards to technology, diversity, culture and structure. These features make GVTs relatively unique and they have important implications in wide array of phenomena (i.e. innovation, performance, and emergence of conflict). These features will be more specifically analysed in the empirical chapters (chapters 5,6, and 7) in this dissertation.

3 Overview of network theory

To recall, the research question of the present study is: *What conditions underpin positive and negative relationships in the intra-firm networks of global virtual teams?* A review of the literature in Chapter 2 highlights that there are several conditions relating to diversity, communication, information flows, and team structure (among other things) which can have a significant influence on both positive and negative network interactions in GVTs. These alternative explanations are more specifically treated and analysed in the empirical chapters 5, 6, and 7. The purpose of the present chapter is to introduce the reader to what is generally referred to as 'network theory' or a 'social network theory' (for a review, see Borgatti and Halgin, 2011). In order to keep consistency in the use of the terminology, the term 'network theory' will be adopted throughout[1]. In a similar vein, by social network analysis (SNA), this study refers to a specific methodological approach used for analysing research questions drawn from network theorising. This chapter is structured as follows. First, network properties are defined as a question of 'what is a network?'. The history of network theory and its current state in academic research is then discussed briefly. This is followed by an introduction to key network concepts which will be used throughout the present study. Key benefits and trade-offs in networks are then presented and discussed. Finally, the main criticisms of network theory and ways of moving forward will be analysed.

---

[1] It is also worthwhile noting that some scholars (i.e. Brass, 2002) have further drawn a distinction between 'network theory' and 'theory of networks'. According to Brass the former emphasises network outcomes while the latter highlights network antecedents (Borgatti and Halgin, 2011). Because both antecedents and outcomes are emphasised in the empirical chapters of this study, such a distinction will not be made in the overview of network theory or empirical chapters of this thesis. In order to keep the terminology as consistent as possible, I will simply refer to 'network theory' which in here will include both meaning as denoted by Brass (2002).

3.1 Network theory and social network analysis

3.1.1 What is a network?

A network is the system of ties or connections among a defined group of objects (also known as actors or nodes). This study adopts the classic position of Radcliffe-Brown, in that social structures are considered to be based on individual human beings, but also recognises that they include collectives such as organisations and nation-states as well (Marsden, 1990). These social structures contain networks where the central elements are relationships between embedded individuals and other social units. Embeddedness refers to a line of argument by Granovetter (1985) which asserts that business-related dealings have a strong tendency to overlap with social ties. In other words, a purely economic point of view explains how firms exchange goods and services in terms of payment, but it fails to fully describe situations when business is based on friendship, kinship, advice, support or another form of informal relationship (Koput, 2010, Kilduff and Tsai, 2003). To be accepted as a social relation, there needs to be at least two actors who have a connection of some sort between them. Naturally, these relationships can take several forms (for instance, lasting or transitory, formal or informal, deep or superficial and so on.) and include a variety of relations such as friendship, business, acquaintance, marriage or any other from many hundreds of observed social connections.

3.1.2 A Brief history of social network analysis

The history of SNA stretches back at least 70 years. A vast amount of knowledge has been accumulated in a disparate set of academic disciplines, including mathematics (graph theory), sociology (e.g. social comparison theory) and social psychology (e.g. balance theory) (Kilduff and Tsai, 2003). SNA is therefore embedded in many different theoretical traditions. Consequently, it has long been described as a powerful approach for studying social structure

with a wide range of applications and a high degree of technical sophistication (Emirbrayer and Goodwin, 1994). At the same time, there have been several theories developed within social network research, such as heterophily theory, strength of weak ties, and structural hole theory (Kilduff and Tsai, 2003; Granovetter, 1973; Burt, 1992). These specific sub-theories are discussed more extensively in the empirical chapters of the present study. Theoretical developments have been especially rapid since the early 1980. As noted by James Coleman (Coleman, 1986, p.1315), one of the key figures in developing theoretical foundations of the network perspective:

"There was no comparable development of tools for analysis of the behavior of interacting systems of individuals or for capturing the interdependencies of individual actions as they combine to produce a system-level outcome. The far greater complexity required of tools for these purposes constituted a serious impediment for their development."

Today, network theory has developed into a thriving field of social scientific inquiry. This is evident, for instance, from the exponential growth in the use of social network approach in academic publications (Borgatti and Halgin, 2011). For instance, Granovetter's seminal work from 1973 now has over 14,000 citations (Borgatti and Halgin, 2011). Furthermore, the emergence of special journals dedicated to social network theory and methods (i.e. *Social Networks, Network Science, Social Network Analysis and Mining,* and *Business Networks*) signals the popularity of this area of research.

3.1.3   What makes social network analysis a distinctive approach?

SNA is a distinctive research perspective to other approaches because the unit of analysis is not the individual but the linkages and patterning of ties consisting of other individuals and ties between these actors. Actors are considered to be interdependent instead of independent, and linkages are considered channels for transferring resources and knowledge (Wasserman and Faust, 1994 p.4-5). Consequently, the network approach has been argued to be a more powerful way of analysing social interactions than other structural approaches, which tend to merely emphasise categorical attributes of individuals and collectives (Emirbayer and Goodwin, 1994). Instead, the network approach prioritises relationships among actors over categories. Indeed, in their review, Emirbayer and Goodwin (1994) call this approach (somewhat tongue-in-cheek) as "anticategorical imperative", which rejects attempts to explain human behaviour only based on categorical actor attributes. Social behaviour and processes are therefore understood as driven by networks of social relationships. Regularities in the pattern of relationships and the context of interactions create a link to the larger picture which gives us insight into conceptualising behaviour and social structure. Indeed, the whole idea of a social network is grounded in the belief that the *pattern* of embedded social ties has important implications for those actors. At the same time, the context of interactions is important because the "social network" consists of many possible types of relationships. Indeed, one of the key strengths and main reasons behind popularity of the network approach lies in the fact that it is relatively *general* in the sense that different groups, relations, and institutions can be conceptualised in network terms. At the same time, it provides *concrete* empirical evidence on the effects of structure and interactions between different types of actors. The latter point avoids the need to aggregate many of the features of social interaction into various types of proxies. SNA can examine these types of effects directly by measuring the types of relationships between actors and the structure of those ties.

3.2 Introduction to key social network concepts

Figure 7 below is a simple illustration of a structure in a network. The goal here is to demonstrate how networks function, and to introduce some main concepts used throughout this study. Ties are the links that connect actors in a network. Social ties always require at least two parties and repeated contact (which does not need to be frequent or face-to-face). In the context of a formal organisation, *social* ties also need to go beyond "prescribed workflow information". Therefore, asking a co-worker for advice counts as a social tie, whereas delivering a regular report does not (Koput, 2010). In Figure below, the relationships between actors are described as information flows. These ties can be either *reciprocated* or *directional*, as is the case in the illustration below. The tie between A and C as well as between D and E are reciprocated (they work in both ways), while other relationships are only uni-directional, as is the case between A and B as well as B and C (for example one actor supports the other while not getting any support in return). In other words, directionality here refers to asymmetry of information flows between actors, while reciprocity is a symmetric relationship where both actors contribute and benefit equally.

Figure 7. Illustration of network triads
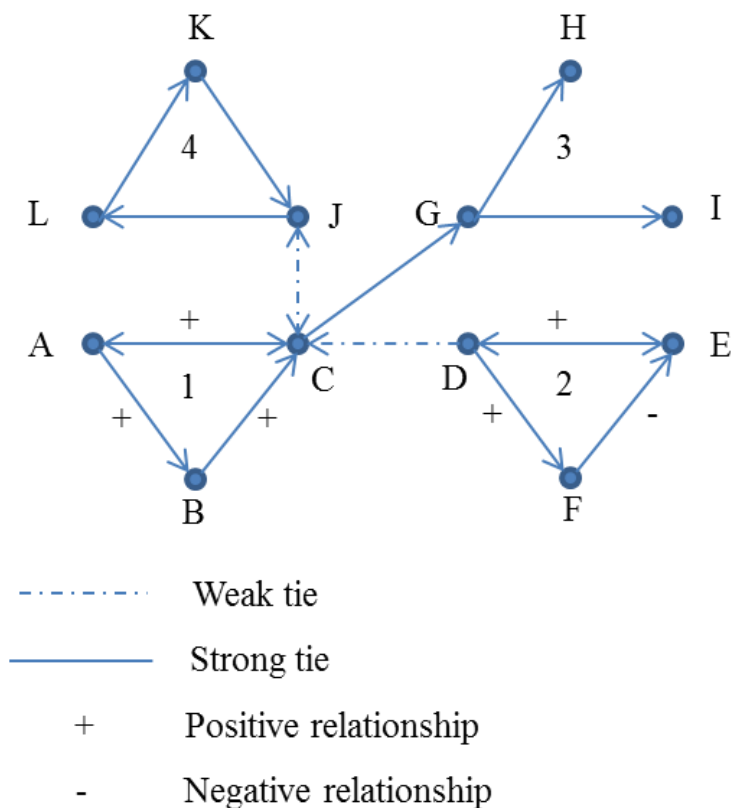
There is a *balance* in the structure of a network only if all of the ties are positive. Therefore, in the case of Figure 7 Triad 1 is balanced but Triad 2 is not due to the negative connection between F and E. Structural balance has been used by sociologists and social psychologists in reference to relationships that are pleasing and lack interpersonal psychological tension (de Nooy *et al.,* 2005). Structural balance is an important concept in the consideration of *transitivity*, which refers to a type of balance where information is passed forward to the next actor. It is necessary to note that a negative relationship (such as between F and E) might form a serious threat to the transition of information. If the tie is laden with negative emotions and tension between actors, it might lead to withdrawal of information, resources, favours, and so on. Taken together, reciprocity, balance and transitivity form a vital consideration in indicating the stability of the network, and the actors' position within it (Hanneman and Riddle, 2005).

Position in a network is closely related to the important concepts of *power and centrality*. It is assumed in network thinking that power is relational and that actors gain power by dominating others (Hanneman and Riddle, 2005). There are two main structural sources of power: *formal* (hierarchical level) and *informal* (network position). While formal power refers to authority or legitimate power in an organisation, informal power refers to individuals, who are not in formal positions but who can exercise power through ties that can, for example, circumvent organisational authorities. Because power and centrality stem from structure and the patterning of ties, the potential of gaining power can vary in each network. For example, it has been argued that *high-density* networks often provide actors with more opportunities than *low-density* networks (Hanneman and Riddle, 2005). This might be simply due to the high degree of connectedness of actors and the large amounts of resource flows within their network. *Density* can be described as the percentage of possible ties that form a network, and a *complete network, cohesive network, or a closed network* is a network that has reached its highest density (de Nooy *et al.,* 2005; Gargiulo and Benassi, 2000). In order to avoid confusion, the term *closed network* shall be used in the present study when referring to highest density networks. In the Figure above, Triad 3 is therefore less dense than the other triads (because actors H and I are not connected), which are complete networks in the sense of simple triads. Density is also negatively linked to network size, and larger networks generally have lower density because of the inherently large amounts of possible ties.

Closely related to network density is the concept of *"structural holes",* a term coined by Ronald Burt (Hanneman and Riddle, 2005). The basic idea is simple. A structural hole describes an absence of ties between actors, which consequently makes any exchange impossible to conduct (Burt, 1992). As the density of network decreases, more structural

holes are likely to appear, and the way they are patterned can be a source of power or constraint for embedded actors. Networks that have no structural holes are therefore closed networks. In Figure 7 above, Triad 3 has a structural hole between actors H and I, whereas other triads are cohesive or closed networks. In this triad, G holds an advantageous position because this position controls information flows for the whole triad, whereas I and H are limited to information provided by G. In some cases, it can be useful to act as a *broker* of ties and connect actors separated by structural holes. For example, G could connect actors I and H, and the increased information flows, learning opportunities and knowledge sharing between actors could leave them indebted and obligated to return a favour to actor G. However, it is important to note that in certain cases when structural holes are bridged in this manner the amount of connections for acquiring information and resources between actors being connected increases, thereby reducing the amount of dependency on other sources. In Figure 7, if the connection between I and H would be bridged, it would imply that these individuals could share information and knowledge which might lead to less dependency on actor G. This effectively exemplifies another trade-off which is often inherent in social ties and the structure of a social network.

It seems intuitively clear that having a better position in a network would lead to a greater amount of control and power. This position is often described by the term *centrality*. In Figure 7, actor C holds a favoured structural position. This favoured position stems from the simple fact that actor C has more exchange opportunities than other actors; if actor B decides not to provide C with information, C has other places to get it from. However, if actor A stops providing B with information, there are no other places where B could acquire information, leading to a certain degree of dependency on actor A. This underscores the logic that actors with more ties and a central position have more opportunities because they have

plenty of alternatives. In the Figure 7, actor C is in a good position because of strong connections to A, B and G, and weak ties to J and D. Tie strength here means the "combination of amount of time, emotional intensity, the intimacy and the reciprocal services that characterise the tie" (Granovetter, 1973). *Strong ties* are not necessarily more important than *weak ties*, and in fact, both types of ties are imperative because they have very different properties. Weak ties, for example, can bridge otherwise disconnected actors together and therefore increase the flow of new information (Krackhardt, 1992). Granovetter (1973) argues that weak ties are often more important than strong ties in understanding certain network phenomena. However, he also argued that strong ties play an important role, and should not be ignored because they can be more easily available, have greater motivation to help, and might be more useful in situations characterised by high uncertainty or the need for protection. Even though extant research has generally supported Granovetter's arguments (Friedkin, 1980; Levin and Cross, 2004), there still exists wide ambiguity of what actually constitutes strong and weak ties, and how they are best measured in empirical studies.

The concepts of balance, centrality, transitivity, density, tie strength are especially important for the present study. This is because in addition to being theoretically significant in explaining social interaction, they will form the foundation upon which a statistical model of network evolution will be built.

3.3   Key benefits of networks

3.3.1   Social Capital

The benefits of networks are often labelled under the general umbrella term "social capital". Social capital, a concept first popularised by sociologist James Coleman (1988), has found a wide array of meanings in the literature, and sometimes very confusing and distant

connotations compared to what it was originally meant to represent. Koput (2010) effectively summarises the properties and views of Coleman about social capital. Coleman argues that social capital consists of three distinctive properties: it is a *productive resource* (that can create value), it requires *investment* (that involves risk and uncertain time-horizons), and it is *inherent in relationships* (requires structure and dyadic involvement) (Koput, 2010 p.17). Due to the ambiguous use of social capital in the extant literature (i.e. all network benefits can be argued to be social capital) (i.e. Adler and Kwon, 2002), network benefits in the present study are referred to in a more specific way. For instance, chapter 6 analyses knowledge flows in GVTs – a network benefit which has specific theoretical and methodological underpinnings and is therefore more effectively analysed outside of a broad umbrella concept such as social capital. Consequently, the term social capital is not used in the present study, and instead more specific terminology is adopted to describe positive network properties (i.e. knowledge flows, strong ties, and potential performance implications).

3.3.2   Key benefits at the level of individual, group, and organisation

In general, the benefits of networks manifest at least on three interconnected levels: individual, group, and organisational. The first refers to one of the most commonly cited benefits of network participation which is the positive effect on individual success through increased salary, better chances of promotion and access to a wider variety of skills and knowledge (Burt, 1992, 2000; Podolny and Page; 1998, Seibert *et al.,* 2001; Moerbeek and Need, 2003). Thus, a key benefit of an individual's participation in a network includes access to resources and information, individual success, and knowledge-transfer. For instance, the flow of information and knowledge transfer can lead to increased identification of opportunities, and increased competitiveness, as well as the possibility of gaining access to otherwise unavailable resources (Mort and Weerawardena, 2006; Chandra *et al.,* 2009; Ellis,

2010). Network brokers, especially, enjoy higher prestige and authority as a result of bringing people together (for example, by mobilising actors with similar goals and increasing information diversity) as well as gaining from indebtedness and obligation for reciprocity from their network partners (Granovetter, 1973; Burt, 1992; Uzzi and Lancaster, 2003; Heemskerk, 2007; Koput, 2010). Indeed, Lechner *et al.* (2006) found that relational mix (even with competitors) is crucial for firm development. The second key benefit of social networks is a normative one. Exclusivity and closure can strengthen and maintain norms and solidarity in groups by imposing sanctions against members who deviate from those norms (Coleman, 1988). Tighter groups also facilitate the creation of trust and increase the spread of reputational effects. This might lead to decreased opportunism and easier verification of information (Provan, 1993; Koput, 2010), and an amplified social cost of breaking a tie (Chua *et al.,* 2009). Finally, considering the research findings reported above, it is not surprising that networks have been found to have positive effects at the organisational level. For instance, networks positively affect company growth in domestic as well as international environments, and this has been discovered to affect different company stages from inception to maturity (Ellis, 2000, Yli-Renko *et al.,* 2001, Maurer and Ebers, 2006). Indeed, at the organisational level, it has been found that higher levels of relational embeddedness for companies can lead to increased chances of a firm's survival (Uzzi, 1996), lower withdrawal rates in alliances (Greve *et al.,* 2010), and a better chance of internationalisation through alliances (Al Alam and Soutaris, 2008). Also, it might have a positive influence on firm performance as well as new product development and production processes (Anderson *et al.,* 2002).

3.3.3 Benefits of networks in GVTs

Networks are critical in team contexts for several reasons. First, it has been argued that managers need to cultivate networks and interpersonal relationships in order to contribute to the firm's global strategy and to the functions of the GVT (Maznevski and Chuboda, 2000). Hence, networks contribute to the strategic direction of the company by integrating information and resources from across the globe so that they can be effectively brought together for the benefit of the firm. Second, interpersonal relationships denote the emergence of informal leaders who primarily tend to exert their power through social networks. Informal leaders arise when formal leaders fail to effectively coordinate activities. Consequently, this type of leadership tends to occur in teams with an absence of formal leadership and flat hierarchical structures. Informal leaders exert influence through interpersonal interactions such as managing others' emotions and cognitions (Pescolido, 2002). Considering the flat structures of GVTs, this type of informal leadership emergence and exertion of informal power over others could be more common than in hierarchically structured organisational forms. Furthermore, heterogeneous organisational networks can enhance a climate which encourages formal and informal interactions with diverse others. These types of networks minimise exclusion (outliers) and encourage trust and acceptance among participants. Indeed, it has been argued that identification (i.e. an individual's belongingness to a certain social category) has important implications for social cohesion of the virtual team (Fiol and O'Connor, 2005). Cohesive influences of identification could be especially important in virtual teams because of reduced opportunities for face-to-face interactions (Wiesenfield *et al.,* 2001). Thus, increased identification could promote social attachment among team members even though members are spread across geographical locations and rarely meet in person.

Communication between team members is critical for the effective coordination of work flow, and teams which consistently fail in their efforts to communicate represent a waste of valuable organisational resources. Networks structures have been shown to be important indicators of a team's communication capabilities. For example, an early study by Roberts and O'reilly (1979) showed that individuals who are peripheral to the team's communication structure relied on written and telephone communication, showed less organisational commitment, and had lower levels of satisfaction (as well as organisational performance) in comparison to more participative team members. Thus, the managerial challenge is how to integrate structurally isolated members so that their effectiveness at the individual as well as team level is maximised without imposing unnecessary cognitive constraint (i.e. by obliging them to interact with others) to peripheral individuals. Networks can also act as a cohesive mechanism which facilitates the reduction of complexity. For instance, when people from different backgrounds are linked within and across companies, they can share information (i.e. on labour market and customers), test ideas (i.e. about new products and future strategies), and together develop a more holistic picture of reality within and outside of organisation (Maznevski and Jonsen, 2007). Conversely, studies which analyse network benefits often acknowledge that there are also negative network effects or trade-offs in the formation of networks as well as in the outcomes of networks. These costs and trade-offs are further explored below.

3.4 Costs and trade-offs in network formation

Authors have increasingly recognised that networks can also carry constraining and unwanted effects (Coviello and Munro, 1995; Johanson and Vahlne, 2009; Ellis, 2010). Some scholars have even claimed that the negative aspects of networks might outweigh the derived benefits, and therefore have a larger impact on explaining workplace outcomes (Labianca and Brass,

2006). Taking this into consideration, there is a huge gap in our knowledge about the "dark side" of networks (see empirical chapter 3 for greater details on the costs of networks). This lack of knowledge can be attributed to the skewed prominence of a body of research which concentrates mainly on the positive effects of networks. The fundamental issue in extant research on benefits of network participation is the fact that it easily ignores or overlooks the costs and unwanted effects, and creates a "romanticised" picture of the phenomenon. For example, in much the same way that having a strong connection to a powerful person may lead to increased salary or promotion, a single bad connection, especially with an actor of high status, can be extremely harmful for a career, leading to decreased status, shorter employment and difficulties in landing a new job (Moerbeek and Need, 2003). These types of relationships are sometimes referred to as hindrance ties (see Chapter 5). The overview of previous research below concentrates on key aspects of network trade-offs: network size, overly cohesive networks, overreliance on network partners, and access to information and resources.

3.4.1   Network size

It is well established that the growth of an actor's network is enabled by access, timing and referrals (Burt, 1992). However, actors need to learn how to balance their time, energy and money spent for networking purposes. Combining the pressures stemming from the demands of the job and the simultaneous need to keep up network connections can take a heavy toll on employees. Balancing network size and directing efforts towards a suitable range of actors is important in order to ensure that resources are allocated in a way that maximises gains derived from carefully cultivated relationships. Consequently, unfocused rapid expansion of networks can lead to suboptimal outcomes or constrain the ability of actors to keep matters under control. For example, access to information (i.e. through large networks) does not

mean the information is absorbed and utilised (Reagans and Zuckerman, 2008). Indeed, simply possessing information does not necessarily convey significant benefits, as there is a need to recognise the value it contains, and to have the power of access to decision-makers who can then utilise the knowledge (Buckley, 2010). It is reasonable to ask: what is the return on investment on social ties? Krackhardt (1994) refers to information overflow in networks as "the law of N-squared", meaning that networks can rarely be fully connected because the number of possible contacts goes up in the same manner as the square of the number of elements in the system. For example, with 10 people, there are 90 possible links (as calculated by 10*9), a group of 20 has 380, 100 people have 9,900, and so on. The time and energy needed to sustain good relations often makes central people feel like they have to work extra hard and be more available (Cross *et al.,* 2002, 2005). Kilduff and Krackhardt (2008) support this view, as they found friendship network centrality to be negatively related to job satisfaction. Hence, obligations to spend time and energy for maintaining high amounts of friendship connections may clash with job responsibilities, leading to decreased job satisfaction.

3.4.2 Overly cohesive networks

Even though it has been demonstrated that close and dense groups can provide a number of benefits (establishing of common norms, low monitoring costs, reduced opportunistic behaviour, among other things), it has also been consistently shown that *too cohesive* groups are subject to several problems. Groups with increased levels of cohesion can suffer from phenomena like groupthink (Janis, 1972). This depicts a tendency for views, opinions and ways of thinking to converge between actors, upon which they might stop challenging each other and no longer produce innovative solutions to problems. Hence, group pressure, norms of behaviour and strong network ties can create a rigid environment that discourages creative

thinking and independent idea development (Villena *et al,* 2011). Not surprisingly, conformity, compliance and control can decrease innovation when deviation from group norms is required (Edelman *et al.,* 2004). Similarly, scholars have noted that cohesive groups suffer from intellectual inbreeding (i.e. everyone having similar ideas) (Zhang 2010), because they lack a steady flow of fresh outside information. Indeed, Burt's (1992) major argument underpinning the theory of structural holes is that dense networks can be crippling when they provide non-redundant contacts - actors who provide the same informational and resource-based benefits.

In line with Burt's (1992) arguments, cohesive groups and network structures are widely known to induce inertia (Gargiulo and Benassi, 2000; Edelman *et al.,* 2004; Zhang, 2010). This refers to the continual resistance towards change, especially in regard to dissolving old connections and forming new ties. Similar effects may also apply in international business settings, since Dunning and Lundan (2008, p.305) note that excessive levels of network cohesion can lead to inertia and intolerance. Indeed, it is often in human nature to exclude new people, organisations and ideas, and instead concentrate on working with old familiar "standbys" (Mauer and Ebers, 2006). Even though these types of strong ties help to develop trust, mutual norms, reciprocity, reduced opportunism and knowledge transfer (Hansen, 1999; Reagans and Zuckerman, 2008; Jack, 2010), they might also engender a loss of objectivity in decision-making. Moreover, growth and performance has been noted to suffer when the networks a company possesses is too homogenous (for example, consisting of individuals with a similar set of goals, orientations, expectations and needs). For example, Hambrick *et al.* (1996) found that network benefits are diminished by group homogeneity, which also has negative effects on market share and profits. Furthermore, Maurer and Ebers (2006) found that homogenous relationships might result in constant relational (norms and mutual trust)

and cognitive (goals and orientations) inertia, that is "lock-in" situations which isolate actors from outside ties. Similarly, Weber and Weber (2011) found that an actors' inability to realise or implement necessary changes in their network configuration was one of the most serious drawbacks of the relationships in the participants' networks. Loss of adaptation and flexibility poses a serious problem because knowledge transfer and innovation depend to a large extent on the ability of actors to adapt to changing conditions (Weber and Weber, 2011). Indeed, research in corporate alliances has found that too much embeddedness can cloud decision-makers' judgement when choosing an alliance partner by producing biases, leading to flawed judgement (McEvily *et al.,* 2003).

3.4.3   Overreliance on network partners

The inertial forces discussed above closely link to the issue of overreliance on network partners. Sometimes a relational transition from independence to *overreliance* takes place over time due to accumulated reciprocity norms, increased relational obligations, and a lack of restructuring efforts (Gargiulo and Benassi, 2000; Uzzi, 1997; Maurer and Ebers, 2006). Overreliance refers to a state when people become increasingly dependent and vulnerable to the actions of others (McEvily *et al.,* 2003). In networking terms, a powerful position is achieved when actors are reliant on an ego to provide them with information and resources; while at the same time an ego is reliant on as few other actors as possible. Reliance on others inevitably decreases an individual's power and flexibility because, if those ties turn sour, there may be no other ways of finding equivalent resources. Furthermore, high dependence allows actors to exert increased levels of influence, control, and pressure over others (Edelman et al., 2004), thus increasing the likelihood of achieving their goals. Whether overreliance stems from slow evolutionary process or individualistic traits depends on a specific context. Regardless, it constrains actors so that they have limited options in finding

resources, and become vulnerable to the opportunistic behaviour of others. This gives them a clear competitive disadvantage.

3.4.4 Access to information and resources

Scholars sometimes assume that a central network position or a large number of network contacts equals increased information flows. This is not always a reasonable assumption because organisations regularly have exclusive strong groups which have a tendency to restrict outsiders from gaining access and receiving the information they possess (Adler and Kwon, 2002). Indeed, power relations often depend on *not sharing* information, because its value might decrease as soon as the particular piece of knowledge becomes commonly recognised. More power can be achieved by withholding certain information, and waiting for its value to increase. Further, membership in one network might be restrictive to others (Kilduff and Krackhardt, 2008). For example, a case study by Krackhardt (1999) shows how an influential leader was part of numerous different cliques (exclusive groups), and heavy constraints posed by obligations and requirements of various memberships froze this person's ability to leverage any network benefits, eventually leading to resignation from his duties. Furthermore, as argued by Krackhardt (1994), even democratic systems have a tendency to be captured by a few key individuals. The danger of this is self-serving goals and manipulation of the decision-making system, and the creation of formidable barriers against free and interactive flows of information and knowledge within a group.

Another potential danger which links to both network size as well as network cohesion concerns information overflow and redundancy. In a modern world filled with information bombarding actors from a wide array of channels, it is difficult to filter what can be

considered useful, what sources night be trusted, and how these should be applied in practice. Network size can contribute to information overload simply because there are more potential sources of information. Network cohesion, on the other hand, emphasises a higher level of interaction as well as stronger interaction intensity, and both have the potential to produce more information (of potentially little importance) than the recipient can handle. Indeed, our capacity to handle information is limited, and it has been found that most individuals have difficulties handling more than seven pieces of information at any given time (Miller, 1956). Also information overflow presents considerable challenges in regard to how the information is stored, accessed, secured and transferred. Information leaks in modern corporations are becoming increasingly difficult to control, and lack of systematic data management can lead to serious set-backs (see, "The leaky corporation" in *The Economist*, 2011, Feb 24th). Indeed, a recent study by Mariotti and Delbridge (2012) found that firms need to take an active strategic approach for solving information redundancy and overflow.

In sum, the research findings above with regards to network cohesion indicate a curvilinear relationship. Uzzi (1997) argues that this type of "paradox of embeddedness" can reduce adaptive capacity (i.e. the ability to reconfigure actions according to changing situations) when companies are over- or under-embedded in their relational networks. The phenomenon was further clarified by Hite and Hesterly (2001) and Adler and Kwon (2002) who all concluded that the same embeddedness that grants access to information and resources also binds companies to the chosen relationships, thus reducing adaptive flexibility. In this sense, the networked organisation would provide no advantages over more traditional hierarchical forms if all employees are ignorant of the resources outside their close ties (Krackhardt, 1994).

3.5   Main criticisms of network theory and ways forward

The discussion above indicates that in order to create a complete picture on the effects of networks, it is vital to discern and recognise the benefits as well as the liabilities of network participation. Labianca and Brass (2006, p.569) use an appropriate metaphor for constructing a more holistic understanding of the network literature. They state that the potential liabilities involved in networks should be taken into consideration in much the same way as they are in financial ledgers. Indeed, it is argued in this study that positive aspects related to networks also contain possible liabilities which may negatively affect the individuals and organisations involved. By combining these viewpoints, it is possible to create a more complete picture on how networks and liabilities are created through several levels of analysis. For example, Zaheer *et al.,* (2010, p.71) conclude in their insightful analysis of gaps in the current network literature that there is much potential in concentrating on the trade-offs and "dark side" of networks. They argue that questions like "how do organisations balance the benefits of trust and embeddedness with the costs of lock-in and inflexibility with the same set of partners?" should be the focus of future research. However, this is not to suggest that networks would not play an important enabling and beneficial role. Instead, the purpose is to highlight the fact that certain conditions give rise to liabilities such as risks, uncertainties, dependencies and other unwanted effects that might accompany the creation of networks. These in turn might create formidable problems for individuals and organisations. Awareness of the beneficial, *as well as* the unwanted consequences of network membership, may help us find new remedies for seemingly complicated situations, as well as providing a more accurate picture of social networks for individuals and organisations.

There are still other lingering criticisms against network theory; the main argument commonly being that the field lacks home-grown theories, and is therefore only descriptive or

just a methodology. However, the pace of development in the field of social networks has been extremely rapid, from Leinhardt (1977), who described it as "a developing paradigm", through to comments by Hummon and Carley (1993), who claimed that network theory has achieved 'normal science' status. At the same time, in their early review of network theory, Emirbayer and Goodwin (1994, p. 1414) argued that network analysis is not a normal unified social theory, but rather a "paradigm", a "perspective", or a "loose federation of approaches". In more contemporary discussions, researchers have sometimes anchored it to a full paradigmatic status, matching the Kuhnian ideal of a mature paradigm (Borgatti and Foster, 2003). A more recent review of network analysis by Borgatti *et al*. (2009) in *Science* considers the arguments that refute the status of network theory as a mature scientific theory in the light of more recent contributions. Indeed, they contemplate that the enduring criticism might be due to novelty and sophistication of methods, transferability of the toolkit to other disciplines, and the tendency of researchers to connect anything mathematical with tools and methods. Theory development relevant to networks (whether home grown or imported) is flourishing as can be witnessed over the last decade by a tripling amount of articles in the Web of Science with "social networks" as a topic (Borgatti *et al.,* 2009; Kilduff and Tsai, 2003). However, the review provided by Emirbayer and Goodwin (1994) is correct in stating that there is much internal diversity in network theory and SNA. Indeed, even today, network analysts debate how social structural concepts such as centrality, social distance, and cohesion should be empirically operationalised, and which sub-theories (i.e. theory of structural holes and theory of strong and weak ties) are appropriate for specific research questions. These debates, however, only signal the relevance of the research topic, as well as strong interest in developing more rigorous and sophisticated tools for analysing the role of social structure and relationships in organisational contexts.

4   Research methods

This chapter describes the data collection procedures and research methods utilised in this study. First, the reader is introduced to the boundaries of the sample and how access to the sample was negotiated. The following section discusses the participating case companies and the industrial context in greater detail. Furthermore, the development and operationalisation of the survey instrument will be examined. In addition, potential issues with regards to questionnaire reliability (i.e. common method variance) will be analysed. Subsequently, methodological underpinnings (methodological individualism) and multiple-case study methods will be briefly discussed. Finally, two analytical procedures which are utilised in all three of the empirical chapters are introduced: namely QAP regression and the E-I index.

4.1   Data collection procedures for the present study

Data were collected from 37 global virtual teams in three Finnish knowledge-intensive companies. Therefore, as with most network studies, this research focuses on well-defined sets of actors with clear boundaries, instead of random sampling from a larger population (Wasserman and Faust, 1994). A research design where inferences are drawn from individuals embedded within teams, which in turn are part of several companies operating within similar industrial and contextual settings, is common in network studies (i.e. Ancona and Caldwell, 1992). Despite the fact that this a convenience sample and may consequently have limited generalisability, the characteristics of the teams and companies involved are representative of GVTs and knowledge-intensive industries in general.

The participating companies were initially contacted through common acquaintances between the primary investigator and managers of the companies (see Appendix A for a project description). This allowed the establishment of a certain degree of trust as common acquaintances (i.e. brokers) vouched for the reliability of both parties. Managers and Chief Executive Officers were then presented with the description of the present study. This included the purpose, goals, requirements, benefits of the participation, and a guarantee of anonymity in case of participation. Further discussion took place between the primary investigator and company representatives in order to ensure that the goals of both parties were aligned, and to ensure the company executives fully understood the data collection procedures and dissemination of the research findings. Simultaneously, these built trust and social capital between parties. Hence, discussions played an important role in facilitating long-term cooperation and establishing how confidential organisational information is handled. Furthermore, the academic purpose was to establish a connection between scientific explanation and context, which has been argued to be an especially important issue in cross-border settings (see Welch *et al*., 2011). Managers stated that the formation of networks within their organisations had previously been a topic of interest (and one of some concern) during internal discussions. This preliminary stage of investigation led to the inclusion of relational challenges and benefits between individuals and groups as a major focus of study.

Considering the amount of relational data (intra-firm) needed to be collected, it is very difficult to properly investigate networks in more than a few organisations. Indeed, it is good to remember that the complexity of networks is immense. For example, a network of 50 actors consists of 2,450 possible ties between individuals. The mathematical modelling of these networks becomes even more complicated when various actor-covariates (e.g. personality attributes, structural positions, and demographic characteristics) are added into

the equation. In fact, some of the most groundbreaking and insightful dynamic network studies are case studies investigating network development of less than 30 actors (see Van de Bunt and Groenewegen, 2007). Indeed, when collecting whole-network type of data (i.e. information of actors in a within a clearly defined boundaries such as work unit) it is not feasible to conduct a survey of tens or hundreds of companies (which common in international business research) because the unit of analysis is not a firm but rather an attribute if individual team-member, relationship between individuals (dyad) or the team itself. It is also important to note that whole-network data requires self-reported information on *all* network actors (or as close as possible) within specific boundaries (i.e. work unit) as opposed to use of key informant (i.e. CEO) which is often used in international business research using survey methods. Moreover, intra-firm network survey requires access to sensitive and complex data on relationships and therefore researchers often need to establish a good working relationship with the case companies. This becomes increasingly difficult as the number of participating firms grows. Even though there are only four participating firms in the present study, their teams are *representative* or *typical* cases (on which see Yin, 2003) in a sense that their GVTs possess attributes often present in such teams (i.e. combination of CMC and face-to-face communication, cultural, geographical and linguistic separation, and a knowledge-intensive industry context) (see a review by Zimmerman 2011 for more details on GVT attributes). In addition, the firms represent a *relevatory* case (on which see Yin, 2003) in the sense that the investigator has an opportunity to explore a phenomenon that can often be inaccessible and burdensome for gathering data. In sum, complete network data has often been difficult to uncover for various reasons; including the need for high level of access, the complexity of maintaining cooperation with the case company, a requirement for a high response rate, and multi-location and multi-cultural settings, and so on. Such conditions can be difficult to overcome, and therefore the use of limited number of participating firms is

justified on the grounds of access to (i) whole-network information, (ii) typical, and (iii) relevatory cases.

4.2 Description of case companies

First case company is involved in the steel and construction industry. The firm's core capability lies in providing innovative energy efficient solutions for better living and working, and their net sales in 2012 totalled almost 3 billion euros. With over 9000 employees globally, their network of dealers and distributors spreads across 30 countries from Finland to South America. Second case company provides indoor climate and plumbing solutions to residential and commercial customers in Europe and Northern America. The focus is on innovative solutions (i.e. plumbing, heating, and cooling) which are sustainable, safe, and reliable. This company has around 3200 employees and turnover of 811 million euros in 2012 fiscal year. Finally, third case company provides solutions for telecommunications and is a global contract manufacturer and systems supplier for communication and electronics. Operations in telecommunications include mobile phone and ADSL networks and testing and assembling of modules relating to enclosure systems. Professional electronics products on the other hand include electronic modules, circuit boards, and cables. Part of their service includes sourcing, planning, purchasing, and production of processes and technologies, product testing, and global logistics management for their customers. This case company has production plants across Europe and China. Their turnover in 2012 was over 40 million euros and current number of employees is around 2000.

All three companies are therefore embedded within knowledge-intensive industries where tightening competition creates a need towards flexible customer solutions and organisational

structures on a global scale. Similarly, while the participating companies are different in terms of their industrial specialisation, all are strongly linked to product and supply chain management, production, manufacturing, and sales and marketing. Therefore, working titles such as development manager, product manager, application specialist, sourcing manager, component engineer, and customer service manager are common in all three participating firms. Teams are therefore highly knowledge-based and draw their competitive advantage from effective transfer of knowledge resources and expertise of team members. Scientific equipment and solutions provided by these companies are therefore very technically advanced and product development cycles are often measured in years. Consequently, knowledge-intensive markets have been long described as turbulent both in terms of future trends as well as in speed of change (Nordberg *et al*., 1996). Rapid changes also imply that customers constantly require new products which are adapted to their specific needs, making it nearly impossible to successfully market off-the-shelf products. Siegel and Hambrick (2005) argued that high-technology presents an interesting paradox in that the dynamic nature of the industry calls for entrepreneurially oriented individuals who are able to show initiative and be creative, and hence should be awarded according to their own and their units' performance. Simultaneously, a knowledge-intensive setting emphasises collaboration, interconnectedness of diverse actors, and coordination of knowledge-based resources towards managing full product cycles from design process to after-sales of a finished product.

The GVTs investigated were geographically dispersed across 19 countries and 50 geographical locations. The executives and CEOs provided additional information about their teams and team members. This information included the official structure of the teams as presented in organisational charts (i.e. who reports to whom), as well as work location and the nationality of each individual. Data sources are summarised in the figure below.

Figure 8 Summary of data sources.
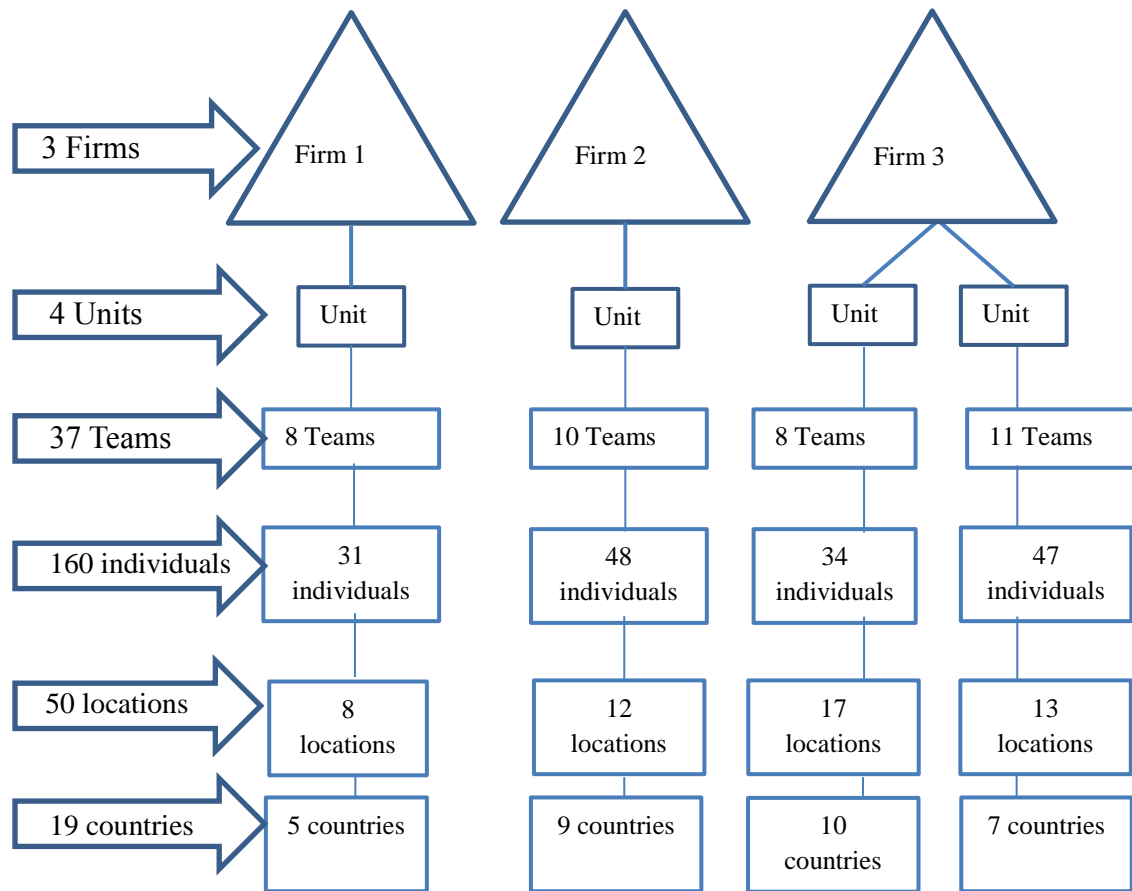
The network data which were collected (see survey instrument – section below) is the unit level. In other words, employees within four units were asked to evaluate their relationships with all other people within their unit. This produced four intra-unit networks. These networks consisted of teams which naturally are formed by individuals. Communication ties between individuals in intra-unit networks are visualized in the figure below.

Figure 9 Visualization of intra-unit networks
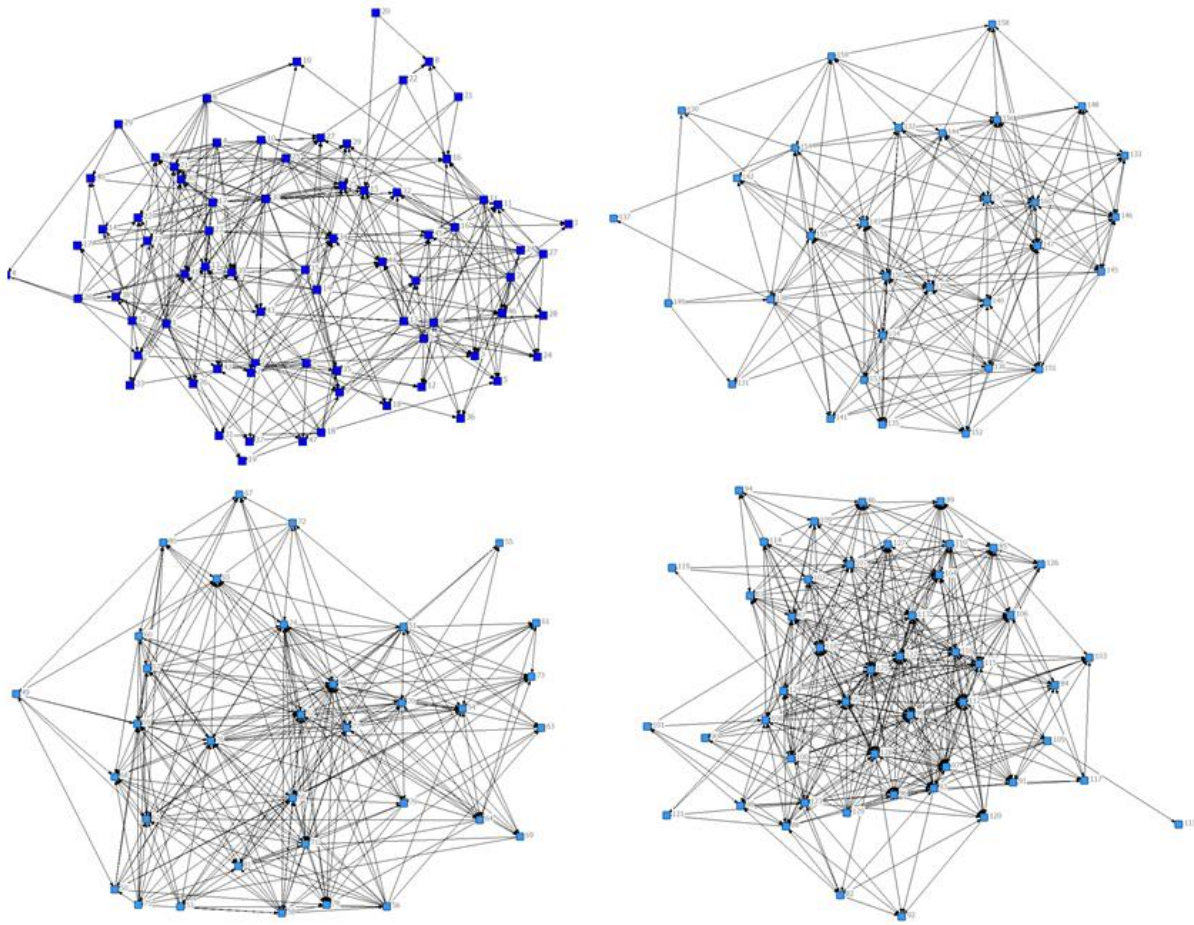
A considerable amount of interaction and coordination between team members therefore takes place through virtual and computer-aided systems. However, as some of the team members were co-located, there was a combination of computer-aided communication and face-to-face interaction. This is illustrated in the figure 10 below. In this figure different colours represent the nationality of each node, whereas team boundaries (i.e. workflow via organizational chart) are defined by dashed lines.

Figure 10 Example of GVTs in the present study
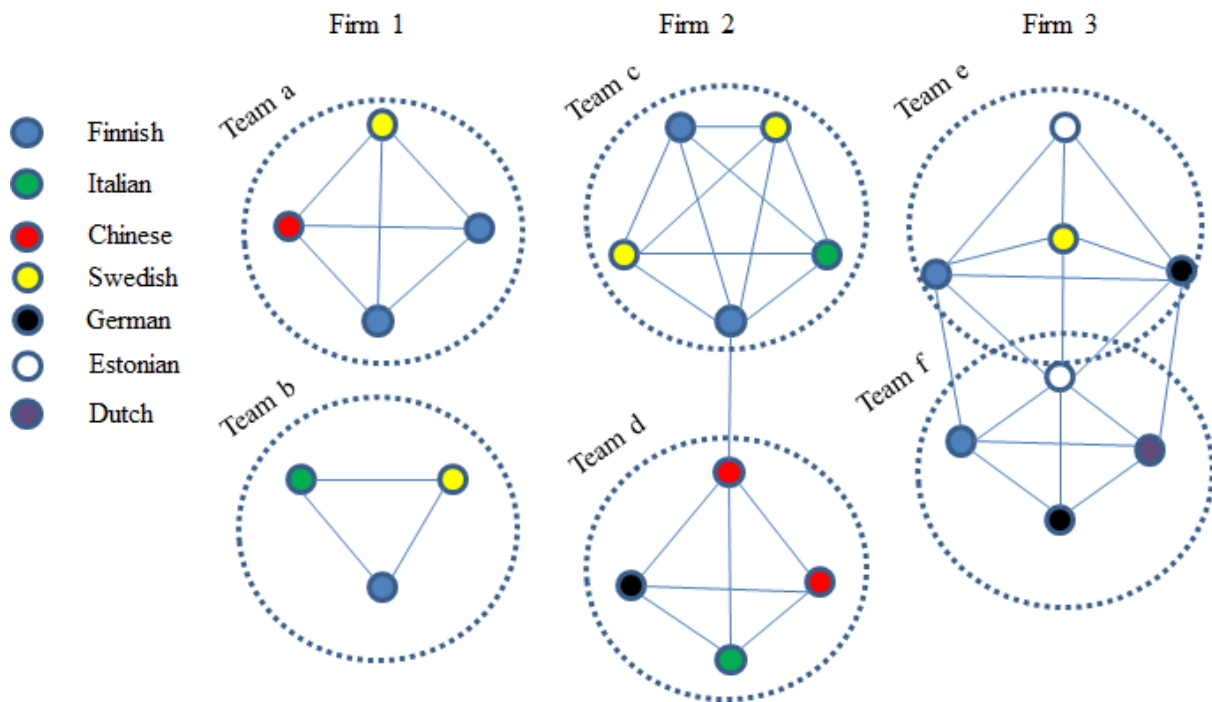
As can be seen, teams consist of people from different nationalities. Even though people might be from the same nationality and work in a same team they may not necessarily be co-located (as there are only 19 nationalities and 50 geographical locations). For instance, in the figure above, Finnish people in Team a in Firm one may have been separated by hundreds of kilometres despite both belonging to the same nationality. Hence, teams were diverse both in terms of a range of nationalities as well as geographical locations. The figure above also demonstrates that the degree of required interaction (in terms of defined work flow) between teams somewhat varied in each firm and their teams. For example, teams a and b in firm 1 are not required to work together while team e and f in firm 3 teams are tightly connected.

It is good to note that while these teams can be assembled to tackle a particular objective (i.e. develop a specific product platform), after which members continue to work on other projects, the focus of the present study is on enduring GVTs working towards common purposes over sustained periods of time. This allowed the analyses of established informal communication

patterns that occur outside of mandated workflow (such as advice and friendship), which may be absent in teams experiencing continual structural variations.

It is also good to note that all of the four participating work units (and hence, most of the teams) were moderately mature in that they have existed for several years. Naturally, there has been a degree of mobility in individuals occupying work positions, but the general structure has remained relatively consistent. Griffin and Pustay (2010) note that the maturity of a work unit has several important implications. First, role structures have become well defined and individuals recognise their part to play in a larger picture. Second, norms among members become increasingly established and individuals develop a sensitivity towards what is allowed in the boundaries of acceptable social behavior. Third, the work unit becomes more cohesive and its members develop shared identity and values among each other. Finally, informal leaders are recognised and official workflow may be diverted to follow more informal patterns. After the discussions took place the work units members were contacted by their employing organisations. Email contacts informed the potential participants of the goals, purpose, issues regarding confidentiality, and benefits of the study. Participation was therefore not mandatory but was highly recommended by the company executives.

4.3   Survey instrument

Before the survey instrument was distributed to the participating companies, it was tested with 11 students conducting their Master's degree in the University of Leeds. The purpose of this pilot study was to examine how long it would take for respondents to complete the survey and whether they had any difficulties understanding the questions. Based on this information, some of the questions were slightly modified. In general, the pilot indicated that

individuals understood the questions and were willing to respond to the questions they were presented with within an acceptable timeframe. Secondly, all the chief executive officers and managers involved in the research project analysed the research survey questionnaire in order to evaluate its contextual fit to their companies and teams.

The survey was administered in early 2012 to 160 employees and received an average response rate of 82 per cent, which is well within accepted boundaries when using a whole network approach (Wassermann & Faust, 1994; Kossinets, 2006). The response rate for each work unit was as follows: work unit 1: 83 per cent (47 members), work unit 2: 80 per cent (34 members), work unit 3: 81 per cent (48 members), and work unit 4: 80 per cent (31 members). Participating work units were relatively small and, thus it was possible to use a whole-network approach. Name rosters helped to reduce measurement error, assist with recall, and enhance overall measurement reliability (Mardsen, 1990). Each respondent was asked questions about their relationships with all other work unit members, and this generated information about the entire intra-unit network (Mardsen, 2005). Data collected were sociometric information. The purpose of using sociometric data was to evaluate affective positive and affective negative ties (i.e. ties that carry emotional influences) among network members, as well as to evaluate relationships which are instrumental in nature (i.e. provide access to diverse resources or information).

In the sociometric part of the survey, the respondents first identified the people with whom they "have regular communications, exchanges or dealings with". This description was chosen because repeated communications, exchanges and dealings are known to be necessary key conditions for social capital formation (Adler & Kwon, 2002; Tsai & Ghoshal, 1998).

Furthermore, communication underlies the discovery of acceptable norms (often through trial-and-error) for social behaviour within global teams consisting of individuals from diverse backgrounds (Chevrier, 2003). Respondents were then asked to report on the extent to which they disagree or agree (on a Likert-scale of 1 to 6) to the statements they were presented with (see table 6 below). Likert-scale ranging from 1 to 6 was chosen because it separates both positive and negative effects in that respondents can either agree or disagree with the proposed statements. In other words, this scale lacks the "neutral" or "undecided" column, which in essence places answers on a continuum from "strongly negative" to "strongly positive". However, it should be noted that respondents were instructed to leave their answer blank if they truly felt neutral or undecided, and could not therefore provide a descriptive answer of their network tie. For analytical purposes this was treated as a lack of tie between respondent and another person for that specific question. This is a reasonable assumption for the present study because the main objective is to investigate the development of clearly positive or negative network relationships over time. Moreover, the respondents were given an option to add more people to their network at any point during the survey. This option was executed via dropdown menu which contained a list of names of all people within the same unit (see Appendix B for an example). The questionnaire items are further elaborated below and summarized in the table 6 below. All items except communication (see below) were measured on a scale of 1 to 6 (strongly disagree, disagree, somewhat disagree, somewhat agree, agree, and strongly agree). Specific coding of these variables will be further elaborated in empirical chapters of this thesis (chapters 5, 6, and 7).

2.1 Communication

Communication is one of the key elements in organizational networks as it is a primary way of transmitting information. Meaningful communication therefore underpins all exchanges

and building of relationships in the workplace (Guo and Sanchez, 2011). Whether formal or informal in nature, communication has been subsequently closely linked to control, power, and influence in organizational networks (Brass, 1984; Pfeffer, 1981; Burt, 1987; Sabatelli and Shenan, 1993). In a context of GVTs, communication has been argued to be one of the key factors for overcoming difficulties stemming from diversity, dispersion, use of CMC (Galagher and Kraut, 1994; Jarvenpaa and Leidner, 1999; Robey *et al*., 2000). Communication in the present study is measured by newly developed item (based on studies cited above) where the respondents were asked to check the names of the people they have regular mutual dealings, exchanges, or communications with. This produced a dichotomous matrix where i,j and j,i = 1 if there was communication among actors and i,j and j,i = 0 if not.

2.2   Access to resources

One of the key advantages of any network is the access it provides to various resources and knowledge. On individual level, access to increased problem-solving capabilities and diversity of information (Burt, 2004), non-homogenous actors with various skills, ideas, values and behaviour can foster creativity (Amabile, 1996; Fiol, 1995), provide access to equipment, material, and opportunities (Mauer and Ebers, 2006). Therefore, one of the main features of social networks is the access to new information, opportunities, and ideas. Consequently, access to network resources was measured by newly developed item (based on studies cited above) where the participants in the survey were asked to indicate the extent to which each their network members are "a good source of information, ideas, resources and opportunities".

2.3   Socialization

Access to these resources and opportunities often requires frequent interaction between actors. Regular contact ensures that individuals know each other on personal level, are able to

provide reliable information, and help each other in finding efficient solutions to challenging problems (Dyer and Naboeka, 2000). Close ties developed through frequent contact familiarity on personal level can also lead to strategic benefits through sharing of sensitive information (e.g. markets, customers, clients, internal opportunities and so on) (Villena *et al.,* 2011). Therefore, socialization on personal level and getting to know other actors as individuals is an important part of generating network benefits (Oh *et al.,* 2004). More specifically, as team members socialize outside of their familiar work environment, opportunities trust, and motivation for various exchanges increases (Oh *et al.,* 2004). Consequently, socialization at the informal level is measured by newly developed item (based on studies cited above) where the participants in the survey were asked to indicate the extent to which they regularly meet with each of their network members outside of work (e.g. for coffee, meals, or social events).

2.4   Shared values and goals

Shared identity and goal congruence relate to the cognitive side of networks (shared norms, values, and attitudes), and are significant factors in connecting and unifying individuals within an organization to work towards common good (Parkhe, 1993; Villena, 2011). Having a shared identity and similarities in organizational goals implies that employees also share similarities in cultural, language, and ideologies (Nahapiet and Ghoshal, 1998), thereby creating an environment which facilitates transfer and creation of knowledge, which in turn can increase organizational capabilities, and reduce opportunistic behaviour (Kogut and Zander, 1992). Similarly, the lack of shared identity has been cited as "dark side" mechanism of social networks because dissimilar goals and lack of cultural consistency can lead to increased time and energy in resolving relational conflicts (Holcomb and Hitt, 2007), higher levels of frustration, and decreased performance (Inkpen and Tsang, 2005; Lei and Pitts,

1997). Therefore, in order for network benefits to occur, organization and individual actors should support development of similarities in organizational culture, and strive to maintain congruent goals among all actors involved. Shared values are measured through an adapted item developed and validated by Leonard, Mehra, and Katerberg (2008). In the survey participants were asked to indicate the extent to which their network participants share "similar values, ways of thinking, and understanding" to their own. On the other hand, item regarding shared goals was adapted from (Villena *et al.,* 2011) and the participants in the survey were asked to indicate on a scale of 1 to 6 (anchored as 1=strongly disagree and 6=strongly agree) the extent to which respondent's each network member "holds different organisational objectives" to them.

2.5   Similar expertise

High amounts of social interaction and very close ties can, however, lead to informational redundancies.   Indeed, development of social capital can facilitate loss of objectivity (Grayson and Ambler, 1999; Locke, 1999), in that individuals learn to rely on their old ties with equivalent knowledge and expertise, instead of searching for new opportunities from diverse network partners (Mauer and Ebers, 2006). Thus, redundancy is the "degree of similarity in partner knowledge, capabilities and skills" (Rindfleisch and Moorman, 2001, p.3, cited in Noordhoff *et al.,* 2011). Theoretically, low redundancy has been argued to be important because it allows access to diverse information, knowledge and resources, which can be then be used to improve actor's competitive position (Burt, 1992; 1997). Therefore, if ego's network partners are in the possession of similar type of resources, there is high amount of redundancy within ego's network, and it becomes increasingly challenging to locate new and diverse resources. Traditionally network redundancy has been measured on group-level (e.g. Jenssen and Greve, 2002), but it can also be investigated on other levels. For instance,

Noordhoff *et al.,* (2011) successfully used a node-level of measurement by simply asking respondents about the extent to which their network partners have similar information, ideas and resources. Consequently, similarity among actors in the present study is measured by adapting the similarity item from Noordhoff *et al.,* (2011). Hence, participants in the survey were asked to indicate the extent to which their network participants have "similar knowledge and expertise" to themselves.

2.6   Self-interest

Opportunistic and self-centred behaviours are often seen as a destructive force that obliterates gains from social ties (Villena *et al.,* 2011). It has been noted that excessive levels of trust can lead to negative consequences through reduced willingness to monitor partners and easing of relational safeguards (Villena *et al.,* 2011; Gargiulo and Ertug, 2006). Dimension of self-interest captures how perception of opportunistic behaviour, zero-sum games (one's loss is another's gain), and pursuing of private benefits might affect networking behaviour within cross-cultural environment. It is important to note that even though there are beneficial aspects to self-interest (as presented famously by Adam Smith in *The Theory of Moral Sentiments, 1759*), the concentration here is on the negative *perceptions* of self-interest as seen by other network members (e.g. advantage seeking at the expense of others). Perceptions relating to self-interest (e.g. morality and ethics of behaviour) are embedded into cultural norms, beliefs and understanding. For example, researchers tend to observe that Chinese employees place group goals before individualistic ones (Lam *et al.,* 2002; Triandis and Gelfand, 1998). Thus, it might be that when there is a wide gap between individualistic and collectivistic actors within a network, the possibility of negative ties relating to perceived self-driven behaviour grows; what other people consider as perfectly legitimate act of self-promotion can be a shameful act of abandoning common goals for others. Self-interest in the

present study is measured by newly developed item (based on Das and Teng, 2000; Fang *et al.,* 2011) where the participants in the survey were asked to indicate the extent to which each of their network member "sometimes puts their own interests ahead of others".

2.7 Relational tension

Researchers have found that increased levels of tension lead to rigidities in thinking, inefficiencies in communication-patterns, and reduced problem-solving capabilities (Verbeke and Bagozzi, 2000). Also Lee *et al.,* (2006) found that greater levels of tension had direct negative effect on levels of trust for both American and Chinese negotiators (thus also hinting that negative effects of relational tension might work in a similar manner across cultures). Therefore, there are indications that relational tension generally leads to negative outcomes. Interestingly, Lee *et al.,* (2006) discovered that a major source of relational tension for both American and Chinese individuals stemmed from intransigence, that is, excessive demands, refusals, avoidance of talking about issues, and uncompromising attitudes. Based on this evidence, relational tension within networks is grounded on dimension of intransigence in Lee *et al.,* (2006). Even though there might be some unobserved tension that this dimension fails to capture, other measurements of social liabilities are likely to overlap into domain of relational tension and thus take them into account in a broad sense (i.e. lack of information, general conflict, deadlocks and so on). Relational tension in the present study is measured by newly developed item (based on Lee *et al.,* 2006) where the participants in the survey were asked to indicate the extent to which they "feel uncomfortable when working with" each specific member of their network.

2.8 Hindrance ties

Negative relationships can include such behaviours as rejection, sabotage, or threats (Sahlin, 1972). Hindrance relationships have been coined (Sparrowe, Liden, Wayne, and Kraimer, 2001) as specific relationships which thwart task behaviours. In other words, hindrance relationships can negatively influence work performance, for instance, through withholding of valuable information, resources, and opportunities (Sparrowe *et al.,* 2001, p. 318). Consequently, hindrance ties in the present study is measured through an item adapted from Sparrowe *et al.,* (2001), where the participants in the survey were asked to indicate the extent to which their each of their network member makes it difficult for them to carry out their job responsibilities (i.e. by withholding information, opportunities, and resources).

2.9 Performance

Extant research is relatively consistent in that both *effectiveness* (quality of work) and *efficiency* (quantity of work) are central to performance measurements (see Franco-Santos *et al.,* 2007; Neely *et al.,* 2005 for reviews). Performance of each network participant in the present study is measured through a newly developed item (based on reviews cited above). Consequently, performance in the survey was measured by asking the respondents to indicate the extent to which their network member's "quality and quantity of work is higher than formal standards".

2.10 Trust

Trust is an undeniably important factor of social networks because it promotes, among other things, cohesion, unity of direction, and cooperation (Zahra *et al.,* 2006; Granovetter, 1985). Interpersonal trust is also considered an important mechanism for stimulating satisfaction, commitment and organizational effectiveness (Deutch, 1973; McAllister; 1995; Zand 1972;

Zucker, 1986). There have been strong arguments that trust is also a key factor in international business. For instance, Johanson and Vahlne (2009, p. 1411) have argued that trust and commitment, are indeed necessary preconditions for successful internationalisation. Jarvenpaa and Leidner (1999) have elaborated that trust and commitment between team members in GVTs underpins firm performance. Trust in the present study is measured by newly developed item (based on studies cited above) where the respondents were asked to on evaluate the extent to which each of their network member "always delivers on their commitments and promises".

Table 6 Relational items and question format

Item	Question format	Item	Theoretical foundations
Communication	Please indicate your answer by placing a check in the space to the left of the names of people you have regular mutual dealings, exchanges, or communications with:	Newly developed	Sabatelli and Shehan, 1993, Guo and Sanchez, 2011
Information and resources	This person is a good source of information, ideas, resources and opportunities:	Newly developed	Amabile, 1996, Fiol, 1995, Burt, 2004
Socialization	I regularly meet with this person outside of work (e.g. for coffee, meals, or social events):	Newly developed	Dyer and Naboeka, 2000, Villena *et al.,* 2011, Oh *et al.,* 2004
Similar values	This person shares similar values, ways of thinking, and understanding to my own:	Adapted	Leonard, Mehra, and Katerberg, 2008
Organisational objectives	This person holds different organisational objectives to me:	Adapted	Villena et.al 2011
Similar expertise	This person has similar knowledge and expertise to me:	Adapted	Noordhoff *et al.,* 2011
Self-interest	This person sometimes puts their own interests ahead of others:	Newly developed	Das and Teng, 2000, Fang *et al.,* 2011
Relational tension	I often feel uncomfortable when working with this person:	Newly developed	Lee *et al.,* 2006, Fang. *et al.,* 2011, Guzzo and Shea,1992, Verbeke and Bagozzi, 2000
Hindrance ties	This person makes it difficult for me to carry out my job responsibilities (i.e. by withholding information, opportunities, and resources):	Adapted	Sparrowe, Liden, Wayne, and Kraimer, 2001
Performance	This person's quality and quantity of work is higher than formal standards:	Newly developed	see Franco-Santos *et al.,* 2007; Neely *et al.,* 2005
Trust	This person always delivers on their commitments and promises:	Newly developed	Zahra *et al.,* 2006, Deutch, 1973, McAllister, 1995, Zand 1972, Zucker, 1986, Granovetter, 1985

4.4 Sensitivity issues

Questions were ordered so that positively and negatively framed ones were mixed. It has

been suggested that careful ordering of items reduces common method variance (for details,

see below) because respondents cannot easily create mental correlations between items and hence produce bias-based patterns (Chang *et al*., 2010; Podsakoff *et al*., 2003). Sociometric questionnaires frequently utilise this type of one-item approach to identify each specific network relation (Borgatti & Cross, 2003). Despite potential validity issues, research has found one-item questions to be reliable when combined with the roster method (Mardsen, 1990) and relatively long-term interactions (Freeman *et al*., 1987). Respondents were allowed to supplement their initial network selection in each question with additional team members from a menu containing a list of all roster names. It was expected that this would increase the validity of the survey because respondents might not recall all their connections during the initial network selection process. For more detailed information on all the questions in the questionnaire, see section 4.4 below.

It is clear that there are some sensitivity issues when asking individuals about social liabilities and the "darker side" of networks. However, there is some existing research that can be used as a starting point. Mardsen (1990) points to an example by Leffler *et al.* (1986), who did a community survey where the respondents were asked about "negative ties" by naming persons who they considered overly demanding, most likely to let them down, and make them angry or upset. Surprisingly, less than 10 per cent named no one, and overall, respondents gave 68 per cent of all names possible (three names/question). Similarly, Barrera (1980) and Dougherty *et al.* (1988) asked respondents about negative ties with good success. More recently, Sparrowe *et al.* (2001), and Van de Bunt *et al.* (2007) have included hindrance and gossip behaviour in their studies, and successfully asked respondents to indicate possible criticism of uncooperative behaviour and negative traits. In sum, previous research has successfully gathered data on sensitive issues such as the unwanted effects of social ties. Ultimately, it was important to carefully consider how questions were worded in order to

maximise response rate and avoid any awkward or unintended negative emotions for participants.

Finally, the executives and CEOs provided additional information about their teams and team members. This information included the official structure of the teams as presented in organisational charts (i.e. who reports to whom), as well as work location and the nationality of each individual.

4.5 Assessing potential common method variance

Common method variance (also called common method bias, and referred to from now on as CMV) is the "variance that is attributable to the measurement method rather than to the constructs the measures represent" (Podsakoff *et al*., 2003). It represents false internal consistency by generating apparent correlation between variables gathered from the same source. Hence, type I and type II errors are common manifestations of CMB. In their review of CMV in international business research, Chang *et al*. (2010) argue that problems arise especially when data are survey-based and perceptual, and gathered from single persons. Importantly, they argue, using similar data source (i.e. person, context, item characteristic) as a predictor as well as a criterion variable can give rise to CMV and may consequently undermine the credibility and contributions of a manuscript. Indeed, a review by Conway and Lance (2010) about the influence of CMV in business contexts concluded that:

"We believe it is reasonable to expect (a) an argument for why self-reports are appropriate, (b) construct validity evidence, (c) lack of overlap in items for different constructs, and (d) evidence that authors took proactive design steps to mitigate threats of method effects".

Several measures were taken in order to address issues relating to CMV. These were mainly based on suggestions by Podsakoff *et al*. (2003) and Chang *et al*. (2010). Initial steps were taken in research design process. First, demographic, organisational, geographical, and cultural information were drawn from different sources other than relational data. Accordingly, utilisation of varying sources of data is one of the most effective methods for avoiding CMV (Chang *et al*, 2010). Furthermore, Podsakoff *et al*. (2003) and Chang *et al*. (2010) identify several factors for successful questionnaire design which were applied for the present study: (i) anonymity and confidentiality to respondents was provided, (ii) ambiguous and vague framing of questions was avoided, (iii) different scale endpoints and anchor effects were used, and (iv) the order of questions was randomised.

With regards to anonymity, confidentiality of responses was established through initial communications between the company managers and research subjects, as well as through all communications occurring through the main investigator. In addition, the following description was provided for the actual survey questionnaire:

Note that all the names are given a random number and data is handled anonymously. All information collected will therefore be treated in the strictest confidence, and no individual will be identified in person in any scholarly work that results from this study. The results will be used for academic publications, but all names will be anonymised so that no particular individual can be identified from the data.

There are also a number of statistical tests to address CMV. In order to evaluate possible emergence of a single factor from questionnaire items, a principal components-based factor analysis (Harman, 1967) through varimax rotation was conducted on all relational items (see Table 7). Four distinct factors accounted for 65 per cent of the total variation, with first factor explaining 35 per cent (see table below for more details). This indicates that none of the variables alone counted for a high degree of variation, and that the weight of each individual variable was distributed relatively evenly.

Table 7 Principal components factor analysis results

Factor	Value	Per cent	Cum %	Ratio
1	3.863	35.1	35.1	3.005
2	1.285	11.7	46.8	1.271
3	1.011	9.2	56.0	1.011
4	1.000	9.1	65.1	1.216

Table 8 Rotated factors loadings between all relational items

	Factors									
	1	2	3	4	5	6	7	8	9	10
Information and resources	0.06	-0.24	-0.06	0.00	-0.03	-0.04	**0.76***	0.40	0.11	-0.28
Friendship	-0.01	-0.10	0.00	0.00	**-0.99***	-0.01	0.09	0.00	-0.01	-0.03
Similar values	0.15	-0.15	0.17	0.00	-0.13	-0.27	**0.79***	-0.08	0.29	-0.14
Similar experience	0.01	**-0.95***	0.04	0.00	-0.12	-0.08	0.22	0.01	0.07	-0.12
Self-interest	**0.96***	-0.01	0.01	0.00	0.01	-0.10	0.12	0.16	0.10	-0.14
Relational tension	0.10	-0.09	0.02	0.00	-0.01	**-0.92***	0.18	0.22	0.11	-0.11
Hindrance ties	0.20	0.01	0.14	0.00	0.01	-0.27	0.13	**0.83***	0.24	-0.15
Organisational objectives	0.01	-0.04	**0.99***	0.00	0.00	-0.02	0.05	0.09	0.01	-0.02
Performance	0.19	-0.15	0.02	0.00	-0.04	-0.14	0.31	0.17	0.23	**-0.86***
Communication	0.00	0.00	0.00	**1***	0.00	0.00	0.00	0.00	0.00	0.00
Trust	0.12	-0.09	0.00	0.00	0.02	-0.14	0.28	0.25	**0.87***	-0.21

*Notes. Significant factor loadings are in bold marked by ***

As Table 8 shows, almost all of the relational items loaded on separate factors. The exception was that "information and resources" and "similar values" items loaded on the same factor. This implies that the measured ties are relatively independent from each other as there are very few cross-loadings between variables. In sum, the results indicated that no single factor emerged and no one factor accounted for most of the variance. When all of the above-mentioned steps are considered together, it is unlikely that substantial amounts of CMV were present. However, in order to ensure item validity, additional analyses on specific constructs and measurements are provided in the empirical chapters of this dissertation.

4.6 Analytical procedures: QAP regression and the E-I index

Most of the hypotheses presented in this dissertation are tested by conducting either a node level or quadratic assignment procedure (QAP) regression. This procedure first perform a standard multiple regression across the dependent and independent vectors. it then permutes cells for the dependent vector, and the regression procedure is repeated with the new permutated dependent vector. Coefficients and R² values are saved. The second step is repeated 10,000 times in order to create a sampling distribution against which the original coefficient can be compared. Social network data cannot be assumed to be independent, and standard statistical tests cannot be applied (Krackhardt, 1987). The QAP approach provides robust indicators of unbiased significance levels because it preserves the dependence in both the dependent and independent variables. It therefore overcomes some of the key assumptions of standard parametric regression and makes no assumptions of distributions of parameters (Dekker *et al*., 2005). It is important to note that QAP and does not rely on distributional properties of standard errors, and the UCINET software which is utilized in the present study does not report standard errors in the case of QAP. Therefore, following the

reporting structure of previous studies which utilize the QAP procedure (i.e. Bell and Zaheer, 2007; Ho and Levesque, 2005; Sherman and Keller, 2011; Tsai, 2002) standard errors will not be reported throughout most of this study and instead standardized regression coefficients will be presented. However, in the case of dyadic variables (used in chapter 6), standard errors are provided as this chapter utilizes the so-called double-dekker semi-partialling procedure (Dekker *et al.,* 2005) (procedure which minimises the collinearity between variables) which has standard errors are available within the UCINET software.

In addition to QAP regression discussed above, empirical chapters 5 and 7 also utilise the so-called E-I index to test for homophily in intra-firm networks (Krackhardt and Stern, 1988). This measure simply compares the number of ties within groups (a tendency towards in-group interactions) against ties with other groups (a tendency to interact with outsiders). More specifically, it subtracts the number of outside ties from in-group ties and divides this by the total number of ties. The final index ranges from 1 (all ties are external) to -1 (all ties are internal). The limitation of this index is that it does not take into account the directionality of the ties and treats all ties as symmetric. This may or may not be a theoretically or empirically appropriate assumption, depending on the context and purpose of the study. Because issues such as group sizes, number of groups, and total number of ties in a dataset can have significant influence on the degree of internal and external contacts (Hanneman and Riddle, 2005), it is important to re-scale the coefficients so that comparisons can be made between groups. Thus, these re-scaled E-I values are the most reliable indicators of homophily (Krackhardt and Stern, 1988). Finally, it is important to evaluate whether the results could have been obtained through random occurrence (i.e. no preference for internal or external relationships). Thus, the E-I index procedure in UCINET software provides a

permutation test to evaluate whether results are significantly different from random distribution.

5 Negative intergroup perceptions in global virtual teams

5.1 Introduction

Over the past two decades, network theory has gained increasing salience in various fields of social sciences research (for a review, Borgatti and Haalgin, 2011). Central to this research stream is that ties and relationships reside at the core of analysis because embedded resources and relational benefits cannot be captured without examining the underlying characteristics of the network. By contrast, early network research (Heider 1958, Simmel 1950), as well as limited amount of recent studies (Kilduff and Krackhardt 2008, Schulte *et al*. 2012), have adopted more individualistic and psychologically-oriented approaches, including consideration of individual perceptions and cognitions in the concept of social networks. To date, these research streams have focused attention primarily on network structures and actor attributes that facilitate beneficial outcomes. Hence, negative effects arising from network participation have generally been overlooked. Although many studies recognise that networks can include unwanted effects (i.e. conflict and dislike) (Portes and Landolt 1996, Labianca and Brass 2006), little prior research has empirically investigated the *sources and conditions* which induce such unwanted consequences (for an exception, see Labianca *et al*. 1998; Huitsing *et al.* 2012). This is an important omission since it has been previously argued that positive and negative perceptions are not merely different sides of a coin, but are largely independent and uncorrelated dimensions (Watson *et al*., 1988). This indicates that the negative effects involved in social networks need to be analysed separately if reliable theoretical and empirical conclusions are to be drawn from positive and negative networks.

Social identity theory (henceforth referred to as SIT) (Tajfel and Turner, 1979, 1985) suggests that negative perceptions are intertwined with perceptions of group[2] membership, which is an important aspect of self-identity. Specifically, identification may promote a tendency to favour the in-group over the out-group in evaluations and distribution of resources (Struch and Schwartz, 1989). This can be manifested as negative perceptions towards the out-group (Brown, 2000). In general, theory development has been faster than theory testing in the field of organisational identities (Foreman and Whetten, 2002). Considerable attention has been paid to the psychological moderators of bias (for a review, see Hewstone *et al.,* 2002) but little attention has been given to specific *types of ties* (i.e. negative ties) and the *structure* of ties in facilitating or impeding organisational outcomes. This is especially the case in settings where diversity and distance between individuals may create additional problems for identity formation (Hsu and Elsbach, 2013). As argued by Salk and Shenkar (2001, p.162), team effectiveness and integration may be to a large degree dependent on behaviour of subgroups (i.e. communication or network exclusion) which are shaped by social identities. In this chapter I adopt a classic view that group dynamics are to a high degree affected by task-related patterns as well as interpersonal relationships (McGrath, 1984). Previous studies often leave unspecified how actors' ties *within* teams and how the ties *outside* teams influences positive and negative perceptions of others within organisational networks. Moreover, the occurrence of in-group favouritism is often in the extant literature presumed to be related to out-group negativity (Cairns *et al*., 2006). Despite the fact that this assumption was challenged as early as 1954 by Allport, little research (especially in

---

[2] It is important to note that "group" and "team" are used in a specific (non-interchangeable) way in this chapter. Term "group" in the present chapter is only used in reference to previous studies which have specifically theorized and analysed various social groups (i.e. friends) rather than officially defined teams within organisations. Focus of the present chapter is hence solely on teams (defined through organisational chart), even though it simultaneously draws from group research. For example, the term "intergroup bias" is well established phenomenon in group research and hence is adopted for the present chapter for consistency with previous research. However, in the context of present study this term refers specifically to organisational teams.

organisational settings) has examined negativity or any type of animosity between groups from a social identification perspective.

The overarching purpose of this chapter is to clarify the sources of negative intergroup bias by relating networks within and between teams with intergroup bias. The role of *intra-team* interactions is emphasised as a major source of intergroup bias because the collective identity of actors conveys both motivational and cognitive stimuli which can surface as, inter alia, prejudice, stereotyping and discrimination (Tajfel and Turner, 1985; Hewstone *et al.,* 2002), even when no intergroup conflict exists (Struch and Schwartz, 1989). To evaluate the proposed hypotheses, network data is analysed on (a) trust, shared goals, and resource-based ties (*positive perceptions*), (b) hindrance, relational tension, and self-interest-based ties (*negative perceptions*), and (c) shared values, from 160 actors across three organisations. From this sample, official teams (defined through the organisational chart) are used to analyse the tendency of individuals to perceive individuals in other teams negatively.

The results indicate that reciprocal positive interactions neither within teams nor between teams are significantly related to negative intergroup bias. At the same time, if an individual's team has negative interactions with other team, negative perceptions will also be adopted at the individual level. However, if an individual's team has a high degree of *internal* negativity, perceptions towards members of other teams are likely to be more positive. At the individual level, the intra-team brokerage position somewhat reduces intergroup bias, while inter-team brokerage position significantly increases negative evaluations of members of other teams. Finally, inter-team negativity is reduced when individuals perceive to share similar values and an understanding with members of other teams. The findings reveal that the negativity-

reducing effect of shared values is moderated by brokerage (intra-team and inter-team) and negative ties (within and between teams). More specifically, the negativity-reducing effect of shared values diminishes when brokerage roles and negative ties are included in the statistical model, thus outweighing the potential benefits stemming from perceptions of similarity.

This chapter makes three key contributions to current knowledge. First, the findings suggest that prior studies have undervalued the role of identification and team membership in inducing negative perceptions between teams. Identification and team membership have been an implicit part of social networks (Coleman 1990; Nahapiet and Ghoshal 1998), but are examined here as mechanisms which can underpin negative perceptions of members of other teams. Second, this chapter contributes to the cross-disciplinary nature of network research (see Kilduff and Krackhardt, 2008) by combining identification with social network research. Thus, new insights are offered into identification and relational configurations which can be seemingly beneficial but may also simultaneously induce undesirable effects. Finally, the findings yield practical implications for managers and leaders who wish to improve the organisational atmosphere or team dynamics through optimal structuring of employee interaction.

The remainder of this chapter is organised as follows. First, previous research with regards to networks and social identification will be explored. This leads to the development of the conceptual framework upon which hypotheses presented in this chapter are based. The procedures for testing these hypotheses and variables used in the analysis are then presented. Finally, the research findings and contributions as well as the limitations of this research will be discussed.

5.2 Theory and hypotheses

The benefits of networks are well established; such as increased salary, better chances of promotion and access to diverse skills and knowledge (e.g. Burt, 1997; Inkpen and Tsang, 2005), increased innovation, adaptation, organisational learning, and revenue growth (Tsai and Ghoshal, 1998, Yli-Renko *et al*. 2001; Batjargal *et al*., 2013). Network research has identified two main conduits for resource flows: namely bridging and bonding ties (Adler and Kwon, 2002). Bonding ties emphasise close relationships within impermeable team boundaries while bridging ties underline connecting unconnected people. For instance, Oh *et al.* (2004, 2006) suggest that intra-team bonding occurs through strong, positive, multiplex, and reciprocated relationships, and intra-team bridging *via* vertical (i.e. connections to supervisors) and horizontal ties (i.e. connections to sub-groups). Similarly, inter-team benefits flow through vertical and horizontal ties. The research reported in this chapter in part builds upon this model because it considers a team's internal network to be a source of benefits (as well as liabilities). Oh *et al.* (2006) suspected that excessive closure may induce in-group and out-group bias and have a damaging impact on group effectiveness, but they did not explore this line of argument in any great detail. The closure effects of both positive as well as negative network ties are empirically examined here, and hence more light is shed upon specific mechanisms and conditions that induce such outcomes.

It is well recognised in the extant literature that teams develop context-specific cultures through interaction, common history, and shared experiences (Salk and Brannen, 2000; Salk and Shenkar, 2001). For instance, a sense of belonging has been found to be closely related to working together and developing a collective system for sharing, communicating and coding knowledge (i.e. 'transactive memory system') (i.e. Wegner, 1986). These types of teams tend to develop coherent identities despite often diverse demographic attributes of their members

(Salk and Shenkar, 2001). Indeed, expectation of cooperation (i.e. official work flow) increases interdependence through knowledge sharing and helping behaviours, hence tightening the team and increasing their confidence in the team's capabilities (Gibson and Manuel, 2003). Social identities within these types of teams are further reinforced by common threats and rewards (Ashforth and Mael, 1989). If team members strongly identify with their team (i.e. develop 'in-group' through familiarity with other members) and the environment emphasises outperforming other teams (i.e. performance-based incentives), 'out-group' distinctiveness and group polarisation may occur. When the team boundaries are salient and teams are juxtaposed against each other, individuals may treat their membership group more favourably than other groups (Tajfel and Turner, 1979). Moreover, when there are problems (i.e. diversity, distance, and linguistic differences) in forming a strong shared common identity, individuals often perceive behaviours of other team members negatively (Hinds and Mortensen, 2005). At the same time, it is well recognised that team dynamics are affected by not only task related patterns (i.e. official team structure discussed above) but also by interpersonal relationships (i.e. affective ties) within and between teams (Williams and O'Reilly, 1998; Hinds and Mortensen, 2005).

Extant network research has found that these types of identifications can bind people together so tightly that they fail to perceive new opportunities (Maurer and Ebers, 2006), and excluded members are considered psychologically distant and subjected to unethical behaviour (Brass *et al*., 1998, p.18). While bonding ties can be beneficial for conformity and cooperation (Adler and Kwon, 2002) they impose constraints and inertia on individual members (Zaheer *et al*., 2010). Bonding ties thus emphasise positive interactions, attitudes and behaviours within a team (Chattopadhyay *et al.,* 2004), but they also imply salient team boundaries where members belonging to in-group and out-groups are clearly separated (for more in-

depth discussion on negative effects of cohesion, see chapter 3). This type of cohesiveness in SIT underscores personalisation of group members and increased self-esteem (Hogg and Turner, 1985; Tajfel, 1978). Simultaneously, bonding can lead to depersonalisation and the stereotyping of out-group members as well as polarisation of groups into rival camps (Horwitz and Rabbie, 1982; Ashforth and Mael, 1989). A high degree of bonding also suggests structural configurations which lack structural holes (Portes and Sensenbrenner, 1993). This may imply suboptimal outcomes like redundancy and in-group favouritism (Hewstone *et al.,* 2002; Burt, 2000). Theoretically, bonding underpins shared identity, and closely relates to the need for a coherent set of self-cognitions within group (See Heider, 1958, Abelson *et al.,* 1968). In order to maintain a balance in relationships, people avoid negative information and seek positive reinforcement that reduces potential discord within their close relationships (Newcomb, 1961). *Reciprocity* is a key element in a balanced relationship as it supports and maintains social equilibrium and relational cohesion (Simmel, 1950). It depicts the tendency towards two-way interaction such as returning favours and advice. Hence, balance is achieved when people have established mutual relationships among themselves (Heider, 1958). Reciprocity represents the extent to which actors are connected to each other through relational obligations and mutual dependence (Gouldner, 1960). Not surprisingly, reciprocity is found to be an important aspect of positive network interactions (Oh *et al*., 2006). Accordingly, it has been argued that discrimination of out-group members stems from the self-interest-based desire to maximise favourable in-group allocation of resources (Gaertner and Insko, 2000; Rabbie *et al*., 1989). Indeed, discrimination has been noted to be especially strong in positively perceived resources (Mummendey *et al*., 1992). Hence, it is hypothesised that:

> *Hypothesis 1a. Intergroup bias at the individual level is increased when there is a high degree of reciprocity in positive interactions within the team.*

In contrast, intergroup bias can be reduced when a team member knows that other members of the same team have close and positive relationships with members of other teams (Wright *et al*, 1997). Furthermore, it is well established that prejudice against other groups is reduced when groups pursue common goals (i.e. Allport, 1954). Intergroup bias is further likely to be reduced when institutional supports enhancing cooperation (i.e. organisational culture) are strong (Pettigrew, 1998). Thus, when a team has many positive reciprocal network ties (consisting of trust, shared information and resources, and common goals), it is likely that negative perceptions with regards to the members of other teams are reduced.

> *Hypothesis 1b. Intergroup bias at the individual level is reduced when a group has a high degree of reciprocity in positive interactions with other groups.*

Discord between individuals of a same team may be well reflected to other employees within the same team (i.e. "negativity breeds more negativity" on which see Barsade 2002). In general, numerous negative relationships within groups make it difficult to avoid negative information, build coherent self-cognitions, and enhance self-esteem (Heider, 1958). If opportunities for positive self-evaluations are non-existent in a team, individuals may be forced to look for more balanced relationships from members of other teams. This, in turn, could lead to more positive perceptions of members of other teams. Indeed, SIT proclaims that when an individual's group is under threat or contains negativity, individuals seek to reassert positive identity (Cairns *et al*., 2006). In this case, individuals with low levels of identification are especially likely to leave the group in order to seek more balanced interactions somewhere else.

Hypothesis 2a. Intergroup bias at the individual level is reduced when a team has many negative ties.

It is well established in both communication network and social contagion literatures that an individual's perceptions are to a high degree influenced by those belonging to that individual's immediate social network (i.e. Valente, 1995; Rogers and Kincaid, 1981; Scherer and Cho, 2003). For instance, when a group adopts a contagious phenomenon (i.e. an attitude towards the out-group), cognitive dissonance emerges when an individual resists a group's apparent consensus (Turner *et al.*, 1988). To the extent that an individual's team members act as a reference point, these members should also exert a high degree of influence on how an individual perceives members of other teams. In general, those individuals who are most connected by social network ties are also most likely to converge in their attitudes, beliefs and behaviours (Scherer and Cho, 2003). With regards to negative perceptions, Bernd and Hamilton (1994) demonstrated that individuals showed a better memory of negative out-group perceptions in comparison to in-group perceptions. Hence, a team's negative perceptions towards other teams are weighed more powerfully in individuals' cognitions in comparison to those which occurred within teams. Considering the importance of negative interactions with members of other teams on an individual's cognitions, it is likely that when a team as a whole is negatively connected to other teams, individuals also adopt more adverse views of members of other teams.

Hypothesis 2b. Intergroup bias at the individual level is increased when a team has many negative ties with (individuals of) other teams.

Brokerage over structural holes (a position where individual contacts who are not tied to each other) emphasises connecting disconnected others (i.e. individuals and teams) (Adler and Kwon, 2002). Inter-team brokers may alleviate overly cohesive interactions because they have the potential to develop personal trust among parties (Newell *et al.*, 2004). At the same time, brokerage is a delicate balancing act due to potentially conflicting demands and interests of members of different teams. Goal incongruences could give rise to perceptions of double standards and apparent hypocrisy with regards to how actors who bridge ties and share information and resources (Hogg and Terry, 2000). Brokering can be considered as individualistic rather than communitarian behaviour because brokers display different beliefs and identities with different people (Burt, 2000, p.354). Brokers are therefore often at the heart of conflicting demands vis-á-vis their own aspirations, and they must tread carefully within the social fabric of an organisation in order to succeed. Indeed, instead of emphasising harmony and collective goals, brokers often aim to achieve task-related outcomes and their personal goals (Xiao and Tsui, 2007). Not surprisingly, there is an increasing recognition that the structural hole theory is built on an idea of adversarial relationships in that brokers play people against each other and manipulate information for the broker's personal benefit (Obstfeld, 2005; Buskens and van de Rijt, 2008; Bizzi, 2013). Indeed, a key part of Burt's (1992) original structural hole argument was that the success of a broker is predicated upon playing actors' conflicting interests against each other (Burt 1992, p.34). Hence, the whole idea of a brokerage benefit is based on the key fact that the broker either keeps a key piece of information or resource to themselves or charges a 'brokerage fee' for it. The fact that a broker's contacts are not connected themselves makes them dependent on the broker for access and opportunities. Hence, the broker's control over resources is based on exclusive access and the broker's strategic decision about who to share it with and when (Buskens and van de Rijt, 2008).

From a social identity perspective, a key question is to which extent brokers utilise their positions for strategic and self-serving purposes *within* their own team. As the teams are based on shared similarities, history, experiences as well as sharing and communicating knowledge (Ashforth and Mael, 1989; Salk and Brannen, 1999), it is unlikely that the broker endangers the team's status quo with such behaviours. Instead, it could be assumed that brokers use much more discretion in how they share information and how they "play people against each other" within their own team. Instead of focusing on the in-group, brokers need to connect to different parts of the organisational network in order for actors to gain access to diverse and non-redundant resources (i.e. Granovetter, 1973). Indeed, it has been often argued that limiting networks to one's own membership group will lead to increasingly similar information to other members of that group (Maurer and Ebers, 2006). Thus, brokers operating within teams are unlikely to find unique and new information, resources, or opportunities from within their own team. Because of this, they are likely to perceive members of other teams as potential sources of information to be used for their own purposes.

> *Hypothesis 3a. Intergroup bias at the individual level is increased when an individual has a high degree of intra-team brokerage opportunities.*

In contrast to brokers within teams, brokers between teams tend to be considered in high esteem because they have a high level of access to, and control over, valuable information and resources (Burt, 1992). The true benefits of a brokerage position are likely to arise only in an inter-team context because of a wider range of opportunities, information, and resources available. Because the brokerage roles may be described through individualistic, opportunistic, and high status terms, individuals occupying these positions may perceive

members of other teams more negatively than non-brokers. Moreover, it is interesting to note that research has shown that high-status individuals tend to show stronger inter-group bias than do low-status ones (Hewstone *et al*., 2002). Similarly, members of high-power groups tend to perceive out-groups negatively (Sachdev and Bourhis, 1994) and show a high favouritism towards their own group (Hewstone *et al*., 2002). When dominant network actors within teams possess influence and power they might experience stronger cognitive commitment with their own team and perceive members of other teams as being disconnected and different. Hence, brokers between teams are likely to perceive members of other teams negatively because of two interconnected mechanisms: their individualistic and self-oriented attitudes, and the fact that high-status individuals have a high tendency to show favouritism for their own team in comparison to other teams. Hence:

> *Hypothesis 3b. Intergroup bias at the individual level is increased when an individual has a high degree of brokerage opportunities between teams.*

Negative intergroup perceptions may be significantly reduced when teams and team members share common interests (Gaertner *et al*., 1993). Having shared values with another individual relates to the cognitive aspect of positive relationships (shared norms, values, and attitudes), and is a significant factor in unifying individuals (Parkhe, 1993; Villena *et al.,* 2011). This, in turn, can improve organisational capabilities and reduce opportunistic behaviour among network members (Kogut and Zander, 1992). Moreover, perceiving 'out-group' members as similar in terms of shared values and ways of thinking reduces the permeability of group boundaries and enhances one shared common identity thus reducing intergroup bias (Gaertner, *et al.,* 1993).Thus:

Hypothesis 4. Intergroup bias at the individual level is reduced when an individual perceives a high degree of social similarity with members of other teams.

The hypotheses discussed above and the conceptual framework underpinning this chapter are presented in figure 11 below.

Figure 11 Conceptual framework underpinning intergroup bias in GVT networks

- o Depersonalisation of out-group
- o Categorisation

H1a -

Reciprocity within teams

H1b +

Reciprocity between teams

- o Cohesion and trust between teams
- o Reduced conflict

H2a +

- o 'grass is greener'
- o Need to seek positive interactions elsewhere

Negativity within teams

H2b -

H3a +

Individual's negative perceptions of members of other teams

Group's negative ties with other teams

H3b +

- o Adoption of team's prevailing perceptions
- o More negative information

- o Information is redundant within the team
- o Need to seek information from other teams

Brokerage within teams

Brokerage between teams

- o Individualistic goals
- o Strategic use of information and resources

H4-

Shared values with members of other teams

- o Perceived similarity
- o Inclusion of out-group members into the in-group

5.3   Methods

5.3.1   Dependent variable: negative perceptions of out-group members

In order to analyse the effect of identification and team membership, the negative perceptions of network members are conceptualised through relational tension, self-interest, and hindrance ties (see table 9 for specific questionnaire items). Increased relational tension among people leads to rigidities in thinking, inefficiencies in communication-patterns, and reduced problem-solving capabilities (Verbeke and Bagozzi, 2000). It also has a direct negative effect on trust levels (Lee *et al*., 2006). Self-interest, on the other hand, captures perceptions of opportunistic behaviour, zero-sum games, and the pursuit of private benefits at the expense of the common good. Self-interest manifests through false promises, expectation of personal advantages, taking shortcuts, and general dishonesty, amongst other things (Williamson, 1975; Provan and Skinner, 1989). *Hindrance ties* make it difficult for individuals to carry out their organisational responsibilities through the withholding of important information, resources or opportunities (Sparrowe *et al*., 2001). This can lead to annoyance, emotional upset and anger (Pagel *et al*., 1987).

First, data on negative perceptions from the participating units were combined into matrices. This process formed three matrices (one for each type of negative tie) consisting of 160x160 actors. As the data were still in 'raw' format in that the values ranged from 1-6 (i.e. ranging from 'highly agree' to 'highly disagree' to questions '*I often feel uncomfortable when working with this person*' , it was recoded so that only network ties with a negative element (values 1-3) remained. Next, the values were recoded so that 1 indicated a mild negative perception and 3 strongest perception. Next, scores of these three sociomatrices were summed together for total negative tie matrix. Thus, the final negative tie matrix consisted of a 160x160 matrix where a maximum value of a negative tie between actors was 9 (indicating

a highly negative relationship in all three relational dimensions). Finally, a procedure developed by Krackhardt and Stern (1988) was utilised for investigating the embedding of network ties within and between teams. This E-I (external-internal) index (calculated from the above-mentioned negative ties) ranges from -1 (all ties occur within team) to 1 (all ties occur between teams) (for more detailed discussion on the E-I index, see chapter 4).

5.3.2   Independent variables: positive network ties

Positive network ties were measured through trust, access to new resources, and shared organisational objectives. *Trust* is an important component of relationships because it promotes, among other things, cohesion, unity of direction, and cooperation (Zahra *et al.,* 2006, Granovetter, 1985). Not surprisingly, trust is regarded as one of the main positive manifestations of networks (Leana and Van Buren, 1999). *Access to new resources* facilitates value creation through the sharing of important information, exchange of favours, and the coordination and combination of skills (Lin, 2000). Classic network research has found that social relationships increase access to the latest research (Coleman, 1988), innovative ideas (Burt, 1987), and job opportunities (Burt, 1992). Hence, accessing new resources and information is one of the most important and commonly cited benefits of network membership (see Adler and Kwon 2002, Tsai and Ghoshal 1998). Finally, *shared objectives* between organisational members are often depicted as desirable states that underpin an individual's choices in behaviour and cognition (Litchfield, 2008). For instance, shared objectives generally add value to a firm's operations as they emphasise concentrated knowledge activation and direction of attention according to the firm's strategy (Locke, 2000). Consequently shared objectives in terms of learning and performance have been found to be significantly and positively related to individual and team creativity and information exchange (Gong *et al*., 2013). Because these positive perceptions were highly interconnected,

they are combined (similarly to negative ties) into one positive tie matrix by summing up the values from trust, access to new resources, and shared goals matrices. As with negative ties, the relationships were first recoded so that only positive ties remained (values 4-6, which indicated agreement to questions such as '*I can rely on this person when it comes to work related issues*'). See table 9 below for more details on questionnaire items. As the shared goals item '*This person holds dissimilar organisational objectives to me*' utilised a reversed directionality, values 1-3 are used (thus indicating a mild to strong disagreement) in order to take into account only relationships where people shared similar goals. Further, all these values were recoded (from one to three) so that low values indicated mild positive perceptions and higher values stronger ones. Similarly to negative ties discussed above, this formed a 160x160 sociomatrix where the maximum value of a positive tie between actors was 9 (thus indicating a very strong positive perception in all three relational dimensions).

Principal component factor analysis reveals that the items loaded on a single factor (see table 9 below and Appendix C for correlations between items). For positive ties, the first principal component explains 81.1 per cent of the variance, and loadings on the first principle component range from 0.93 to 0.85. The Cronbach's alpha value for these three items is 0.88. For negative ties, the first principal component explains 51.3 of the variance, and loadings on the first principle component range from 0.76 to 0.65. Cronbach's alpha is 0.52. This noticeably poorer fit between negative tie items may be in part attributed to the fact that in general the 'negative relational dimension' has received much less attention in the extant literature in comparison to positive ties (Labianca and Brass, 2006). Hence, these items are not as interrelated as 'positive ties', thus indicating that negative ties may be more heterogeneous in nature.

Table 9 Factor analysis of network relationships

Construct	Item	Question	Mean	SD	Factor Loading
Positive ties	Trust	*I can rely on this person when it comes to work-related issues*	0.102	0.687	0.914
	Resources	*This person is a good source of information, ideas, resources and opportunities*	0.096	0.735	0.931
(Chronbachs alpha = 0.88)	Similar objectives	*This person holds dissimilar organisational objectives to me*	0.076	0.622	0.854
Negative ties	Hindrance ties	*This person makes it difficult for me to carry out my job responsibilities (i.e. by withholding information, opportunities, and resources)*	0.004	0.087	0.757
	Self-interest	*This person sometimes puts their own interests ahead of others*	0.015	0.160	0.649
(Chronbachs alpha = 0.52)	Relational tension	*I often feel uncomfortable when working with this person*	0.007	0.129	0.738

5.3.3   Network measurements

Intra-team and inter-team brokerage. Brokerage is measured as a function of the number of times a person connects two others who are unconnected by a network tie within a team. This measure is similar to the coordinator role suggested by Gould and Fernandez (1989). The inter-team brokerage variable is further used to analyse the effect connecting any unconnected individuals outside of a focal actors' team.

Reciprocity. Reciprocal connection between two actors exists if there is a tie between *i* and *j* as well as between *j* and *i* (Wassermann and Faust, 1994). In order to examine the level of intra-team reciprocity, the so-called dyad method is utilised. This method calculates the proportion of reciprocated ties among pairs of actors who are connected to each other (Hanneman and Riddle, 2005). Ties between actors belonging to the same team are then

aggregated to the team level. Each individual is then assigned a value responding to the degree to which the ties within that individual's team are reciprocal. Similarly, the degree to which a team's interactions with other teams are reciprocal is also measured. Again, individuals are assigned values responding to the aggregated degree of reciprocity that an individual's team has with other teams.

Negative ties. Negative ties within teams are calculated as the sum of negative ties within a specific team. Negative ties with members of other teams are similarly calculated as the total sum of negative ties that a team has with other teams. Individuals are then assigned intra-team and inter-team values responding to the aggregated degree of negative ties that a team has with other teams.

Shared values with members of other teams. Shared values were first measured with the questionnaire survey with an item which asked respondents to indicate the extent to which a specific person's network members share 'similar values, ways of thinking, and understanding to my own' (disagree or agree on a scale of 1-6). Values indicating shared values (values 4-6) were then extracted. Next, the extent to which each individual shares similar values with intra-team members in comparison to inter-team members was calculated (E-I index). The final measure is the number of ego's ties with alters in the same category (team) divided by the total number of ego's ties.

5.3.4 Control variables

In order to rule out alternative explanations individuals' network size, gender, co-location (i.e. working in the same office), and supervisory position are included in the analyses.

Demographic attributes and leadership may affect how social network ties emerge and are perceived (McPherson and Smith-Lovin, 1987; Brass and Krackhardt, 1999). Moreover, physical proximity and team membership can enhance social identification processes, and are therefore are potential sources of strong categorisation and stereotyping (Stahl *et al.*, 2010). Gender, geographical location, team structures, and leadership position were extracted from company archival data, and network size was calculated by summing the ego's direct connections.

5.3.5 Analytical procedures

Initially, the distribution of negative ties within and across teams was analysed. Negative perceptions external to the actors' own team are considerably more common than negative ties within team. Negative intergroup ties directed towards other team members accounted for 79 per cent while negative perceptions of same team members accounted for only 21 per cent. The E-I index (highly significant at $p<0.001$) revealed that negative ties also have a strong statistical tendency to extend to individuals outside the actors' own team. Figure 12 illustrates this tendency diagrammatically. Even though positive ties are abundant within and between teams (figure 12a), negative perceptions are located almost exclusively *between* these same teams (figure 12b). As observed by Labianca and Brass (2006), negative ties are on average less common than positive ties.

Figure 12 Graphical representation of intergroup bias in negative network ties

a) Positive ties within and between team members

b) Negative perceptions within and between team members
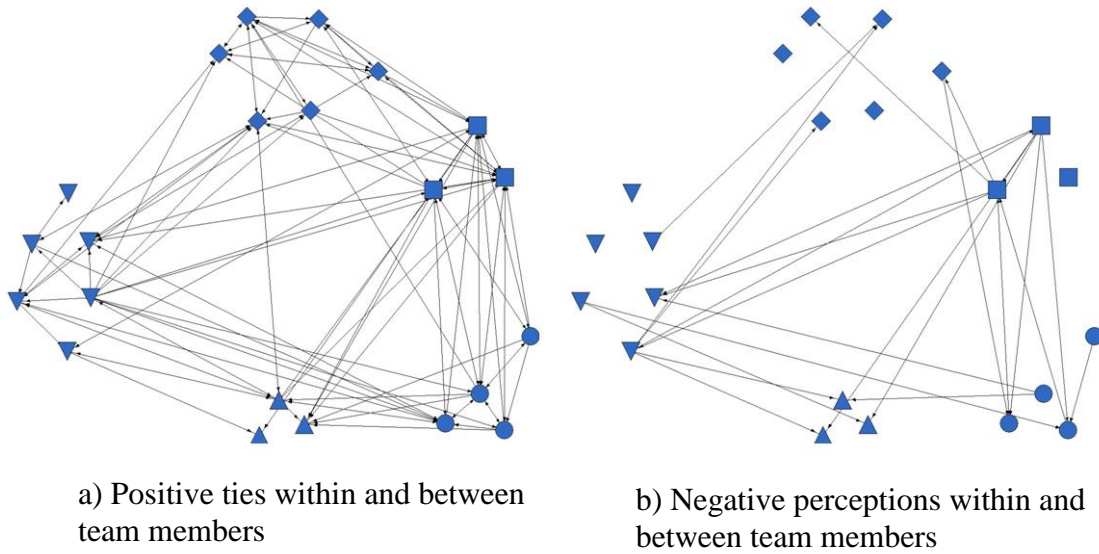
A node level quadratic assignment procedure (QAP) regression was utilised to test the hypotheses discussed previously (see chapter 4 for more details on this procedure).

5.4   Results

First correlations and descriptive statistics were generated (see table 10). This is followed by a regression analysis of the factors affecting the creation of negative out-group perceptions.

Table 10 Correlation between variables

	Mean	St.dev	1	2	3	4	5	6	7	8	9	10	11	12
1 (DV) Negative perceptions of inter-team members	0.26	0.46	1.00											
2 Location	25.67	15.58	**0.20**	1.00										
3 Nationality	4.41	4.74	0.04	0.07	1.00									
4 Gender	1.28	0.45	-0.05	0.03	-0.04	1.00								
5 Supervisor	0.43	0.50	0.01	0.00	0.13	-0.12	1.00							
6 Reciprocity in teams	0.45	0.31	-0.07	0.03	0.01	-0.07	**-0.19**	1.00						
7 Reciprocity between teams	2.95	1.11	0.14	**0.18**	-0.12	0.00	-0.05	0.05	1.00					
8 Shared values with members of other teams	0.20	0.20	-0.10	0.15	**0.19**	-0.06	-0.07	**0.25**	-0.13	1.00				
9 Inter-team brokerage	2.61	3.97	-0.04	0.04	-0.11	-0.07	0.01	-0.11	0.04	-0.11	1.00			
10 Brokerage between teams	1.01	2.65	-0.02	0.08	-0.07	-0.06	-0.11	0.06	0.09	**0.27**	0.07	1.00		
11 Negative ties within teams	6.61	9.23	0.12	**0.52**	-0.02	0.00	-0.09	0.05	**0.32**	**0.30**	-0.15	**0.35**	1.00	
12 Teams' negative ties with other teams	19.84	17.54	0.10	**0.45**	-0.09	-0.03	-0.08	0.15	**0.35**	**0.28**	-0.10	**0.31**	**0.87**	1.00

*Correlations over 0.16 are significant at $p<0.05$, correlations over 0.21 are significant at $p<0.01$, and correlations over 0.26 are significant at $p<0.001$

Table 11 Regression of variables affecting intergroup bias (teams)

	DV: negative perceptions of individuals in other teams					
	1	**2**	**5**	**4**	**3**	**6**
Location	-0.22**	-0.23**	-0.19**	-0.22**	-0.04	-0.08
Nationality	-0.15*	-0.11	-0.11	-0.13	-0.16*	-0.10
Gender	-0.11	-0.12	-0.13	-0.11	-0.12	-0.11
Supervisor	-0.03	-0.04	-0.05	-0.05	-0.06	-0.07
Reciprocity in teams		-0.04				-0.01
Reciprocity between teams		0.09				0.13
Shared values with members of other teams			-0.21**			-0.09
Inter-team brokerage				-0.14		-0.03
Brokerage between teams				0.25***		0.17*
Negative ties within teams					-0.47**	-0.40*
Team's negative ties with other teams					0.14	0.11
R squared	0.09	0.10	0.13	0.17	0.18	0.24
R squared adjusted	0.06	0.06	0.10	0.13	0.14	0.18
Significance	p<0.01	p<0.05	p<0.01	p<0.001	p<0.05	p<0.05

*10,000 permutations, N=160, *p<0.05, **p<0.01, ***p<0.001*

The analysis proceeded in a stepwise manner. Table 11 demonstrates the relative importance of each independent variable (in terms beta coefficients and as R^2 values) in predicting negative perceptions of members of other teams. Hypothesis 1a predicts that intergroup bias at the individual level increases when a team has a high degree of reciprocity in positive interactions within team. This is not supported because the regression coefficients are non-significant (models 2). Hypothesis 1b predicts that intergroup bias at the individual level is reduced when a team has a high degree of reciprocity in positive interactions with other teams. This is also not supported as the regression coefficients are non-significant. Hypothesis 2a, stating that intergroup bias at the individual level is reduced when a team has many negative ties, is highly supported. The regression coefficients for negative intra-team ties are significant (at $p < 0.01$) in model 3. Hypothesis 2b predicts that intergroup bias at the individual level is increased when a team has many negative ties with members of other teams. This hypothesis is partly supported. Regression coefficients for negative out-group ties in terms of official teams are significant at $p < 0.10$, thus broadly supporting the hypothesis. The significant effect of both hypothesis 2a and hypothesis 2b is further evident in that the explanatory power of the statistical model increased by 9 per cent for teams from the baseline model by the addition of intra-team and inter-team negative tie variables to the equation. Hypothesis 3a, predicts that intergroup bias at the individual level is increased when an individual has a high degree of intra-team brokerage opportunities. This hypothesis is not supported as the regression coefficients are not significant. Hypothesis 3b, which postulates that intergroup bias at the individual level is increased when an individual has a high degree of brokerage opportunities between teams, is highly supported. Regression coefficients for out-group brokerage are highly positive and significant (at $p < 0.01$), thus demonstrating that brokerage increases negative perceptions towards members of other teams. It is important to note that adding both intra-team and inter-team brokerage variables increases the explanatory

power of the statistical models by 7 per cent. Finally, hypothesis 4 predicts that intergroup bias at the individual level is reduced when an individual perceives a high degree of social similarity with members of other teams. This hypothesis is supported. Indeed, the regression coefficients for shared values with inter-team members are negative and significant at $p<0.01$. Furthermore, adding this variable increased the R^2 values by 4 per cent.

It is interesting to note that only brokerage between teams (H3b) and negative ties within teams (H2a) remain significant (at $p<0.05$). Importantly, the effect of shared values with members of other teams disappears in the final models. This indicates that there are interaction effects between variables. The interaction effect was more closely examined, and both negative ties and brokerage position (in-group as well as out-group) moderated (see Baron and Kenny, 1986) the effect of shared values with members of other teams. Hence, the strength of relationship between perceived value similarity and intergroup bias is dependent on the values of negative ties and brokerage within and between teams. The inclusion of negative ties (within and between groups) reduces the coefficients of shared values with members of other teams from -0.25 to -0.16 and brokerage (intra-team and inter-team) to -0.20. Taken together, they reduce the effect of shared values with members of other teams from highly significant (at $p<0.001$) to non-significant ($p>0.05$). For more details, see Appendix E. These results are summarized in figure below.

Figure 13 Summary of hypotheses in chapter 5

Hypothesis	Result
Hypothesis 1a. Intergroup bias at the individual level is increased when there is a high degree of reciprocity in positive interactions within the team.	Not supported
Hypothesis 1b. Intergroup bias at the individual level is reduced when a team has a high degree of reciprocity in positive interactions with members of other teams.	Not supported
Hypothesis 2a. Intergroup bias at the individual level is reduced when a team has many negative ties.	Supported
Hypothesis 2b. Intergroup bias at the individual level is increased when a team has many negative ties with (individuals of) other teams.	Supported
Hypothesis 3a. Intergroup bias at the individual level is increased when an individual has a high degree of intra-team brokerage opportunities.	Not supported
Hypothesis 3b. Intergroup bias at the individual level is increased when an individual has a high degree of brokerage opportunities between teams.	Supported
Hypothesis 4. Intergroup bias at the individual level is reduced when an individual perceives a high degree of social similarity with members of other teams.	Supported

5.5   Discussion

Recognition is growing that organisational social networks are central to the success of individuals and organisations (Tsai and Ghoshal, 1998; Borgatti and Halgin, 2011). However, the mechanisms through which seemingly beneficial interactions generate adverse outcomes are inadequately understood. Over-embeddedness may lead to undesirable consequences (Uzzi, 1997; Maurer and Ebers, 2006), but little is known about how different types of network mechanisms and individual-level cognitions affect these negative manifestations. Consequently, the extent to which bridging and bonding ties within teams relate to negative perceptions of members of other teams was analysed. Negative ties and perceptions can have serious organisational ramifications, for instance, because of greater emotional contagion (Barsade, 2002), and stronger influence on organisational outcomes than do positive interactions (Labianca and Brass, 2006).

No support is found for the hypothesis that bonding ties between teams promotes negative perceptions of members of other teams. At the same time, the findings presented here do not provide support for a more classic argument that cohesive and dense networks can advance conformity and cooperation, and hence reduce intergroup bias. Indeed, the effect of reciprocal positive ties within as well as between teams has no relationship with the extent to which individuals perceive members of other teams negatively. This is surprising because reciprocity in positive interactions such as trust, shared resources, and goals relates to shared norms and dependence within groups (Rabbie *et al*., 1989), all of which could lead to higher levels of identification within that team and more negative perceptions of other teams. At the same time, it is surprising that positive interactions on these dimensions *between* teams did not reduce negative perceptions towards members of other teams. One explanation is that relatively low levels of reciprocation (32.2 per cent) within all positive ties may have affected the ability of statistical procedures to discern reciprocity effects. Alternatively, reciprocity in these interactions may simply promote beneficial human behaviour (i.e. returning help and advice) without reducing negative intergroup bias through a higher degree of identification.

Findings with regards to negative ties between teams indicate that negativity can be "self-perpetuating" in that these attitudes can escalate into even greater emotional negativity in a vicious circle (Raush, 1965). For instance, it is possible that individuals learn more 'negative information' about other teams if the members of their own team have many adverse interactions with individuals from other teams (see Heider, 1958). As indicated by the results reported here, this information may then be a source of stronger negative perceptions towards members embedded within other teams. At the same time, when there is a high degree of negativity *within* a team, individuals may be forced to look for more balanced relationships outside of that team. Indeed, the findings indicate that under these conditions, individuals

tended to perceive members of other teams in a less negative way. This could indicate that individuals cognitively draw comparisons between teams, and under intra-team negativity, interactions with members of other teams may seem more appealing in comparison. Indeed, it is well recognised in SIT that individuals have a strong need to seek positive identities – especially when an individual's own group is under threat (Cairns *et al.,* 2006). In a similar way, groups often implement control mechanisms under the potential denial of a group's norms or consensus (Feldman, 1984). Hence, if individuals would *disagree* with the rest of the team on perceptions of members of other team (i.e. see the members of other teams positively), then a team as a whole could pressure that individual to perceive the situation from the team's point of view. Indeed, by converging and complying with the team's social norms individuals reduce doubts with regards to their relationships with their team members (Gibson and Earley, 2007).

The hypothesis that brokering within teams increases intergroup bias was not supported. The logic behind this hypothesis was that brokers may avoid opportunistic behaviours with others in closed groups (teams) because such actions can be easily spotted (Coleman, 1990), and hence brokers are forced to manoeuvre between teams instead. On the other hand, when a sparser network (i.e. whole intra-firm network) is taken into consideration, opportunistic behaviours are much more difficult to detect due to increased monitoring costs, and this gives rise to brokerage benefits. Indeed, the findings indicated that actors with a high degree of whole-network brokerage perceived members of other teams more negatively than non-brokers. These two findings raise an important question: why do *inter*-team brokers perceive members of other groups negatively when *intra-team* brokers do not? A relatively straightforward explanation could be that intra-team brokerage and inter-team brokerage positions are not highly related. This was also evident from the lack of high correlation

between these variables. In other words, actors with a high degree of intra-team brokerage may not be brokers between teams. Thus, intra-team brokers may be relatively satisfied with their position in the team without looking for opportunities outside of that team for 'strategic manipulation of information' or 'playing people against each other'. In contrast, brokers *between* teams operate more through individualistic goals and identities instead of emphasising harmonious and uniform interactions (Xiao and Tsui, 2007). Moreover, brokers between teams could possess more status and power (i.e. Granovetter, 1973; Burt, 1992), which have been noted to be consistently related to a high degree of preference towards own group, as well as increased bias towards other groups (Hewstone *et al.,* 2002). Indeed, power is a crucial factor in separating the effects of intra-team and inter-team brokerage. Individuals embedded within closed networks (i.e. contained *within* a team) have limited personal power and are also less interested in pursuing control and influence (Seibert *et al.,* 2001; Burt, 2007), while brokers in sparse networks (i.e. whole intra-firm network) are at the core of a firm's informal power and authority. Consequently, when brokers gain personal power they may become increasingly self-oriented and less sensitive to other's opinions, which further exuberates conflicts and negativity in organisations. It is also important to recognise that too much brokerage in intra-firm networks can have negative effects as it is well recognised in the extant literature that in teams where many individuals seek personal power, the organisational climate is described by tension, power struggles, hindrance efforts, and lack of integration (i.e. Greer and Van Kleef, 2010). These views are well in line with the results reported in this chapter, as intra-team brokers indeed perceived members of other teams in a negative light.

Finally, the findings indicate that shared values with people from other teams relates to unifying individuals and reducing negativity between actors. This is likely to reduce

opportunistic behaviour, taking advantage of others (Villena, 2011), and consequently, conflict and animosity is likely to be diminished. Similarly, this reduces the distinctiveness of team boundaries and creates more common ground for all teams within the organisation (Gaertner *et al.,* 1993). However, the fact that shared values is not significant in the final statistical models draws attention to potential mediating effects of other variables. Indeed, the effect of shared values is reduced from highly significant to non-significant when brokerage and negative ties within and between teams are taken into consideration. This is an interesting finding because it indicates that the importance of shared values diminishes when there is either a high degree of negativity within and between teams, or individuals hold brokerage positions in organisational networks. Key contributions and future research directions are discussed more thoroughly in Chapter 8.

6 Knowledge flows in global virtual teams: A network perspective

6.1 Introduction

Multinational enterprises (MNEs) have become increasingly embedded within international knowledge networks, where a high degree of emphasis is placed on innovation and knowledge intensity (Mudambi and Navarra, 2004). MNE strategies consequently revolve around subdividing various economic activities to optimal geographic locations (Buckley and Ghauri, 2004; Buckley, 2009). These have simultaneously created a need towards increasingly flexible organisational structures which rely heavily on (i) non-hierarchical communication patterns, (ii) reliable information, and (iii) specialisation of activities (Buckley, 2010; Mudambi and Navarra, 2004). Strengthened global competition thus necessitates dynamic organisational forms which are able to respond rapidly to changing economic landscapes. One response to these requirements is the GVT. These teams consist of two or more individuals working towards long-term common goals across geographical, cultural, and linguistic boundaries, and who interact mainly through computer-aided communications, as was discussed in chapter 1.

Improving absorptive and productive capabilities through the deployment of virtual teams and collaboration across geographical, cultural, linguistic, and temporal zones has been made possible by the internet revolution and the near universal availability of digital and computer-based applications (UNCTAD, 2005; Benkler, 2006). As a consequence, the number of GVTs has been rapidly growing over the past two decades (McDonough *et al*., 2001; Sidhu and Volberda, 2011). Indeed, Maznevski and Athanassiou (2006) found that 85 per cent of

international managers conducted more than half of their work through such teams. Within these environments, knowledge transfer through organisational social networks underpins cooperation and provides learning opportunities, which in turn facilitate the creation of new knowledge and innovations (Kogut and Zander, 1992; Tsai, 2001). However, much of the previous research on social capital and network ties is based upon the premise that relationships are bounded by geography and national borders (i.e. Putnam, Leonardi, and Nanetti, 1993; Laursen *et al*., 2012); an assumption that effectively overlooks MNEs pursuing global strategies by organising work through GVTs. At the same time, it has been argued that integrating various tasks and functions in GVTs requires extensive internal networks and social capital (Gibson and Cohen, 2002; Tsai and Ghoshal, 1998) in order to overcome issues such as technological failures, communication problems, conflicts, and inefficiencies in the coordination of work flows. There are strong arguments claiming that relationships and interpersonal interactions are at the core of successful GVTs (for reviews, see Martin *et al.,* 2004 and Zimmerman, 2011). However, studies to date provide only anecdotal evidence to support these arguments. For instance, it is well established that strategic actions are strongly influenced by the social structure within which actors are embedded (i.e. Burt, 1982; Granovetter, 1985). However, less is known about what network mechanisms may affect knowledge flows within GVTs specifically. This may be in part due to difficulties in obtaining primary data on virtual teams (Martin *et al*., 2004) as well as about individual-level knowledge exchanges (Levine and Prietula, 2012). This has often resulted in laboratory studies and use of student samples (Mortensen, 2009). Consequently, Ebrahim *et al*. (2009) noted that future studies on GVTs should focus on providing empirical assessment of patterns and process structures within MNEs. Moreover, there have been numerous calls for research that takes into account structural and relational configurations within global and virtual team settings (Martins *et al.,* 2004; Maznevski and Athanassiou, 2004; Mortensen *et al*., 2009;

Zimmerman, 2011). To the extent that MNEs utilise informal intra-firm networks for transferring information and resources, a better understanding of *specific* structural and relational antecedents which underpin real-life knowledge flows within transnational teams is needed.

It is important to examine knowledge networks from both a theoretical as well as an empirical perspective. From a theoretical perspective, analysing how globally spanning networks facilitate knowledge flows between team members represents an important but under researched contingency. At the same time, current economic trends emphasise the need for flexible and dynamic structures which allow for the completion of tasks across time and distance, and the internalisation of activities within an organisation which were previously bound by geographical location (Buckley and Ghauri, 2004). Simultaneously, knowledge can be "sticky" and difficult to diffuse to distant units (Szulansky, 1996). By drawing from social network theory and the knowledge-based view of the firm, in this chapter I present a distinctive individual-level conceptual model which explores the network factors that facilitate: (i) the knowledge availability, and (ii) complementarity of information in GVTs. As noted by Levine and Prietula (2012, p. 1761) analysing knowledge at the individual level is difficult because previous research has tended to examine this mainly at an aggregate level (i.e. between firms or teams). Instead, this chapter adopts the view (similarly to Wu, 1989; Buckley and Casson, 1998; Buckley and Carter, 2004) that a firm consists of a coalition of active agents (actors) who respond to changing environmental situations according to their individual motivations, goals, and biases. This view of the MNE is complemented in this chapter by focusing attention *specifically* on the role that the interconnectedness of actors plays in knowledge flows within GVTs. This chapter thus contributes towards expanding an understanding of the network drivers of intra-firm knowledge flows between individuals.

This provides a unique perspective for analysing knowledge sharing among team members who are embedded within larger formal, *as well as* informal, organisational structures.

The remainder of this chapter is organised as follows. The role of networks and interpersonal interaction within GVTs is first analysed. Second, the nature of knowledge flows in terms of (i) knowledge availability, and (ii) complementarity of information is explored. The *availability of knowledge* is defined here as the extent to which team members are able to access information, ideas, and opportunities from their networks. *Complementarity of information* on the other hand refers to the extent to which actors are embedded within network structures that underpin the likelihood of obtaining diverse and non-redundant information (Burt, 1992). The conceptual framework which draws from social network theory and the knowledge-based view of the firm is then presented. The hypotheses, context of the research, and the data collection procedures are then discussed. Finally, the research findings and contributions, and the limitations of this study are discussed, while suggested directions for future research are examined.

6.2   Development of hypotheses

6.2.1   Global virtual team

Extant research has focused on exploring the key underlying differences between distributed and virtual teams in comparison to traditional co-located organisational forms (Gibson and Cohen, 2003; Mortensen *et al*., 2009; Sidhu and Volberda, 2011). While the GVT provides superior flexibility in terms of tapping into different pools of knowledge and expertise across geographical and national boundaries, many of the issues that co-located teams experience are further amplified in virtual and global business environments (Gibson and Cohen, 2003).

For instance, virtual teams are hindered by the absence of face-to-face communication, lower familiarity with team members, and linguistic and temporal issues (Martin *et al*., 2004). These can become serious obstacles to the effectiveness of the GVT because establishing common understanding and shared language are key elements in ensuring effective knowledge sharing among team members (Levine and Prietula, 2012). Perhaps not surprisingly, extant research has also found that cultural differences in GVTs manifest as interaction problems (Maznevski and Chudoba, 2001; Kayworth and Leidner, 2000) and coordination difficulties (Van Ryssen and Godar, 2000).

Communication has been regarded as a key factor in overcoming these difficulties. Interestingly, virtual teams tend to have a higher degree of communication in comparison to co-located teams (Galagher and Kraut, 1994), and this may indicate the need to compensate for inherent problems caused by virtuality and dispersion through extensive interaction. For example, Jarvenpaa and Leidner (1999) found a direct positive relationship between the amount of social communication and relational trust in virtual teams. The quantity of communication in virtual teams is also positively related to a higher quality of relationships in terms of sociability and emotional loading (Robey *et al*., 2000). However, authors have presented dissimilar findings about the role of informal communications in GVTs *versus* co-located teams. To illustrate, Ahuja and Carley (1999, p.742) argue that a *high* degree of informal interaction is a defining key feature of virtual organisations because non-hierarchical network structures emphasise shared norms and procedures, and lack of formal rules. Similarly, Sole and Edmonson (2002) argue that information and situated knowledge can be informally exchanged just as effectively in virtual teams as co-located teams, but it requires more time and effort to do so. Gibson and Cohen (2003), on the other hand assert that technology-aided communication is by its very nature explicit and formal, and therefore

leads (in combination with geographic dispersion) to decreased opportunities for informal and social interaction. These divergent views indicate that there is a lack of a clear understanding and consensus about the extent to which *informal* communications may influence knowledge exchanges within GVTs. This provides an avenue for developing the hypotheses presented in this chapter.

6.2.2 Availability of knowledge

The idea that knowledge is behind much of a firm's competitive advantage is nothing new. Adam Smith noted in *The Wealth of Nations* (1776) that workers learn from experience. Similarly, Victorian economist Alfred Marshall (1890) emphasised the role of knowledge as a productive resource (Ichijo, 2007). A major breakthrough in knowledge-based arguments in economic theory came from Arrow (1962) who suggested that firms can become more efficient when they 'learn by doing' and manage to transfer this knowledge across the organisation.

Previous studies of MNEs (i.e. Buckley and Carter, 1996; Mudambi and Navarra, 2004) have proposed that innovation occurs through synthesis of knowledge flows from various parts of the organisation. More specifically, these studies argue that the intra-firm pattern of knowledge determines the current and future potential sources of added value within the firm's network. Furthermore, access to a firm's knowledge and information stocks can enhance flexibility because it facilitates forecasting and responding to internal and external changes (Buckley and Ghauri, 2004). Consequently, communication patterns within modern MNEs often tend towards networked and non-hierarchical forms as managers at different levels must be able to consult their peers and minimise the trade-off between strategic

cohesion and local responsiveness (Buckley, 2010; Hedlund, 1993). However, as discussed above, knowledge transmission is riddled with difficulties. Tacit knowledge tends to remain localised due to its contextual nature, while codified knowledge transmits relatively easily across geographical locations and even across national borders (Mudambi and Navarra, 2004). Indeed, previous studies have noted that the availability of highly tacit knowledge is most often driven by either strong unique local competencies or specific networking capabilities (Cantwell and Santangelo, 1999). Innovation and knowledge in MNEs has been described as relatively centralised because of the advantages of physical co-location of R&D (Cohen, 1998), and the importance of the home market (Dunning, 1980; Cantwell, 1989). For knowledge-based GVTs, this is a detrimental scenario because their key function often is to share various types of knowledge (i.e. task-related, markets, opportunities etc.) among team members. At the same time, GVTs are especially vulnerable to the difficulties of knowledge sharing because recipients of information often tend to develop context-specific heuristics and cognitive schemas (i.e. about markets and customers) in order to apply the acquired knowledge (Dougherty, 1992).

6.2.3   Complementarity of information

Extant economic literature has long recognised the importance of bundling complementary factors together (Milgrom and Roberts, 1990; Roberts, 2004). Combining diverse knowledge resources is largely beneficial to an organisation because it increases the availability of know-how, creative capacity, and innovative capabilities which the firm can access through its networks (Glassman, 2001; Kotabe *et al*., 2007). Previous research has provided insights into the characteristics of knowledge creation and sharing, and the necessity of interpersonal interaction in facilitating these processes (i.e. Birkinshaw, 2001; Soo *et al*., 2002). The interplay between developing a mutual knowledge-base and an effective communication

structure is generally considered a fundamental element of a successful team. For instance, Buckley and Carter (2004) argue that transmission of knowledge across national boundaries is most efficient when group members possess shared information and collective understanding. Similarly, Powell *et al* (2004) assert that a shared knowledge-base can be established when all actors possess the same information, and when actors are aware of the knowledge which their co-workers possess. Consequently, teams will be able to avoid communication problems, misallocation of valuable information, and difficulties in interpreting equivocal messages, amongst other things.

The above arguments are only valid, however, when group members possess information and resources which are *complementary,* in the sense that they add value to the accumulated knowledge pool. Thus, when all team members possess the same knowledge, the information is likely to be redundant to the extent that the members may lack new insights or ideas to contribute towards common goals. This was empirically demonstrated by Maurer and Ebers (2006) who found that overly cohesive interactions led to similar information and resources among network partners, which in turn hindered firm growth. Raegans (2005) also found that high communication frequency between people indicated a high degree of knowledge overlap between the network actors. Figure 14 from Reagans and Zuckerman (2008) depicts this from a social network analytical perspective. In the figure, the ego (focal actor) wishes to maximise the amount of accessible knowledge through non-redundant (NR-Strategy) information. Organisational clusters, such as different groups within virtual teams, tend to contain diverse information and expertise (Tortoriello *et al.,* 2012). Accessing these clusters in turn increases the amount of information and advice available to the ego. In contrast, redundancy is increased when the network contacts are contained within the same cluster and possess a similar type of knowledge. Accordingly, Gibson and Cohen (2003) argued that the

more diverse is the virtual team the more knowledge there is to be shared. Non-redundancy therefore depicts the actual realised information benefits in terms of complementarity of information. Thus, these network ties are additive instead of redundant (Burt, 1998), and add value to the larger context like pieces in a puzzle (Reagans and Zuckerman, 2008).

Figure 14 Network redundancy

Source: Reagans and Zuckerman, 2008

6.2.4   Tie content

Both knowledge availability and complementarity of information are likely to be influenced by various types of network ties (i.e. trust, like, and dislike) at different levels of analysis (i.e.

individual, team, organisation). However, previous studies on the role of relationships in GVTs have overlooked the fact that individuals possess qualitatively different types of relationships which often overlap. For instance, employees may be connected by reporting relationship as well as by friendship ties. In this case, a workflow tie becomes intertwined with friendship, thus forming a "multiplex" tie, i.e. a relationship composed of two individuals sharing more than one type of network tie (Wasserman and Faust, 1994). This is an important feature of the social organisation because previous studies have noted that the more that the actor dyads share overlapping relationships the more influence it has on different attitudes (Ericsson, 1988). Multiplex relationships are often associated with both high degrees of trust and predictability because co-workers interact in different contexts (Ibarra, 1995). Friendship and social ties (i.e. interaction outside of the work environment) have been noted to be especially relevant for knowledge sharing (Bell and Zaheer, 2007; Schrader, 1991) because they facilitate discussion (Ibarra and Andrews, 1993), mutual support and assistance (Heimer, 1992), and the development of a deep bond based on mutual affection and liking (Verbukke, 1979). These overlapping ties may be simultaneously difficult to develop in GVTs because of minimal face-to-face interaction and diversity of team members. Consequently, official reporting relationships might not be adequate for transferring complex and potentially context-dependent information across knowledge-based teams. It is therefore postulated that a combination of friendship *as well as* workflow ties (task interdependence) is positively related to the knowledge availability and complementarity of information within GVTs. Thus, it is hypothesised that:

> *Hypothesis 1a. Multiplex ties wherein individuals share workflow ties as well as friendship ties are positively related to knowledge availability within global virtual teams.*

Hypothesis 1b. Multiplex ties wherein individuals share workflow ties as well as friendship ties are positively related to complementarity of information within global virtual teams.

6.2.5   Coordination

One of the key issues affecting the dynamics of GVTs is that team members are typically spread across wide geographical and cultural distances, and hence individuals are likely to experience different norms of behaviour and interpretations about how to manage their work responsibilities. Thus, different geographical and cultural clusters are likely to greatly vary in their interpretations of issues such as responding to emails, quality and speed of communication and time pressures, amongst other things. Tacit information has been noted to be especially difficult to successfully transmit without the medium of face-to-face interaction (Daft and Lengel, 1986). Accordingly, geographical distance between team members can have damaging consequences for successful knowledge flows (Owen-Smith and Powell, 2004). Not surprisingly, the chances of conflict in highly specialised knowledge-based teams may be greater when individuals share tasks and workflow but are separated by geographical distance (Cramton and Hinds, 2005). Conflicts arise in part because geographically dispersed individuals often assume that co-located members have more informal interaction and knowledge sharing about topics that is not being communicated to more distant members (Kayworth and Leidner, 2001). In contrast, individuals have been found to more readily share information with geographically close team members (Ingram and Roberts, 2000). At the same time, the knowledge embedded within distant parts of the network is likely to be diverse and non-redundant due to team members' dissimilar educational, social, and institutional backgrounds. Therefore:

Hypothesis 2a. Geographical distance is negatively related to knowledge availability within global virtual teams.

Hypothesis 2b. Geographical distance is positively related to complementarity of information within global virtual teams.

Differences in language, social norms, knowledge specialisation, as well as professional and personal identities can hinder the flow of information and resources within MNEs (Buckley and Carter, 2004). More specifically, the differences in developing shared understanding, common expectations, and rules of behaviour may act as impediments to knowledge flows. In turn, these are also likely to induce feelings of discomfort and confusion (Gibson and Cohen, 2003). Similarly, lack of cultural skills and an inability to activate appropriate behavioural models when interacting with people from different cultural backgrounds can lead to performance anxiety (Stajkovic and Luthans, 1998; Wood and Bandura, 1989). An important variable here is the degree of discrepancy between the norms of the native culture and the norms related to foreign cultural interactions (i.e. Molinsky, 2007). In international business literature, this is most commonly referred to as cultural distance (i.e. Chapman *et al.*, 2008; Shenkar, 2001, 2012). Not surprisingly, both interpersonal and task-related conflict have been found to be most emphasised in interpersonal interactions which span across countries and cultures (Hinds and Mortenson, 2005). Cultural conflicts in turn have been found to hinder knowledge acquisition (Lyles and Salk, 2007). Thus, it is hypothesised:

Hypothesis 3a. Cultural distance is negatively related to knowledge availability within global virtual teams.

Hypothesis 3b. Cultural distance is positively related to complementarity of information within global virtual teams.

6.2.6 Clustering

It is well established that the flow of beneficial resources such as information and knowledge strongly relates to the development of networks and relationships within a team (i.e. Almeida and Kogut, 1999; Bell and Zaheer, 2007), particularly in subgroups which form as a consequence of this (Gibbs and Cohen, 2003). A clique is a group of individuals where the focal actor is directly connected to all other members of the group. In general, cliques within organisations form simply because both normative and comparative needs of an individual are influenced (usually positively) by a group to which an actor belongs (Tichy, 1973). Naturally, these structures can differ in terms of size and the degree to which they overlap; i.e. an actor can be part of several cliques of different sizes (Scott, 1991). Cliques may also have significant implications for organisational knowledge flows. For instance, Vanhaverbeke *et al.* (2009) postulate that information redundancy may be dependent on clique structures. At the same time, the formation of globally spanning cliques can be significantly hampered not only by wide geographical distance, but also cultural, temporal, and linguistic differences between team members. This is because both normative and comparative needs may be more likely to be filled by co-located individuals who share similar mind-sets, values, and understanding. At the same time, an important feature of these subgroups in virtual teams is the overlap between subtasks and subgroups so that different types of skills and expertise can be effectively utilised to tackle a wide array of problems (Gibbs and Cohen, 2003). For example, virtual teams can utilise multiple sources of information by facilitating work across diverse geographical knowledge centers (Gibbs and Cohen, 2003). It is therefore posited that

bridging the gap between various geographical locations and overcoming relational difficulties in forming global cliques is paramount for effective information flows. Thus:

Hypothesis 4a. Increased participation in cliques increases knowledge availability within global virtual teams.

Hypothesis 4b. Increased participation in cliques is positively related to complementarity of information within global virtual teams.

6.2.7 Motivation

Motivation to share information and resources has been identified as a key factor in knowledge-based organisations (Cohen and Levinthal, 1990; Szulanski, 1996). Contemporary learning in organisations in turn has been characterised to occur through the connectedness of motivated units within flexible organisational networks where learning is facilitated by non-hierarchical architecture (Huber, 1991; Tsai, 2001). Motivation of the group members to share knowledge may be promoted through the building of trust and identification with the firm's goals (Casson, 1991). Extant international business literature has revealed that knowledge transfer can only be successful when both "senders" as well as "receivers" of information are willing to participate (Oddou *et al.*, 2009). One of the key motivational factors underpinning the sharing of knowledge and information is reciprocity in interpersonal interactions; that is, the extent to which individuals promote coordination and cooperation (such as returning advice and favours) with their network contacts. Reciprocated relationships tend to be stronger by nature (Krackhardt, 1999), and non-reciprocal interactions are also often quickly noted by other group members, and explicit or implicit sanctions may follow

(see Gouldner, 1960). Finally, solving complex problems and sharing tacit knowledge in organisations has been linked to the development of reciprocal norms of trust and disclosure (Mariotti and Delbridge, 2012). It is therefore hypothesised that:

Hypothesis 5a. Reciprocal network interactions are positively related to the knowledge availability within global virtual teams.

Hypothesis 5b. Reciprocal network interactions are positively related to the complementarity of information within global virtual teams.

Hence four distinct factors affecting intra-firm knowledge flows in MNEs and GVTs are identified: (i) tie content (multiplexity), (ii) coordination (geographical and cultural distance) (iii) clustering (cliques), and (iv) motivation (reciprocity). These are summarised in figure 15 below.

Figure 15 Conceptual model
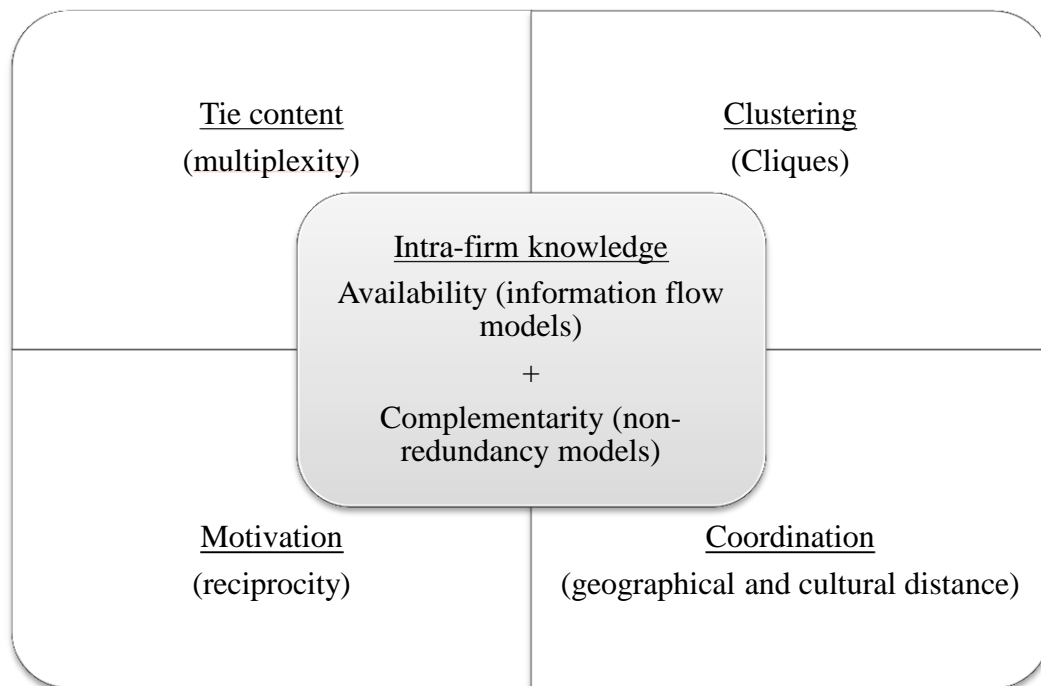
6.3 Research methods

6.3.1 Dependent variables

Knowledge availability. Respondents evaluated on a scale of one to six how "good a source of information, ideas, and opportunities" their network contacts were perceived to be. These responses were then placed in a 160x160 matrix.

Complementarity of information. First the knowledge availability matrix was dichotomized (see knowledge availability above) so that values four to six were one and values one to three zero. Hence, only network ties that emphasised a high degree of knowledge availability remained. Burt's (1992) dyadic redundancy measure was then utilised and an inverse measure of it was used in order to analyse the extent to which sources of knowledge are complementary and non-redundant.

6.3.2   Independent variables

Geographical distance. First, a 160x160 dichotomous communication network was formed from a questionnaire item where the respondents were asked to indicate "*people you have regular mutual dealings, exchanges, or communications with*": Then the direct distance between was measured in kilometres using a tool in Google Maps. The values from the communication network were than replaced with the distance measures. For instance, if actors i and j in a communication network were connected (i,j=1, indicating a communication tie between them), and i is located in Madrid and j in Hamburg, then i,j=1788. Naturally, this measurement is symmetric in that the distance between i and j is the same as j and i.

Cultural distance. Similarly to geographical distance, dichotomous values in the communication network were replaced with cultural distance values derived from GLOBE values (House, 2004) and operationalised through the Kogut-Singh (1988) index (a commonly used tool in international business studies).

Multiplex ties. Multiplex ties were measured as a combination of a friendship and an official workflow. Friendship ties are proxied from a question where respondents evaluated their network contacts on a scale of one to six (disagree-agree) whether they *"meet with this person outside of work (e.g. for coffee, meals, or social events)"*. The friendship matrix was dichotomised so that values from one to three were zero and values from four to six were one. These were combined with official work flow ties so that if the actors shared a workflow tie as well as a friendship tie then i,j=1 and j,i=1, if not then i,j=0 and j,i=0. Thus, in the final matrix, multiplex ties are one and other ties zero.

Cliques. Cliques were measured as maximally complete subgraphs. Hence, a clique is a group of individuals where the focal actor is directly connected to all other members of the group. A clique procedure embedded within the UCINET software was utilised for this measurement. This procedure provides information on how many times actor dyads are in the same clique and runs a hierarchical clustering algorithm (Bron and Kerbosch, 1973) which detected cliques with three or more actors based on this data. The communication matrix was used as an input dataset for this procedure.

Reciprocity. $i \leftrightarrow j$, Knowledge-flow matrix (constructed from actors' perceptions of another as a good source of "information, ideas, and opportunities") was recoded so that values four to six were one and other values and non-reciprocal interactions were zero. Thus, the remaining ties respond to reciprocal knowledge exchanges.

6.3.3 Control variables

Gender. A matrix where actors i and j are connected ($i,j=1$ and $j,i=1$) if they have the same gender, otherwise $i,j=0$ and $j,i=0$

Co-location. A matrix where actors i and j are connected ($i,j=1$ and $j,i=1$) if they have the same geographical location, otherwise $i,j=0$ and $j,i=0$

Team membership. A matrix where actors i and j are connected ($i,j=1$ and $j,i=1$) if they belong to the same team, otherwise $i,j=0$ and $j,i=0$

Supervisory position. A matrix where actors i and j are connected ($i,j=1$ and $j,i=1$) if they are both supervisors, otherwise $i,j=0$ and $j,i=0$

6.4 Analytical procedures

Each hypothesis is tested by conducting a dyadic level quadratic assignment procedure (QAP) regression (for more details on this, see chapter 4). The first part of the analysis was to examine the proportion of variance between formal and informal communication. *Informal* communication ties ("mutual dealings, exchanges, and communications") were regressed with *formal* ties (workflow-based communication structures – see team membership variable), and the variance explained is less than 8 per cent ($R^2 = 0.076$). Therefore, there is a significant discrepancy between informal and formal communication in GVTs, and a substantial amount of informal communication takes place outside the formal team structure. This gave an indication that, even though communications in GVTs have been argued to be (i) direct and explicit, (ii) frequently documented through technology, and (iii) limited in non-verbal cues (Gibson and Cohen, 2003), only a minimal amount of interpersonal interaction is found to actually occur through officially structured work flows.

6.5 Results

First, correlations and descriptive statistics were generated (see table 12 below). This is followed by a regression analysis of the factors affecting the flow of information (information flow models) and knowledge redundancy (redundancy models) (table 13 below)

Table 12 Descriptive statistics

1. Information flow	**0.27**	**1.11**	1									
2. Non-redundant ties	0.04	0.15	0.80***	1								
3. Physical proximity	0.04	0.20	0.30***	0.28***	1							
4. Gender	0.59	0.49	0.00	0.01	-0.02***	1						
5. Supervisor	0.51	0.50	-0.01	-0.01*	0.00	-0.01	1					
6. Team members	0.03	0.17	0.30***	0.25***	0.21	-0.01	0.00	1				
7. Geog.distance	59.66	439.00	0.45***	0.49***	-0.03	0.02	0.00	0.11***	1			
8. Cult.distance	0.03	0.18	0.51***	0.61***	-0.02	0.01	0.00	0.13***	0.63***	1		
9. Multiplex	0.07	0.37	0.41***	0.34***	0.25	-0.01	0.00	0.95***	0.16***	0.20***	1	
10. Reciprocity	0.02	0.15	0.65***	0.49***	0.22	0	-0.01	0.26***	0.29***	0.27***	0.35***	1
11. Cliques	0.07	0.44	0.57***	0.49***	0.26	0.00	-0.01	0.21***	0.25***	0.28***	0.31***	0.67***	1

Table 13 Regression of network factors on knowledge flow variables

	KNOWLEDGE AVAILABILITY MODELS						COMPLEMENTARITY OF INFORMATION MODELS					
	1	2	3	4	5	6	7	8	9	10	11	12
Physical proximity	0.25*** (0.05)	0.27*** (0.04)	0.28*** (0.03)	0.23*** (0.03)	0.16*** (0.03)	0.15*** (0.03)	0.24*** (0.01)	0.27*** (0.01)	0.27*** (0.01)	0.24*** (0.01)	0.17*** (0.01)	0.17*** (0.00)
Gender	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)
Supervisor	0.00 (0.02)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.01 (0.00)	0.01 (0.00)
Team members	0.24*** (0.05)	0.19*** (0.04)	0.17*** (0.04)	-0.60*** (0.07)	-0.38*** (0.05)	-0.30*** (0.05)	0.22*** (0.01)	0.18*** (0.01)	0.16*** (0.01)	-0.07*** (0.01)	-0.01 (0.00)	-0.01* (0.01)
Geog.distance		0.43*** (0.00)	0.2*** (0.00)	0.2*** (0.00)	0.16*** (0.00)	0.12*** (0.00)		0.35*** (0.00)	0.14*** (0.00)	0.14*** (0.00)	0.09*** (0.00)	0.09*** (0.00)
Cult.distance			0.36*** (0.05)	0.29*** (0.05)	0.25*** (0.04)	0.25*** (0.04)			0.33*** (0.01)	0.28*** (0.01)	0.22*** (0.01)	0.21*** (0.01)
Multiplex				0.83*** (0.06)	0.55*** (0.05)	0.43*** (0.05)				0.28*** (0.01)	0.14*** (0.01)	0.15*** (0.01)
Reciprocal dyads					0.32*** (0.05)	0.12*** (0.05)					0.35*** (0.01)	0.40*** (0.01)
Cliques						0.35*** (0.01)						-0.05*** (0.01)
R^2.	0.15	0.34	0.41	0.47	0.55	0.59	0.14	0.26	0.32	0.34	0.43	0.43
R^2.adj	0.15	0.33	0.41	0.47	0.55	0.59	0.14	0.26	0.32	0.34	0.43	0.43
R^2. Change	-	0.18	0.08	0.06	0.08	0.04	-	0.12	0.06	0.02	0.09	0.00
Sig.	p>0.001	p>0.001	p>0.001	p>0.001	p>0.001	p>0.001	p>0.001	p>0.001	p>0.001	p>0.001	p>0.001	p>0.001

*10,000 permutations, N=24.440,*p<0.05, **p<0.01, ***p<0.001, standard errors are displayed in brackets*

Hypothesis 1a and 1b predicts that multiplex ties where actors shared a workflow tie as well as a friendship tie is positively and significantly related to both knowledge availability and complementarity of information. The t-statistics are significant in models four and ten, and the R^2 values increase by six per cent and two per cent, respectively. Hence, hypotheses 1a and 1b are generally supported, despite a relatively weak effect in relation to H1b. Hypotheses 2a predicts that geographical distance between actors decreases knowledge availability within the organisational network. This hypothesis is not supported, and surprisingly, the coefficients are significantly positive. Therefore, geographical distance, in fact is found to *increase* the knowledge availability (R^2 change 0.18 from the baseline model). Correspondingly, hypothesis 2b is supported, and geographical distance between network members significantly increases information complementarity (R^2 change 0.12 from the baseline model). Thus, physical distance between actors has a considerable beneficial effect in terms of knowledge flows in GVTs. Hypotheses 3a and 3b follow a similar pattern. The directionality of effect of cultural distance on knowledge availability is unexpectedly positive, and complementarity of information also increases with a higher degree of cultural distance. Cultural distance variables improve the explanatory power of the statistical model in terms of R^2 changes by 0.08 and 0.06 (knowledge availability and information complementarity, respectively). Hypotheses 4a and 4b predict that participation in cliques spanning across different parts of the organisational network has a positive effect on both knowledge availability as well complementarity of information. These hypotheses are only partly supported. The relationship between cliques and knowledge availability is significant and positive, and increase the R^2 value of the statistical model by four per cent. However, the relationship between complementarity of information and clique participation is significantly negative (but this had no effect on R^2 values). Finally, hypotheses 5a and 5b predict that reciprocal network interactions are positively related to both knowledge availability and

complementarity of information. Both hypotheses are supported. The reciprocity variables in both models have positive and significant t-values (models five and eleven). These increase the R^2 values in knowledge availability models by eight per cent and complementarity of information models by nine per cent. A summary of these hypotheses and results are presented below.

Table 14 Summary of results

Hypothesis	Result
Hypothesis 1a. Multiplex ties wherein individuals share workflow ties as well as friendship ties are positively related to knowledge availability within global virtual teams.	Supported
Hypothesis 1b. Multiplex ties wherein individuals share workflow ties as well as friendship ties are positively related to complementarity of information within global virtual teams.	Supported
Hypothesis 2a. Geographical distance is negatively related to knowledge availability within global virtual teams.	Sign in opposite direction
Hypothesis 2b. Geographical distance is positively related to complementarity of information within global virtual teams.	Supported
Hypothesis 3a. Cultural distance is negatively related to knowledge availability within global virtual teams.	Sign in opposite direction
Hypothesis 3b. Cultural distance is positively related to complementarity of information within global virtual teams.	Supported
Hypothesis 4a. Increased participation in cliques increases knowledge availability and resources within global virtual teams.	Supported
Hypothesis 4b. Increased participation in cliques is positively related to complementarity of information within global virtual teams.	Sign in opposite direction
Hypothesis 5a. Reciprocal network interactions are positively related to the knowledge availability and resources within global virtual teams.	Supported
Hypothesis 5b. Reciprocal network interactions are positively related to the complementarity of information within global virtual teams.	Supported

6.6 Discussion

Extant research has increasingly noted that an organisation's ability to access and transfer knowledge has a significant impact on innovation, creativity and product development

(Carlile, 2004; Tortoriello, Reagans, and McEvily, 2012). Even though organisational networks are critical for this process, there is still a limited understanding on *specific* intra-firm network mechanisms that contribute to knowledge flows on a global scale. Consequently, the purpose of this chapter is to analyse networks within GVTs in order to unpack the factors which facilitate: (i) knowledge availability and (ii) complementarity of information within these teams. As hypothesised, organisational knowledge flows are significantly influenced by tie content (multiplexity), coordination (geographical and cultural distance), clustering (cliques), and motivation (reciprocity).

Various types of ties and multiplexity have been previously found to promote information flows in domestic country settings (Heimer, 1992; Bell and Zaheer, 2007). However, it is demonstrated in this chapter that the overlap between friendship and workflow ties helps in overcoming some of the inherent difficulties (i.e. language differences, technology-based communication, context-dependent nature of information) regarding knowledge availability and complementarity of information in GVTs. The result that overlapping workflow ties and friendship ties provided a superior platform for accessing knowledge is in line with previous studies which have shown that informal ties are more resilient to geographical dispersion than are formally structured work ties (Hansen and Lovas, 2004). Thus, it could be argued that the friendship component of the relationship in combination with workflow, facilitates information flow through beneficial mechanisms such as affection, helping, predictability, and trust (Schrader, 1991; Ibarra, 1995). At the same time, friends may over time develop a shared knowledge base through sustained information exchanges. This may explain partly why only minor support for an argument that friendship would increase the complementarity of information is found. In other words, while friendship may be effective for sharing

information across teams globally, it may over time become increasingly redundant as people learn more and more from each other.

Friendship ties may also help to reduce the effect of geographical and cultural distance between actor dyads. Previously, Bell and Zaheer (2007) found that friendship ties actually increases knowledge-seeking behaviour as firms become increasingly geographically dispersed. While their study concentrated on geographical dispersion within a sample of Canadian firms, in this chapter I extend the observed positive effects of geographical dispersion and cultural distance on availability of knowledge and complementarity of information to *globally* distributed teams. Considering these findings, it is not surprising that geographical and cultural distance variables have a reverse effect within the hypothesised model. In addition, knowledge availability and complementarity of information should increase along with the heterogeneity of the contexts (i.e. cultural, institutional, and markets) from which the knowledge is extracted. Finally, technology-aided communication may mitigate some of the potential pitfalls associated with cross-cultural face-to-face interaction in GVTs. For instance, interpreting ambiguous messages may become easier through technologically aided communications as the recipient has more time to cognitively unpack the message and formulate an appropriate reply. Consequently, uncertainty reductions observed in CMCs (Tidwell and Walther, 2002) may mitigate conflicts and miscommunications often observed in international business environments (i.e. Shenkar and Zeira, 1992; Leung *et al.,* 2005).

The findings presented in this chapter further demonstrate that subgroups and cliques may form and function in GVTs in a similar manner to within co-located teams. This is despite the

expectation that normative and comparative needs might be better fulfilled by team members who are geographically proximate. Overlapping cliques are found to have a significant positive effect on accessing knowledge from different parts of the organisation. At the same time, cliques may contain relatively similar type of information (as indicated by negative coefficients in hypothesis 4b). Hence, over time, strong ties (i.e. multiplex relationships) and cohesive network structures may similarly lead to increasingly redundant information contained within the shared knowledge base, and eventually to the depletion of stock of ideas, resources, and opportunities that are complementary.

Finally, the motivation to reciprocate in knowledge sharing activities is found to significantly contribute to effective information flows. This finding is in line with those of Oddou *et al.* (2009) in that both senders as well as receivers are needed for successful knowledge and information flows. Further, organisational as well as social sanctions may be applied to individuals who do not follow reciprocity norms relating to knowledge sharing (Gouldner, 1960). Interpreting such implicit social norms should be relatively intuitive even for culturally and geographically distant actors, as the "norm of reciprocity" has been argued to be a universally applicable principle that permeates all human interactions (Thurnwald, 1932; Gouldner, 1960). One line of argument could be that information exchanged through a reciprocal network may become less complementary in the same way as through multiplex ties and cliquish network structures discussed above. However, this is not evident in the context of GVTs. Instead, reciprocal interactions in sharing knowledge are strongly linked to complementary and diverse information. This could be, for instance, due to actors' willingness to reach towards distant parts of their network in order to find different potential ways for fulfilling the norm of reciprocity (i.e. in returning important favours to their co-workers). Overall, the strength of reciprocity norms in GVTs is surprising considering

different types of distances between actors (physical and cultural) as well as infrequent face-to-face interactions. Contributions and limitations to this chapter are further elaborated in Chapter 8.

7 Determinants and Consequences of Strong and Weak Ties in Global Virtual Teams

7.1 Introduction

A growing amount of research on organisational networks has provided evidence that dense and cohesive networks facilitate the sharing of highly contextual knowledge (Uzzi, 1997; Balkundi and Harrison, 2006). At the same time, extant research has shown that ties which are embedded within sparse networks are crucial for transmitting non-redundant information to far-flung areas of the organisation (Burt, 1992). Balancing the trade-offs between weak and strong ties, as well as between sparse and cohesive network configurations, can be challenging for network participants. For instance, too many close and strong relationships can lead to information redundancy (Maurer and Ebers, 2006). At the same time, overly widespread networks can lead dealings with numerous information providers, leading to information overload and costs in maintaining large number of contacts (Mariotti and Delbridge, 2012). As Mariotti and Delbridge (2012, p. 511) pointed out, there is still a very limited understanding about how network members balance network cohesion versus sparseness. This trade-off has important implications, in particular for how expertise is distributed, integrated, and accessed (see "absorptive capacity" by Cohen and Levinthal, 1990) through social relationships in organisations – a research area which has received little attention from scholars up to now (Levin and Cross, 2004). Analysing the effects and outcomes of these types of trade-offs are further complicated when the *types of ties* (i.e. strong *versus* weak) are taken into consideration – a point which this chapter is principally concerned about.

Explicit analysis of cohesive forces (i.e. strong ties) and bridging forces (i.e. weak ties) has been lacking from prior studies on GVTs. Indeed, rather than examining the antecedents underpinning strong and weak ties, as well as their outcomes, previous research has often revolved around cognitive (i.e. expectations and understanding), behavioural (i.e. communication and conflict), and affective (i.e. satisfaction) aspects of GVTs (Zimmerman, 2011). Thus, extant research has limited value in evaluating both the antecedents for emergence of strong and weak ties, and their performance implications in GVTs. This is an important research gap because relationships and networks are known to be a key driver of a GVT success (Zimmerman, 2011). By delineating the sources and effects of strong and weak ties in GVTs, we can better understand the conditions under which value is added and liabilities are created. This discussion generates the key research problems addressed in this chapter: how are strong and weak ties formed in terms of (i) actors' network position, (ii) homophily, and (iii) what are their effects on perceived performance?

An underlying premise of this chapter is that social networks may be different in global business contexts. This is because of increased physical distance (i.e. limited face-to-face communication and temporal differences) between network members, greater diversity among network members (i.e. due to cultural and linguistic differences) who work in different national, cultural, and social contexts across countries and regions, and problems relating to organising highly knowledge-based tasks (i.e. R&D and product development) across the world, amongst other things. Indeed, international business scholars have only relatively recently begun to recognise that cooperative mechanisms (i.e. trust and reciprocity) within and between MNEs have received insufficient attention by scholars from the perspective of the role of social networks in value creation (Castro and Roldán, 2013). Yet, despite calls for social network approaches to be used to analyse team effectiveness

(Balkundi and Harrison, 2006) and GVTs (Maznevsky and Athanassiou, 2006), the emergence and consequences of strong and weak ties within these teams remain largely unexplored. This observation leads to the research questions being addressed in the present chapter: how do the network positions of individuals and homophily affect formation of strong and weak ties in GVTs, and what are the performance implications of strong and weak ties at the level of individual actor? By analysing strong and weak ties in intra-firm networks we can better understand the cohesive (i.e. social bonds which bring unity to groups) *versus* bridging forces (i.e. social relationships which connect disconnected people and groups) these ties bring about, and how they add value for GVT operations.

In this chapter, a theoretical framework that synthesises literature on GVTs and social network research at the ego level is advanced and tested. I concentrate here on the ego level of analysis because the key objective is to examine the basis on which strong and weak ties are formed in GVTs (i.e. the network position and tendency of the ego towards socialising with similar others), and the effects of these ties on perceived organisational performance. To this end, I analyse (i) the link between the amount of strong and weak ties and the characteristics of actors' networks (in terms of brokerage, betweenness centrality, and reach), (ii) whether or not there is a tendency towards homophily (i.e. to form ties with people from the same team, nationality, geographical location, gender, or supervisory position), and (iii) the effect that these ties have on perceived work performance in GVTs. It was expected that brokerage, betweenness, and reach would be related to weak rather than strong ties. Surprisingly, betweenness was found to be related to strong ties and negatively to weak ties. Moreover, strong ties (more so than weak ties) are found to be used to connect different groups and to link dissimilar others. Furthermore, it is found that actors who possess many strong ties had a higher perceived organisational performance than other team members.

Finally, the results indicate only limited evidence of homophily in GVT networks. On a broad scale, these findings contribute to our understanding of the problems involved in managing complex intra-firm networks within MNEs. More specifically, they add to the literature on the benefits and disadvantages of weak and strong ties in complex and diverse international business environments.

This chapter is organised as follows. First, Mark Granovetter's (1973) theory of 'strength of weak ties' is briefly examined and how it relates to GVTs is then discussed. Hypotheses are then presented and these are linked to the theoretical framework. This is then followed with information on how the variables used to test these hypotheses were quantified, and the analytical procedures used to run these tests. The results are then presented and discussed. Finally, the limitations to the study reported here, and conclusions and contributions to theory will be presented.

7.2   Theory and development of hypotheses

Granovetter's *strength of weak ties* theory lies at the core of network research (Borgatti and Halgin, 2011). In his early research, Granovetter discovered that individuals received more information on new work opportunities through acquaintances rather than close friends. This led to a theoretical premise that weak ties (as opposed to strong ones) that span across distant parts of the network are a potential source of novel information. A key argument is that information acquired through these types of ties is new because it originates from outside a set of close contacts where everyone tends to possess similar types of knowledge, information, and resources (Maurer and Ebers, 2006). Weak ties, rather than strong ones, are portrayed to constitute "local bridges" (see Figure 16 below) between actors (i.e. people and groups)

because interactions with contacts at distant parts of a social system tend to be characterised by less frequent contact, decreased emotional attachment, and lack of strong reciprocity (Hansen, 1999; Mariotti and Delbridge, 2012). Indeed, Granovetter (1973, 1983) argued that *all* bridging ties are inherently weak ties.

Figure 16 Bridge between two groups
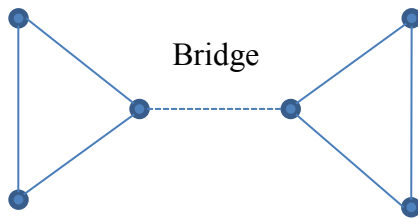
One benefit of weak ties is that they are less costly to manage than strong ties in terms of time, energy, and resources spent for cultivating relationships. Strong ties, on the other hand, tend to increase cohesion, unity, shared norms, trust, and cooperation (Krackhardt and Stern, 1988; Uzzi, 1997; 1999; Gulati, 1995). Thus, weak ties are likely to act as bridges to (or sources of) novel and new information while strong ties facilitate bonding, familiarity, and the transfer of knowledge that requires a high degree of trust to be shared (i.e. confidential or tacit information). The characteristics of strong and weak ties are summarised in Table 15 below.

Table 15 Typology of strong and weak network ties for GVTs

	Strong tie	Weak tie
Frequency of interaction	High	Varies
Length of relationship	High	Varies
Cost of relationship	High	Low
Nature of information and resources	Complex, tacit, non-codifiable	Non-redundant, unique
General orientation of relationship	Cohesion, shared norms	Bridging, self-interest, information

Source: adapted from Mariotti and Delbridge, 2012.

7.2.1 Effect of context: strong and weak ties in GVTs

Extant studies have often emphasised the importance of research context for analysing the effects of strong and weak ties. For instance, a recent review by Borgatti and Halgin (2011) explores the issue of context dependency from a network theoretical perspective. They argue that theory should first be built at the abstract level and then applied to a specific setting where appropriate contextual properties can be examined. These contextual influences have been especially evident for Granovetter's (1973) strong and weak tie theory. For instance, studies by Rowley *et al*. (2000) and Mariotti and Delbridge (2012) demonstrated that industry context significantly affects how strong and weak ties impact organisations. From an international business perspective, pleas have long been made for more social network perspectives to be applied to study MNEs and GVTs operating in multiple national environments, institutions, and normative environments (e.g. Maznevsky and Athanassiou, 2006). A key observation arising for GVTs from extant research is that positive interpersonal relationships among team members are a key factor for the team success, but that they are simultaneously difficult to establish (for a review, see Zimmerman, 2011). Indeed, in comparison to traditional unicultural and co-located teams, GVTs experience additional

difficulties in terms of identification (Fiol and O'Connor, 2005), leadership (Kayworth and Leidner, 2001; Joshi *et al*., 2009; Muethel and Hoegl, 2009), socialisation (Ahuja and Galvin, 2003), coordination and conflict (Hinds and Mortensen, 2005; O'Leary and Mortensen, 2010), empowerment (Kirkman *et al*., 2004), and innovation (Gibson and Gibbs, 2006). Social networks within GVTs have been argued to be a major force for overcoming some of these well-known difficulties (Maznevsky and Athanassiou, 2006).

With regards to tie strength, strong ties contain emotional components such as trust and obligations, and hence they tend to be particularly useful for transferring knowledge that is confidential, complex, and difficult to codify (Hansen, 1999). This could be especially important for GVTs due to the knowledge-based nature of many of these teams. Indeed, knowledge-based teams such as R&D units often face the challenge of transferring complex, non-codifiable knowledge that is hard to articulate to individuals located in other parts of the project team (Polanyi, 1996; Von Hippel, 1988). In their recent review Jonsen *et al*. (2012) find that effective leadership in GVTs requires being able to build durable relationships, maintaining a high degree of communication, establishing trust, and managing conflict. Indeed, a lack of cohesion in GVTs (i.e. stemming from diversity and dispersion) emphasises the importance of developing strong ties. As for managing diversity, Nelson (1989) found that low-conflict organisations are characterised by strong ties connecting units. The fact that strong ties are needed for connecting non-homogeneous groups is even stronger in global settings where conflict often stems from different types of diversity (Joshi *et al*., 2002; Stahl *et al*., 2010). Indeed, strong ties are often required in order to exert influence (i.e. managers solving conflicts) over other network participants (Bian, 1997). Moreover, because cultural diversity leads to process losses through both increased task conflict and decreased social integration (see meta-analysis by Stahl *et al*., 2010), the ability to incorporate dissimilar

others into one's network with strong ties could be perceived as highly valuable skill in GVTs. These studies therefore make a strong argument for the importance of developing strong ties in GVTs.

At the same time, recent reviews by Zimmerman (2011) and Zander *et al.* (2012) both emphasise the role of bridging weak ties which are able to reach far into the firm's network in order to draw non-redundant information and resources. The role of weak ties has been argued to be emphasised in networks among groups which are largely characterised by CMCs, geographical dispersion and diversity (Pickering and King, 1995). A key argument against strong ties is that they can be relatively costly to operate due to the need for regular visits and meetings with these network contacts (Hansen, 1999). In contrast, weak ties are relatively cheap to maintain in terms of time, intensity, and relational management. These qualities fit well with CMCs utilised in the global business environment. In general, there is a substantial amount of support for both strong and weak ties within and outside the context of GVTs. Hence, it is likely that neither type is unconditionally preferred, but rather a mix of different relationships is needed in order to achieve different purposes (Rowley *et al.,* 2000).

7.2.2   Weak ties in GVTs: brokerage, betweenness centrality, and reach

The discussion above outlines the main effects of strong and weak ties in domestic as well as global organisational contexts. I now move on to examine three theoretically and empirically critical elements to conceptualising how different parts of the GVT are interconnected through weak ties: (i) brokerage over structural holes, (ii) betweenness centrality, and (iii) network reach.

While Granovetter's (1973) strength of weak tie theory emphasises relationships between actor dyads, scholars such as Burt (1992) and Coleman (1998) instead highlights the structure of interactions. Indeed, Burt's (1992) original structural hole argument suggested that the strength of tie is almost irrelevant − what matters is whether the tie bridges or not. At the same time, both Burt and Granovetter recognised that not all weak ties provide access to diverse pockets of information (Burt, 1992; Bian, 1997; Bael, 2010). However, Granovetter argued that bridging weak ties are the *only* ones that are of special value to individuals (Granovetter 1973, 1983) because of their bridging capacity and tendency to provide non-redundant information. Burt made no such claims with regards to strength of relationship and instead maintained that a position which spans over a structural hole is all that matters − not tie strength. Despite the divergent views on the role of weak ties in bridging across different groups, both ideas are underpinned by the relatively similar intuitive notion: being connected to others who themselves are not connected (at least very strongly) brings about various benefits in form of information, resources, knowledge, opportunities, and control.

Burt's theory of structural holes (1992) and the concept of betweenness are highly interconnected theoretically as well as empirically (Burt, 2000, 2007; Everett and Borgatti, 2005). Indeed, the concept of structural holes (Burt, 1992) draws heavily on the concept of betweenness; an index measuring the extent to which an individual stands between direct as well as indirect connections of all people in the network. Both positions highlight the importance of being located between different actors in the organisational network. This translates into an ability to control the flow of information and influence others (Freeman, 1977; Newman, 2005; Burt, 1992, 2007). Effective information flow is especially relevant for GVTs where individuals commonly act as coordinators of various types of knowledge (often complex and non-codifiable) between team members across vast distances. The difference in

these two concepts is that betweenness centrality is a whole network based measurement, whereas brokerage is measure of ego's *direct* network contacts. For instance, brokerage measurement includes ego's direct friends, while betweenness also includes friends of ego's friends. This is demonstrated diagrammatically in Figure 17 below. As can be seen, betweenness centrality and brokerage measures are identical in the first network. In this network actor 1 controls all the network flows as they need to pass through this node in order to reach others. In figure 17 b, actors 3 and 4 have arisen to occupy important positions as they act as hubs through which flows need to pass in order to reach other network parts. Finally, as demonstrated in figure 17 c, larger differences between brokerage and betweenness centrality begin to emerge when the network is further extended so that the ego's *indirect* ties are taken into consideration. For instance, in the last network, actors 1 and 3 have the highest opportunities for brokerage, but 4 and 3 have the highest degree of betweenness amongst other network members. These differences hence emerge because betweenness is a whole network-based measurement whereas brokerage is measured at the level of the ego's direct connections. Thus, even though an actor would have a high degree of local brokerage that does not necessarily mean a high degree of betweenness in the organisational network as a whole. As noted by Burt (2007, p.122), it has been rare for previous scholars to draw comparisons between these measurements (see Everett and Borgatti, 2005 for an exception). The distinction is also utilised here because the focus of the present chapter is on weak ties (which are argued to effectively reach distant parts of the network) and strong ties (which have been previously considered to be relatively local). Hence, a more important question than the extent to which these measures are correlated is whether these network positions are similarly described by strong or weak ties.

Figure 17 Betweenness centrality and brokerage across structural holes

(a)

(b)

(c)
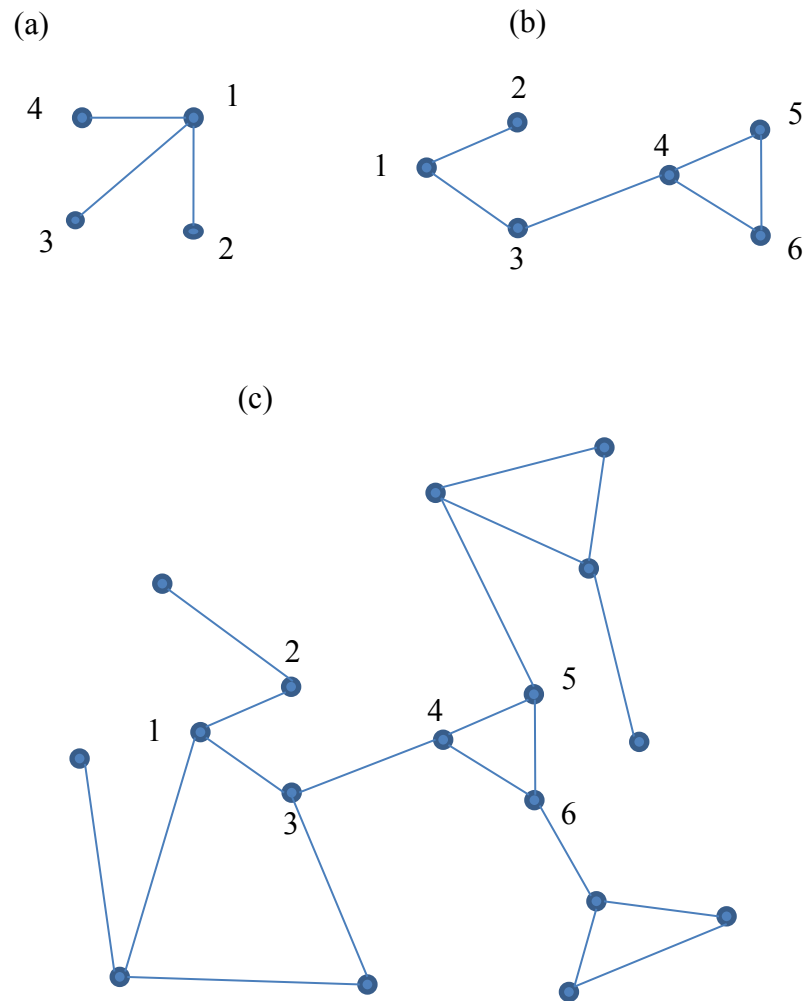
	Brokerage (figure 17a)	Brokerage (figure 17b)	Brokerage (figure 17c)	Betweenness (figure 17a)	Betweenness (figure 17b)	Betweenness (figure 17c)
1	3	1	3	3	4	39
2	0	0	1	0	0	15
3	0	1	3	0	6	61.5
4	0	2	2	0	6	63
5		0	2		0	48
6		0	2		0	39

Granovetter's (1973) classic argument was that weak ties are likely to connect different social

circles while strong ties remain relatively local. Accordingly, previous studies have found a

stronger link concerning the relationship of weak ties and betweenness in comparison to strong ties (van der Leij and Goyaly, 2006). However, Perry-Smith (2006) found that betweenness was highly correlated with both weak *as well as* strong ties (in terms of relationship closeness, frequency, and duration). As the development of strong ties is likely to require time and energy to maintain, as well as to include obligations and reciprocity, they do not characterise the brokerage position very well. Indeed, brokers are more often characterised by independence, goal-oriented attitudes, self-interest, and playing people against each other (Bizzi, 2013). This may require flexibility of weaker rather than stronger ties. Similarly, people with a high betweenness are likely to use their position in a strategic way as they are able to control the flow of information, resources, and knowledge (Mehra *et al.,* 2001). Finally, weak ties are likely to reach distant parts of the network and connect disconnected pockets of people, hence leading to new information (Granovetter, 1973, 1983). These arguments may be especially valid in contexts where team members are separated by vast distances and a reliance on CMCs, and therefore people may have difficulties in developing strong ties which reach across the organisational network. Thus:

> *Hypothesis 1a. Network actors with a high degree of a) brokerage, b) betweenness centrality, and c) network reach have more weak ties than strong ties.*

7.2.3 Tie strength and perceived performance in GVTs

According to communication theory, perceptions are socially constructed from direct interaction with others, and networks are the pipes or conduits along which communication of culture and norms is channelled (Rogers and Kincaid, 1981). According to this theory, *direct* network contacts are used for comparing and reflecting perceptions, and this simultaneously influences the resultant opinions and views of others. This implies that the more intimate and stronger network links an individual has, then the greater their social influence. This is

because strong ties provide chances for frequent interaction, and greater repetition of knowledge and information exchanges. Strong ties are also well-known to be associated with high pressures for conformity and persuasion (Brass, 1992; Ibarra and Andrews, 1993). From this perspective, actors who have a strong tie between each other may be somewhat obligated to rate each other's performance higher than if such a tie did not exist (or if it were weaker). Alternatively, because stronger ties present a higher degree of opportunities for informal interaction, knowledge sharing, and increased familiarity, actors sharing these types of ties may be more comfortable with evaluating each other's' performance. This could be simply because they know each other's capabilities better than if they share only a weak tie. Thus, whether due to obligatory pressures, or a deeper knowledge of others' capabilities, it can be postulated that stronger ties entail perceptions of higher organisational performance. Hence:

Hypothesis 2. Network actors with a high perceived organisational performance have more strong ties than weak ties.

7.2.4 Tie strength and homophily in GVTs

Research findings with regards to the tendency to interact with similar others in organisational settings are somewhat contradictory. For instance, strong ties such as friendship are known to have a tendency to be formed with people who possess similar attributes such as age, gender, and religion (Ibarra, 1992). Moreover, similarity in various attributes increases identification among team members (van Knippenberg and Schippers, 2007; Homberg and Bui, 2013). Other researchers have found that homophily based on strong ties has a pronounced effect on group composition (Ruef *et al.*, 2003). Indeed, Ruef *et al.* (2003) argued that due to a tendency towards homophily, lack of similar others can lead to social isolation. Similarly, Koput (2010, p. 36) proposed that heterogeneous settings with limited similar others in a social network and increased interpersonal dissimilarities

emphasise the creation of relatively weak rather than strong ties. Taken together, these studies highlight that dissimilarity in a network can lead to isolation and weak ties, while similarity promotes stronger ones. In contrast, Yuan and Gay (2006) found no significant homophily effect (i.e. gender and race) in networks of distributed student teams. Even though their study presents the somewhat positive view that diversity does not have a large impact on relationship formation in distributed teams, this assessment may be premature. First, student samples may not be generalisable to real-world situations (for an extensive discussion, see Gordon *et al*., 1987 and the editorial by Bello *et al*., 2009), and second, the authors failed to analyse the effects of other important dimensions such as nationality (i.e. do Americans tend to form ties with Americans). The latter point is especially pertinent since several researchers have argued that cultural dissimilarity has a negative relationship with interpersonal attraction (Triandis *et al*., 1994; Lee, *et al.,* 2006), and can lead to subgroup polarisation (i.e. splitting of teams into several subgroups with opposing opinions) (Lau and Murnighan, 1998). When these types of homophilous groups are formed, they may contain redundant information and thus hinder organisational and network performance (Maurer and Ebers, 2006). Thus, strong ties are likely to occur between people who share multiple similar attributes such as language, nationality, and physical work location. Therefore:

> *Hypothesis 3. Strong network ties have a greater tendency to be formed with similar others than do weak network ties.*

These hypotheses are summarised in the theoretical framework below.

Figure 18 Theoretical framework and summary of hypotheses
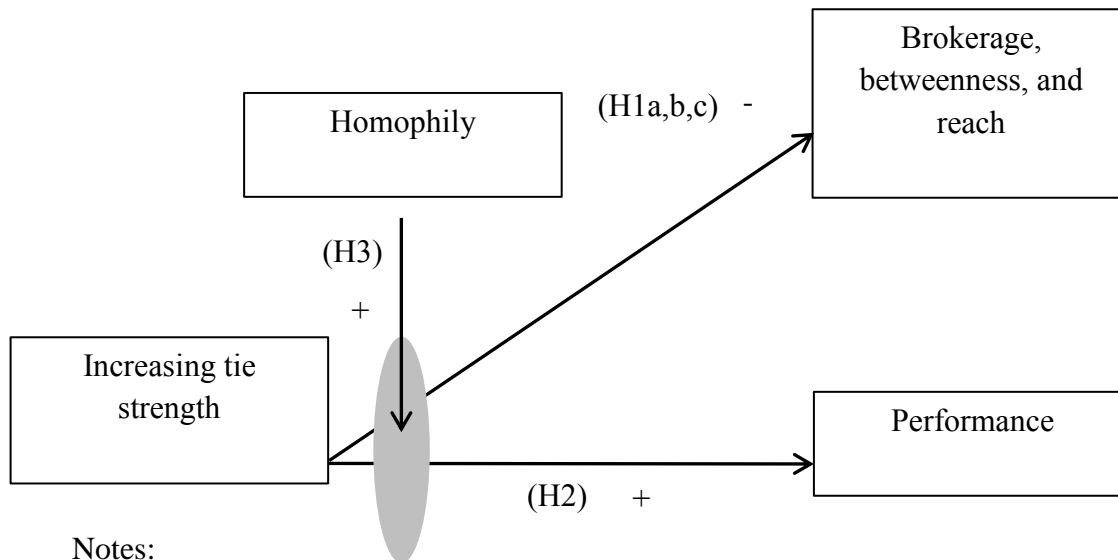
Notes:

(H1a,b,c) *Hypothesis 1a. Network actors with a high degree of a) brokerage,*

b) betweenness, and c) network reach have more weak ties than strong ties.

(H2) *Hypothesis 2. Network actors with a high perceived organisational performance*

have more strong ties than weak ties.

(H3) *Hypothesis 3. Strong network ties are more related to homophily than weak*

network ties.

7.3   Research methods

To test these hypotheses, data were collected from 37 GVTs embedded within three companies. See chapter 4 for more information about the data collection procedures and the participating case companies.

7.4   Measurements

7.4.1   Measuring strong and weak ties

There are a multitude of different ways to measure strong and weak ties in extant research (for an early review, see Mardsen and Campbell, 1984) including closeness of relationship (Hansen, 1999), communication frequency (Levin and Cross, 2004), and reciprocity (Friedkin, 1980). One of the most potent criticisms of how strong and weak ties are measured comes from Krackhardt (1992). He argues that operationalising a strong tie as a continuous variable is ambiguous and instead recommends that each individual relationship be measured as a separate construct. Consequently, strong and weak ties have been conceptualised in more recent studies (i.e. Rowley *et al*., 2000) as separate concepts rather than being located on a continuum. This line of argument is followed here because my purpose in this chapter is to draw comparisons between strong ties and weak ties – an objective that requires delineating a clear empirical as well as theoretical distinction between these different types of ties. To do this, I utilise several proxies which follow Granovetter's (1973) original definition (see Appendix F for more technical description of the present measurements) of strong and weak ties. Firstly, three categories of network tie are identified, namely 'very strong', 'strong' and 'weak ties'. A strong tie is conceptualised here to be a combination of *emotional intensity* (how comfortable actors are with working with each other), *reciprocity* in interpersonal interactions (two-way interaction in dealings, exchanges, and communications), and *intimacy* (social interaction outside of work). It is also conceptualised that the formation of a very strong tie lies at the intersection of emotional intensity, intimacy, and reciprocity. In other words, a tie needs to satisfy the requirement of being simultaneously intense, intimate, and reciprocal for it to be categorised as a very strong one. A strong tie differs from this category in that it includes both intense and intimate relations without the necessary overlap (i.e. union instead of intersection), but the assumption of tie reciprocity still remains in place. Hence, a

strong tie can be either intense *or* intimate *but* still needs to be reciprocal. Finally, weak ties are all ties where actors communicate with each other but are not particularly strong in terms of emotional intensity and intimacy. Communication in weak ties can be also non-reciprocal. Thus, in weak ties, actors share mutual dealings, exchanges, and communications, but they lack the necessary emotional key components in order to be categorised as a very strong or strong tie.

7.4.2 Dependent variables

In the analysis which follows, the antecedents of very strong ties, strong ties, and weak ties are measured separately. As outcome variables predicted by independent variables, very strong ties (VST), strong ties (ST), and weak ties (WT) are measured in terms of how other network members perceive an ego (instead of how ego perceives others). More specifically, they are sums of how 'in-coming' ties (i.e. *indegree*) which a specific network member 'receives' from others. This is because a key purpose of this chapter is to investigate how ego is perceived by others – not how an ego perceives the network.[3] In the next section I describe the independent variables utilised in the analysis. Betweenness centrality, reach, and brokerage below are measured from the communication network (more technically, 160 x 160 sociomatrix) where actors shared mutual dealings, exchanges and communications amongst each other.

Performance. Extant research is consistent in that both *effectiveness* (quality of work) and *efficiency* (quantity of work) are central to performance measurements (see Franco-Santos *et*

---

[3] In order to rule out alternative explanations, I also tested all of my statistical models in terms of *proportion* of network ties that are either strong or weak. The results are identical to those showed in the main part of the analysis in this chapter.

al., 2007, and Neely *et al*. 2005 for reviews). Accordingly, in this study respondents rated on a 1-6 Likert-type scale whether "*This person's quality and quantity of work is higher than formal standards".* The average value is calculated for each individual's perceived performance.

7.4.3   Independent variables

Betweenness centrality: This measure views an actor as being in a favoured position to the extent that he or she falls on the paths between other pairs of actors in the network. For instance, in the Figure 19, Actor b has a relatively high betweenness centrality because that node is between a and d who then connect other actors.

Reach: This is the amount of actors an ego can reach within a network distance of two (i.e. 'friends of friends'). This is then divided by the size of each of that actor's network contacts. Total network reach is then expressed as a proportion from one to hundred. For example, in the figure below Actor b has a reach value of 100 because he or she can reach all the nodes within the network with two relationships (i.e. 'steps').

*Brokerage***:** This is the number of times an ego lies on the shortest path between two alters (i.e. the number of pairs of alters that are not directly connected). It is good to note that brokerage can occur both within groups as well as between groups. For instance, in the Figure 19 Actor a is a broker between c and b, and b is broker between a and d. The difference is that Actor a brokers within a group, while b brokers across groups.

Figure 19 Brokerage within and between groups
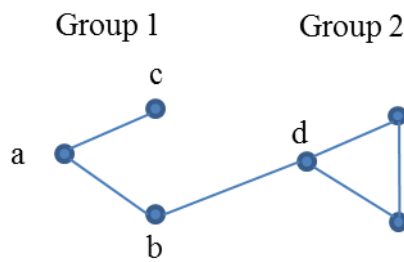
Control variables. In order to rule out alternative explanations I included individuals' gender (coded as 1=male, 2=female), work location (categories 1 to 50), official team membership (categories 1 to 37), supervisory position (1=supervisor, = not a supervisor), and nationality (categories 1 to 19) in all of my analyses as control variables.

7.5 Analytical procedures

The hypotheses presented in this chapter are tested through QAP regression (hypothesis 1-2) and E-I index (hypothesis 3) (see chapter 4 for details). Because a key element in this analysis is to examine the differences between VSTs, STs, and WTs, separate statistical models are developed for each of these relationships. VSTs are analysed in models 1 and 2, STs in models 3 and 4, and WTs in 5 and 6. Subsequently, the effect of these ties on perceived performance is then analysed in models 7 to 10. Finally, the tendency towards homophily of VSTs, STs, and WTs is separately examined in table 18. Hypothesis 3 regarding the tendency towards homophily in GVTs is again analysed through the E-I index (Krackhardt and Stern, 1988) (for more details on this procedure, see chapter 4).

7.6 Results

First correlations and descriptive statistics were generated (see table below). This is followed by a regression analysis of the structural network positions affecting formation of very strong, strong, and weak ties.

Table 16 Correlations and descriptive statistics

	Mean	Stdev.	1	2	3	4	5	6	7	8	9	10	11	12
1. VST	0.86	1.22	1											
2. ST	4.76	3.73	**0.67**	1										
3. WT	6.99	5.01	**-0.27**	**-0.19**	1									
4. Gender	1.28	0.45	0.06	-0.09	-0.03	1								
5. Team members	18.98	10.20	**0.28**	0.06	**-0.55**	0.06	1							
6. Supervisor	0.43	0.50	0.04	-0.01	0.10	-0.12	0.01	1						
7. Location	25.67	15.58	**0.28**	0.07	**-0.52**	0.03	**0.92**	0.00	1					
8. Nationality	4.41	4.74	0.06	-0.05	**-0.29**	-0.04	0.13	0.13	0.07	1				
9. Between Centrality	25.01	26.41	**0.38**	**0.70**	0.11	-0.09	-0.07	0.00	-0.03	-0.09	1			
10. Reach	20.94	15.53	-0.15	**-0.38**	**-0.55**	0.01	**0.37**	-0.13	**0.37**	**0.29**	**-0.36**	1		
11. Broker	41.77	41.33	0.15	**0.45**	**0.73**	-0.09	**-0.43**	0.05	**-0.39**	**-0.24**	**0.59**	**-0.56**	1	
12. Performance	4.21	0.93	0.06	**0.20**	**0.23**	-0.14	**-0.25**	0.12	**-0.29**	-0.09	0.14	**-0.31**	**0.26**	1

*Correlations >0.16 are significant at the level of p<0.05, correlations from 0.16 to 0.21 at p<0.01, and from 0.21 to 0.26 at p<0.001,

correlated variables are highlighted in bold, VST=very strong ties, ST=strong ties, WT=weak ties, BetweenCent=Betweenness centrality

Table 17 Regression results

	Very Strong Ties		Strong Ties		Weak Ties	
	1	**2**	**3**	**4**	**5**	**6**
Gender	0.06	0.08	-0.1	-0.04	-0.01	0.01
Team members	0.03	0.25	-0.02	0.19	-0.48**	-0.16
Supervisor	0.04	0.01	-0.02	-0.05	0.14	0.04
Location	0.26	0.12	0.1	0.02	0.04	0.01
Nationality	0.04	0.11	-0.06	0.07	-0.24**	-0.07
Betweenness centrality		0.32**		0.58***		-0.44***
Reach		-0.16		-0.23*		-0.16
Brokerage		0.06		0.08		0.81***
Model sig.	p>0.05	p<0.05	p>0.05	p<0.001	p<0.001	p<0.001
R^2	0.09	0.28	0.02	0.55	0.37	0.75
R^2adj	0.05	0.23	-0.02	0.52	0.35	0.74
R^2change	-	0.18	-	0.54	-	0.39

	Performance				
	7	**8**	**9**	**10**	**11**
Gender	-0.12	-0.12	-0.12	-0.12	-0.09
Team members	-0.22	-0.22	-0.17	-0.17	-0.09
Supervisor	0.11	0.10	0.11	0.11	0.09
Location	-0.01	-0.05	-0.06	-0.01	-0.07
Nationality	-0.07	-0.08	-0.06	-0.06	-0.02
VST		0.15			-0.01
ST			0.21**		0.25*
WT				0.10	0.16
Model sig.	p<0.05	p<0.05	p<0.05	p<0.05	p<0.05
R^2	0.09	0.11	0.14	0.10	0.15
R^2adj	0.06	0.07	0.10	0.06	0.10
R^2change from baseline	-	0.01	0.04	0.01	0.4

*10,000 permutations, N=160, *p<0.05, **p<0.01, ***p<0.001*

Hypothesis 1a predicts that actors with a high degree of brokerage will have a larger number of weak ties rather than strong ties. The regression coefficients are highly significant in weak tie models five and six (both at $p<0.001$). Strong tie models do not show any significant relationship with brokerage. Hypothesis 1a is therefore strongly supported. Hypothesis 1b predicts that networks of actors with a high degree of betweenness centrality will also be dominated by weak rather than strong ties. The regression coefficients of betweenness centrality in both the very strong tie and strong tie models (two and four) are significant (at $p<0.01$ to $p<0.001$). Also, betweenness centrality is significantly and negatively ($p<0.001$) related to weak ties (model six). Hence, Hypothesis 1b has a different directionality to the one predicted by the hypothesis. Hypothesis 1c predicts that a high degree of network reach would be related to weak rather than strong ties. This hypothesis is not supported. Regression coefficients in reach variable are non-significant with regards to weak ties. However, model four demonstrates that reach is significantly ($p<0.05$) and negatively related to strong ties. This indicates that, even though a high network reach is not especially characterised by many weak ties, having many strong ties significantly *decreases* actor's ability to reach distant parts of the network. In general, adding structural network position variables significantly increase the explanatory power of the statistical models. After these variables are added the R^2 values in the very strong tie model increase by 18 per cent (model 2), the strong tie model by 54 per cent (model 4), and the weak tie model by 39 per cent (model 6) from the baseline models.

Hypothesis 2 predicts that strong ties rather than weak ties are related to higher perceived organisational performance. This hypothesis is partially supported. Significant regression coefficients ($p<0.01$) in model nine and ten provided tentative evidence that strong ties are related to a higher perceived organisational performance. However, the effect is not particularly strong as there is only a minor increase in the R^2 values (from 0.06 to 0.10) after

strong ties are added into the statistical model. No statistically significant relationship is found between perceived performance and very strong ties or weak ties.

Finally, Hypothesis 3 states that strong ties rather than weak ties are driven by homophilic tendencies. This tendency is analysed through the E-I index and five dimensions: official team membership, nationality, co-location, gender, and supervisory position). Results of this analysis are showed in table 18. This hypothesis receives limited support. First, the results indicate that VSTs and STs have no particular tendency to be contained within official teams. Thus, they can span across different teams and are *not* homophilous with regards to team membership. It is found that 66 per cent of the very strong ties, 74 per cent of strong ties, and 87 per cent of weak ties are external to the official team (significant at $p<0.001$). Surprisingly, the re-scaled E-I index (i.e. when group sizes are taken into consideration) reveal that stronger ties have a statistically slightly higher probability to span across official teams than do weak ties. Interestingly, strong and weak ties function in a similar manner as official teams with regards to geographical location. The re-scaled E-I values reveal that strong ties (E-I value = 0.36) are more likely to occur between geographically separated groups than are weak ties (E-I value = 0.04).

Table 18 Homophily in forming strong and weak ties in GVTs

		Frequency (internal)	Frequency (external)	% internal	% external	E-I Index	Expected E-I	Re-scaled E-I	SD	Sig.
Official team	Very Strong Ties	80	156	0.34	0.66	0.32	0.94	**0.32**	0.03	p<0.01
	Strong Ties	230	652	0.26	0.74	0.48	0.94	**0.38**	0.02	p<0.01
	Weak Ties	290	1884	0.13	0.87	0.73	0.94	**0.22**	0.01	p<0.01
Nationality	Very Strong Ties	138	98	0.59	0.42	-0.17	0.55	**-0.17**	0.10	p<0.01
	Strong Ties	492	390	0.56	0.44	-0.12	0.55	**-0.12**	0.05	p<0.01
	Weak Ties	982	1192	0.45	0.55	0.10	0.55	**0.10**	0.04	p<0.01
location	Very Strong Ties	110	126	0.47	0.53	0.07	0.92	**0.07**	0.04	p<0.01
	Strong Ties	262	600	0.32	0.68	0.36	0.92	**0.36**	0.02	p<0.01
	Weak Ties	494	1680	0.23	0.77	0.55	0.19	**0.04**	0.01	p<0.01
Gender	Very Strong Ties	130	106	0.55	0.45	-0.10	-0.19	-0.10	0.12	n.s.
	Strong Ties	532	350	0.60	0.40	-0.21	-0.19	-0.21	0.06	n.s.
	Weak Ties	1306	868	0.60	0.40	-0.20	-0.19	-0.20	0.04	n.s.
Supervisor	Very Strong Ties	104	132	0.44	0.56	0.12	-0.01	0.12	0.09	n.s.
	Strong Ties	402	480	0.46	0.54	0.09	-0.01	0.09	0.05	p<0.05
	Weak Ties	1080	1094	0.50	0.50	0.01	-0.01	0.01	0.03	n.s.

Notes. 5000 permutations, n.s. = non-significant interaction levels, N for Very Strong ties was 236, for Strong Ties 882, and 2174 for Weak Ties.

Gender and the supervisory position of actors are found to have no significant role in producing homophily. Finally, nationality is the only dimension which showed a minor tendency for the preference of forming strong ties with similar others. The results indicate that 59 per cent of VSTs and 56 of STs occurred between individuals of the same nationality while this is applicable for 45 per cent of all weak ties. Also, a similar tendency is observed in the E-I values of -0.17 and -0.12 for stronger ties and 0.10 for weak ties. Hence, there was a minor inclination for homophily to be found in terms of actors' nationality. However, care should be taken when drawing conclusions from these results. The direction of effect in the case of homophilous ties with others from the same nationality is not particularly strong. Recall that homophily ranges from -1 (full homophily) to 1 (full heterophily), and values ranging from -0.12 to -17 indicate a relatively weak tendency for similar others. In sum, the hypothesis that stronger ties, rather than weak ties, tend to be formed towards similar others is generally not supported despite a minor tendency revealed for stronger ties to be formed between people of the same nationality. Surprisingly, strong ties are found to be more or equally likely to connect separate groups (teams and geographical locations) in comparison to weak ties. These results are summarized in the figure below.

Figure 20 Summary of hypotheses in chapter 7

Hypothesis	Result
Hypothesis 1a. Network actors with a high degree of brokerage have more weak ties than strong ties.	Supported
Hypothesis 1b. Network actors with a high degree of betweenness centrality have more weak ties than strong ties.	Sign in opposite direction
Hypothesis 1c. Network actors with a high degree of network reach centrality have more weak ties than strong ties.	Not supported
Hypothesis 2. Network actors with a high perceived organisational performance have more strong ties than weak ties.	Supported
Hypothesis 3. Strong network ties have a greater tendency to be formed with similar others than do weak network ties.	Not supported

7.7 Discussion

Extant research has paid limited attention to the role of strong and weak network ties in GVTs. Moreover, we know little about how these relationships are related to an individual's network positions. The purpose of this chapter was to analyse how strong and weak ties are related to individual's network position and perceived organisational performance, and to reveal whether the networks of GVTs exhibit homophilous tendencies. Surprisingly, many of the hypotheses were not supported, and in fact, some had an opposite direction of effect to the one predicted by review of extant research and theory development. These findings are discussed in greater detail below.

7.7.1 Strong and weak ties and a structural network position

Burt (2007) argued that if the structure of direct contacts is correlated with the broader networks structure (indirect contacts) then information on the whole network structure may not add value to predictions drawn from direct ties. The findings reported in this chapter

revealed that the structure of direct contacts (brokerage) is indeed correlated with those of indirect contacts (betweenness). However, the results simultaneously demonstrate that local structures (brokerage) considerably *differed* from broader structures (betweenness) in terms of whether they consist of strong or weak relationships. As predicted, the results indicate that weak ties are especially important for a local brokerage position in GVTs. However, it is surprising that betweenness centrality is found to be highly related to strong ties rather than weak ties.

The reason why betweenness (whole network structure) is characterised by strong ties while brokerage (direct network contacts) may relate to weak ties could be due to at least two factors: exposure and power. Individuals central to the whole organisational network are often perceived favourably as they have more freedom, status, and power (Ibarra and Andrews, 1993; Brass, 1984). Moreover, being centrally located in the whole network generates awareness about larger dealings through wider exposure to different social circles in comparison to only local embeddedness (Perry-Smith, 2006). Hence, central individuals make attractive network partners when the whole organisational network is taken into consideration. Indeed, Burt and Knez (1995) demonstrated that when an ego has a strong connection with an alter, indirect connections are important for transferring positive information regarding ego (i.e. reputation for trustworthiness). Consequently, they found that indirect connections significantly increased the likelihood of increased levels of trust in close relationships, and decreased the levels of trust in weak relationships. The results presented in this chapter resonate with these findings because a high degree of betweenness (which included indirect connections) is found to significantly relate to stronger ties while local brokerage was more related to weak ties. Thus, local brokerage positions may lack stronger

ties because they in part ignore the wider network which in turn carries a significant influence in signalling positive information (i.e. reputation) about the focal actor.

From one perspective, the finding that brokerage is characterised by weak ties and betweenness by strong ties supports Burt's (1992, pp.18-34) argument that structural holes are not dependent on the type of ties but rather on the position of the individual in the organisational network. Even though the relationship between strong ties and betweenness is surprising, the tie strength may not matter as long as the information they provide is not redundant. For instance, it has been suggested that weak rather than strong ties are beneficial for creativity (i.e. Perry-Smith, 2006). This link is reliant upon an argument that these ties effectively deliver access to areas that contain diverse information (Baer, 2010). As GVTs naturally consist of a highly diverse work force, it may be that information even in local settings is often non-redundant and therefore unique information may not need to be retrieved from distant parts of the firm. At the same time, to the extent that measurement of betweenness matches Granovetter's description of a 'bridging relationship', the results contradict the argument that bridges are *always* weak ties as was argued by Granovetter (1973, 1983). In this chapter I demonstrate that strong ties can act as bridges at the whole network level. At the same time, the results presented in this chapter tell us little about whether brokerage *benefits* are different in local *versus* global networks.

A second noteworthy finding is that network reach plays only a minor role in the formation of both strong and weak ties. Hence, a capability to reach distant parts of the network was not found to be characterised by the categorisation of ties in the present chapter. While this finding is not unexpected for strong ties (as they are argued to be relatively local and relate to issues of cohesion, shared norms, trust and so forth) it is more surprising with respect to weak

ties. Weak ties are often portrayed as connections which reach out to distant parts of the organisation in order to obtain non-redundant resources (i.e. Granovetter, 1973; Capaldo, 2007). Considering the potential effects of interpersonal differences and large spatial distances between team members it would have been reasonable to expect weak ties to play an even more important role in reaching distant parts of the intra-firm network in GVTs. At the same time, one explanation does place a high emphasis on weak ties. It could be that coordinating work and communications through virtual environments facilitates the creation of weak ties to the extent that team members share many ties with their co-workers. If the network contacts of an ego have more or less the same interaction partners as the ego themselves, this could explain a relatively low degree of efficiency in reach. Thus, even if actors with weak ties could reach the same remote locations, their *efficiency* is diminished by the fact that their other network partners are also connected to the distant locations. Consequently, it is possible to conclude that weak ties do not provide actors with as much non-redundant resources (i.e. information and opportunities) from the wider network because the same resources are also available to other network members. All these results are summarised in Table 19 below.

Table 19 Summary of the relationship between tie strength and actor attributes

	Broker	Reach	Betweenness centrality
Effect of strong ties	Strong ties are negatively related to having a high degree of brokerage	Strong ties are negatively related to having a high network reach	Strong ties are positively related to high betweenness in GVT networks.
Theoretical implications	Dedication and commitment to limited groups, rather than connecting many groups through bridging behavior, may underpin strong ties.	Instead of reaching towards distant parts of the network, strong ties in GVTs convey benefits linking to cohesion, shared norms, and trust.	Forming strong ties with people who have influence, control, and ability to coordinate network flows may bring strategic advantages.
Effect of weak ties	Weak ties are positively related to high degree of brokerage	Weak ties are not related to a high network reach	Weak ties are negatively related to high betweenness in GVT networks.
Theoretical implications	Forming weak ties with people having brokerage positions may bring strategic advantages (i.e. information and opportunities)	Actors in GVTs may share many weak ties with their network participants, and therefore have a low degree of reach efficiency	Indirect network connections facilitate strong rather than weak ties. Status and exposure to wider network may make actors with high betweenness attractive network partners.

7.7.2 Strong and weak ties and perceived organisational performance

Scholars have previously found that both cohesion and network range are positively related to performance (Raegans *et al.*, 2004). In the context of GVTs, it is found here that only strong network ties are significantly related to perceived performance.[4] As hypothesised, this may be due to at least three (potentially interconnected) explanations which are based around obligations, familiarity, and knowledge sharing. First, conformity, obligations, and emotional attachment which are generally associated with strong ties could influence team members to rate the performance of their contact more highly than if they are only connected by weak ties. Second, actors who share strong ties could be in a better position to evaluate each other's *actual* performance because they know the skills, capabilities, and motivation of the individual better than if they were only weakly tied. Finally, strong ties facilitate the sharing

---

[4] In order to rule out alternative theoretical explanations, I also tested the relationship between network position and perceived performance. Statistical effects of individuals' network position (brokerage, reach, and betweenness centrality) on perceived performance are all non-significant. Similarly, adding these variables did not improve the explanatory power of the model – in fact, it decreased it so that the model became insignificant (at $p > 0.10$). Thus, network position and performance are not related in the present study.

of contextual, tacit, and complex knowledge in a more effective manner in comparison to weak ties (i.e. Capaldo, 2006). This could contribute towards higher organisational performance. Logically, the cause of higher perceived performance is likely to lie in a combination of these factors.

It is important to note that the results regarding perceived performance are tentative and some caution is required in drawing firm conclusions. Even though the results achieve an acceptable level of significance, they are not particularly strong in terms of size of effect or explanatory power of the statistical models. One reason for this could be that the types of ties (i.e. stronger or weaker ties) may not be *directly* related to perceived performance. Instead, perceived performance may also be affected to a greater extent by the skill-set, motivation, collaborative capabilities, and ability for decision-making of an individual network member, amongst other things (i.e. Katzenbach and Smith, 1992). Such variables are not incorporated into the present study, and this may explain why the type of network ties an individual possesses has only a relatively small effect on perceived performance.

7.7.3   Strong and weak ties and homophily

The results indicate that the initial hypothesis that stronger ties are more homophilous than weak ties is not generally supported. However, the findings reveal some interesting details about the antecedents of strong and weak ties in GVT networks. Surprisingly, weak ties show a little tendency for being externally directed (i.e. connecting groups of dissimilar people) in comparison to stronger ties. This result is unexpected because strong ties (i.e. friendship) are often based on similarity (Ibarra, 1992). Correspondingly, close working relationships (i.e. being in the same team and having a shared location) can lead to increasingly strong interactions due to the greater potential for *more* frequent interaction amongst team members

(Van Den Bulte and Moenaert, 1998). Interestingly, the findings highlight that strong ties in GVTs can occur between members of different teams, geographical locations, and hierarchical levels more frequently than is the case for weak ties. The only dimension where strong ties demonstrate a tendency to be formed with similar others is an individual's nationality. In this aspect, the respondents are somewhat inclined to form stronger ties with people who originate from the same country. However, this effect is markedly weaker in comparison to the propensity for strong ties to connect different groups. These findings in general depart from previous studies which claim that heterogeneous settings place greater emphasis on the formation of weak ties rather than strong ones (i.e. Koput, 2010). One reason why strong ties may be forged between dissimilar people could be due to the characteristics of team members who work in global environments. For instance, it is possible to postulate that individuals in GVTs are likely to possess above average cross-cultural intelligence, competency in multiple languages, networking capabilities, and extensive experience in working within multicultural environments (i.e. Ang *et al*., 2007; Crowne, 2008). These types of attributes could diminish the effects imposed by dissimilarity and distance in GVTs, especially regarding the formation of social networks which consist of strong ties. The limitations and contributions of this chapter are further elaborated in Chapter 8.

8 SUMMARY AND CONCLUSIONS

The main message of this dissertation is that networks are important for global business operations with regards to several key organisational phenomena. Moreover, the global business context presents a considerably more complex set of challenges in comparison to domestic settings, and more research is needed to unravel the specific ways in which these two contexts differ from each other from a network theoretical perspective. This dissertation provides an analysis on the network mechanisms which underpin value added as well as potential liabilities in GVTs. Three empirical chapters delved into network mechanisms behind various organisational phenomena critical to the success of GVTs. In total, 22 hypotheses across three empirical chapters are developed and analysed in this dissertation. In general, this analysis can be considered a success as most of the hypotheses are supported. Moreover, the testing of these hypotheses and the results they provided meets the objectives set for the present research. The main objective of this study is to combine international business/management, network, and virtual team management literatures to analyse intra-firm networks as both antecedents and outcomes of value added in GVTs. By identifying major network factors (i.e. individual's network position, types of ties, and informal network structure) underpinning GVT outcomes (i.e. knowledge flows, negative intergroup bias, and formation of strong ties), this dissertation accomplishes its stated purpose. Therefore, significant support was found for an underlying argument of this dissertation: networks and relationships carry substantial influence on organising business operations globally. More specifically, key organisational factors such as information flows, potential for conflict, and perceived performance, amongst other things, are found to be to a considerable extent influenced by the informal social fabric of the firm.

The purpose of this concluding chapter is to provide a summary of the main research findings and contributions presented in this dissertation. The contributions of the three empirical chapters will be first discussed. This is then followed by a summary of the research contributions of this dissertation as whole. The goal is to draw out the central findings of the research, and how they advance our fundamental understanding of networks in international business operations. Correspondingly, implications for managers and practitioners will then be discussed. Finally, the limitations to the present study and potential avenues for future scholarship will be examined.

8.1   Chapter 5: Negative perceptions in GVTs

The purpose of chapter 5 was to identify and analyse the sources of negative perceptions in Global Teams. Specifically, the objective was to establish the role of (i) in-group cohesion, (ii) in-group negativity, (iii) role of brokerage, and (iv) effect of shared values on negative intergroup bias. One of the key findings of this chapter was that network mechanisms *within* groups can decrease negative perceptions towards members of other groups. More specifically, negative interactions within the group may force individuals to look for more balanced relationships with members of other groups. This may, in turn, cause individuals to evaluate out-group members in a more positive and optimistic manner. At the same time, negativity *between* groups also increased negative perceptions of out-group members at the individual level. It is postulated that when a group has negative interactions with other groups, then individuals have more opportunities to learn negative information about members of other groups, which (in combination with a group's normative pressure) may cause actors to adopt negative views about them. At the same time, the results indicate that individuals who broker structural holes between groups (but not within groups) perceive other group members more negatively than non-brokers. This was attributed to the theoretical premise that

brokerage advantages arise only when people in those network positions strategically manipulate information and gain power through exclusive access to organisational resources not available to everyone else (for similar arguments, see Obstfeld, 2005, Bizzi, 2013). Finally, the analysis demonstrates that shared values with other group members can significantly reduce negativity – but only when there is a low degree of negativity (within as well as between groups) and when brokerage roles are not taken into consideration in the statistical model. Hence, the benefits gained from establishing shared values were found to be dependent on network structure as well as an individuals' position within the intra-firm network.

8.2   Chapter 5: contributions to literature and future research

While social networks are crucially important for team's success in various organisational contexts (Adler and Kwon 2002, Field 2010), the conditions under which they may induce negative outcomes has received insufficient attention in the extant literature – especially from an empirical viewpoint. By combining insights from SIT and organisational network theory this chapter offers a rich picture of the conditions under which relationships and structuring of these ties can induce negative outcomes. This study demonstrates that the structural configuration of network ties has important implications for the socio cognitive processes which cause individuals to adopt increasingly negative attitudes towards members of other teams. In general, the findings presented in this chapter in general resonate with cognitive network and SITs, which propose that individuals utilise least complex cognitions to make sense of their environment (Moskowitz, 2005; Kilduff and Krackhardt, 2008; Fiske and Taylor, 1984). Overall, this chapter contributes towards a better understanding of the sociopsychological aspects behind well-established network mechanisms and how they link to negative perceptions of members embedded within other teams.

Specifically, this chapter provides four key contributions to the current understanding of social networks and the psychological processes which underpin positive and negative interpersonal interactions. First, it contributes to social network theory by introducing the notion of negative intergroup bias into this stream of research. Specifically, it establishes social identification as a cognitive mechanism underpinning the development of negative perceptions of members of other teams and thus contributes to the cross-disciplinary nature of organisational network research. To the best of my knowledge, this chapter is the first systematic attempt to demonstrate how the structure of a network is linked to intergroup bias and negative perceptions of members of other teams from both a theoretical and empirical standpoint. As argued in Chapter 1, previous research in networks has mainly focused on positive interactions, and little attention has been paid to the fact that negative ties can be a major threat to the effective functioning of individuals and organisations. While extant research recognizes that networks can have negative effects (i.e. Labiance and Brass, 2006; Portes and Landolt, 2006), the sources and conditions of such negativity has not been previously analysed. This chapter adds to these discussions by examining the structure of seemingly beneficial positive networks from the perspective of social identity and negative perceptions of co-workers. It thus elaborates the conditions under which they can have adverse consequences by analysing social and structural mechanisms behind positive and negative interactions. There has previously been a limited empirical effort to quantify negative interactions (in network research, virtual team literature, as well as international business studies) beyond measurements such as "dislike". This chapter quantifies several key elements of both positive and negative relations, thus forming a foundation upon which future studies should be able to build when investigating both pro-social and counterproductive behaviours from an organisational network perspective. Third, the results have implications for managers of virtual teams and global virtual teams. An important question is how

negativity in these teams can be minimised. Corrective action should be taken, at the latest, when a minor subconscious in-group bias surfaces as obstructive behaviour or quarrels between teams. A potential managerial tool to counteract excessive in-group/out-group division could be structural alteration of workflow within and between identity groups. Re-categorisation of teams could emphasise one common identity and superordinate goals between team members (Dovidio *et al*., 1998). Social interaction between intra and inter-team members and the resulting personalisation of intra-team members could reduce the salience of divisions between in-group and out-group (Galinsky, 2002). However, identification of key individuals, such as brokers, within networks can be a challenging task, which requires social intelligence and a good understanding of social dynamics. Finally, this chapter contributes to extending research on conflict management in international business settings by revealing those network mechanisms which can increase or reduce negativity in global teams. As cross-cultural conflicts are one of the biggest challenges in international business (Dong and Liu, 2010; Hennart and Zeng, 2002), this is an important step for identifying relational sources of potential conflict.

8.3   Chapter 5: future directions and limitations

The limitations of this chapter provide pointers for future research. First, the cross-sectional data do not allow a causal direction to be established. Thus, future studies should include longitudinal research designs that capture the directionality between variables and examine the dynamic nature of networks over an extended period of time (i.e. co-evolution of network structure and affective states in formation of negative ties, conflict, and social liabilities). Secondly, the results may have been influenced by other unknown variables. Future studies should investigate different mechanisms and conditions underpinning negativity within networks. For example, competition over scarce resources and undesirable future prospects

has been found to give rise to intergroup hostilities and biases (Galinsky 2002). An interesting avenue for future work would be to examine how these may mediate or moderate the network processes which underlie the formation of positive and negative network relationships. In general, more emphasis should be placed on the investigation of mechanisms and outcomes of intergroup bias in organisational studies; especially when bearing in mind the increased use of teams, diverse work forces, matrix structures and cross-functional designs, all of which require effective interpersonal and intergroup interactions in order to add value to organisational activities.

8.4   Chapter 6: Knowledge flows in GVTs

The purpose of chapter 6 was to develop and test a conceptual model of *availability* and *complementarity* of intra-firm knowledge in GVTs. As suggested in the theoretical investigation and development of hypotheses, intra-firm knowledge flows are affected to a high degree by network factors such as tie content, coordination, clustering, and reciprocity. An important finding in this analysis is that even though participation in globally spanning cliques increases knowledge available to team members, this information may not be new and unique. Hence, people in these structures share plenty of information, but it may be redundant in that it is already known to other clique members. This finding resonates strongly with Granovetter's (1973) strength of weak tie theory in that acquaintances rather than strong network connections (i.e. clique members) are considered as an important source of new and unique information. While Granovetter's focus was on types of relationships that people share (strong and weak ties), my analysis demonstrates that structure of the network and types of ties are inevitably interconnected. At the same time, the finding that reciprocal network ties (i.e. relatively strong relationships) significantly increases both availability as well as the complementarity of information (i.e. its non-redundancy) somewhat contradicts

Granovetter's strength of weak tie theory. The analysis presented here demonstrates that these reciprocal ties have no tendency to be contained within a certain geographical region, and therefore span across the globe. Hence, cultural, institutional, and market differences in each actor's location are likely to have contributed to the non-redundant nature of knowledge exchanges in GVTs. This is an interesting observation since multiplex ties where people shared official workflow as well as friendship connections only have a minor positive effect for knowledge complementarity. Hence, friends may over time develop a somewhat shared knowledge base (where friends know the same things) but this was not the case for reciprocal interactions. This could be because friends may have a higher degree of affection, helping behaviours, and more interaction in comparison to co-workers who reciprocate knowledge exchanges.

8.5   Chapter 6: contributions to literature and future research

The study reported in this chapter fits well with two key issues in international business literature: (i) how to organise international activities flexibly while maintaining reliable information, specialisation of activities, and non-hierarchical structures (Buckley, 2010; Mudambi and Navarra, 2004), and (ii) discerning the extent to which networks and embeddedness play a role in effective functioning of a global firm (Coviello, 2006; McDermott, 2009; Ellis, 2010). This chapter provides two key contributions to the current understanding of international business research and the role that GVTs play in MNEs. First, this analysis is that it extends the knowledge based view of the firm (Kogut and Zander, 1992) by revealing the specific network mechanisms which may facilitate and hinder knowledge flows in the context of GVTs. As was stated in Chapter 1, international business research has tended to ignore networks at the individual, dyad, and teams levels at the expense of macro-level attributes (Malhotra *et al.,* 2007; Zander *et al.,* 2012). This chapter therefore extends

research on knowledge-based GVTs by introducing social network concepts such as redundancy, multiplexity, and clique participation into this stream of research. Specifically, I ascertain here that such network properties underpin effective sharing of information and resources within globally distributed teams. Indeed, the knowledge-based view has often highlighted the importance of co-location of decision-making and knowledge (Grant, 1997), and the analysis reported here demonstrates how GVTs can achieve higher levels of knowledge exchanges as well. To the best of my knowledge, this chapter represents the first systematic attempt to discern how the structure of a network and network relationships are linked to information sharing within GVTs from an empirical standpoint. Thus, the nature of networks within global teams and the conditions under which they can facilitate competitive advantage through the promotion of information, resources, and knowledge flows is elaborated. Second, this chapter also provides new insights into the conceptual novelty of several key elements of variables affecting the knowledge flows as well as the nature of knowledge itself, thus forming a foundation upon which future research should be able to build when investigating knowledge sharing within international business contexts from an organisational network perspective. Second, these results have implications for managers operating in global business environments. An important question is how factors positively affecting knowledge creation and sharing can be maximised. In this chapter I examine several mechanisms which can facilitate these processes, and managers should strive to create an organisational environment and culture which makes it easy to structure interpersonal interaction accordingly. Overall, this chapter contributes to international business by unravelling how MNEs can extend their resource base and build new organisational advantages by managing increasingly complex internal networks across national borders. By examining potential impediments for effective resource combination and utilisation within organisational networks, this chapter contributes towards finding new ways by which

multicultural teams may realise their full potential. I draw on ideas and methods from several disciplines in order to advance a fundamental understanding of the *social* context of the multinational company, resulting in a contribution that could not have been obtained through a single-disciplinary lens.

8.6   Chapter 6: future directions and limitations

The limitations of the analysis reported in this chapter provide pointers for future research. First, the cross-sectional data do not allow a causal direction to be established. For instance, it is not possible to discern whether multiplex ties affect the flow of information and resources, or whether the fact that a person is a good source of information could lead to greater interaction and further development of that relationship into the friendship domain. Thus, future studies should include longitudinal research designs which capture the directionality between variables and examine the dynamic nature of international networks over an extended period of time (i.e. co-evolution of network structures and affective states in flow of knowledge, information, and resources). This would also allow examination of how bonding between team members may over time dispel the effects of geographical and cultural distances in GVTs. Second, the types of ties that can arise between actors at different levels of analysis are numerous. In this chapter the main focus is on knowledge sharing, communication, workflow, and friendship, but future studies could investigate various other types of relationships such as trust, conflict, and dislike. For instance, reciprocity has been found to vary depending on the type of exchanges (i.e. emotional *versus* instrumental) (Rook, 1987). This could have implications for knowledge flows in networks consisting of different types of ties. It is posited here that it is also important to explore potential moderating variables which may affect the formation of different types of ties in GVTs. For instance, use of various technologies (i.e. Skype, intranet, and videoconferencing) could moderate the

nature and types of ties that form between team members. Third, even though the variables are found to have a significant positive effect on both knowledge availability as well as complementarity of information, these benefits may be dependent on the type of knowledge and information concerned (i.e. tacit *versus* formal). For example, Ho and Levesque (2005) postulate that multiplexity may become less useful the more organisation-wide the information is or, in other words, if the information is widely available through multiple channels then there is little need for deeper multiplex ties. Finally, while knowledge flows are modelled in terms of knowledge availability and complementarity of information, future studies may extend the findings presented here into more explicit knowledge dimensions including innovations, product development, and patent citations for example. Unfortunately, exploration of issues regarding utilisation and taking advantage of organisational knowledge stocks is beyond the scope of the present study. As noted by Forsgren and Pedersen (2000), taking advantage of the knowledge benefits can be a difficult challenge for MNEs to overcome. A question future researcher may wish to ask is whether the knowledge availability and complementarity of information in MNEs *actually* leads to increased innovative capacity and innovative products.

8.7   Chapter 7: strong and weak ties in GVTs

The purpose of chapter 7 was to analyse the basis for forming strong and weak network ties, and therefore extend Granovetter's (1973) theory of weak ties into GVTs. One of the main key findings of interest was that global team attributes have little influence for forming of strong network ties. In other words, strong network ties in GVTs are non-homophilous. This was a surprising finding in that it somewhat contradicts the theory of homophily (for example, see McPherson *et al.,* 2001) which argues that strong ties are more likely to form between similar people than are weak ties. Instead, the GVTs studied here reveal little tendency for

this type of behaviour, and network members have forged strong connections amongst each other despite salient differences. One potential explanation for this may lie in the CMC utilised by the firms in the present study. It could be that individual attributes (i.e. cultural background or gender) become less salient in CMC contexts, and therefore team members tend to form stronger ties without the need for similarity.

Another key interesting finding is that strong network ties (opposite to weak ones) often act as bridges between global teams. This finding goes directly against Granovetter's strength of weak ties argument that *all* bridging ties are weak ties. One explanation of this conflicting result is that the role of diversity and the relatively low reach of weak ties. The findings reported in chapter 7 indicate that strong ties in GVTs are non-homophilous and diverse. Hence, there is no theoretically valid reason why they could not act as bridges between groups and pockets of diverse information. Consequently, they may also be rich in different types of information, ideas, knowledge-based resources, and opportunities. Moreover, it is important to reflect upon the findings with regards to strong ties against weak ties. It was found that weak ties are not significantly related to a high degree of network reach, and therefore they may often fail to access distant parts of the network in order to gain unique information. In this case, the key benefits of weak ties are lost, and they do not provide significant *informational* advantages over strong ties. Indeed, strong ties are also found to be significantly linked to perceived organisational performance at the individual level whereas weak ties were not. This relationship further demonstrates the value of strong ties – especially in a context where the capability to communicate and integrate information between diverse groups of people embedded within distant locations is important.

8.8   Chapter 7: contributions to literature and future research

To the best of my knowledge, this chapter represents the first systematic attempt to analyse the role of strong and weak ties in GVTs. More specifically, I discern how strong and weak ties in GVTs are linked to (i) network position, (ii) homophily, and (iii) perceived performance at the individual level. Consequently, this chapter makes several contributions to the social network theory and international business research. First, it contributes to network theory by shedding light on the often observed trade-off between cohesiveness and bridging by analysing these effects in the context of the global business environment. I demonstrate that GVTs present similar problems in managing this trade-off as for domestic firms in terms of betweenness centrality (cohesion) and brokerage (bridging). However, it is stronger ties, more so than weak ties, which contribute most to connecting groups, linking diverse individuals, and higher organisational performance. Specifically, this chapter contributes to social network research by (i) demonstrating the influence of the international business environment for the formation of strong and weak ties, and (ii) by delineating the contextual effects which inevitably influence theorising about dyadic ties (Granovetter, 1973), structural holes (Burt, 1992), and homophily (i.e. McPherson *et al*., 2001).

Second contribution of this chapter to both social network research, virtual team research, and international business studies is that it provides new insights into the conceptual novelty of strong and weak ties. Even though in general it has been rare to measure strong and weak ties as separate constructs (for an exception, see Rowley *et al.,* 2000), the value of this approach is demonstrated through a comparative analysis of their antecedents as well as their effects. Hopefully, the study reported here will create a foundation upon which future scholars can build when investigating organisational networks and strong and weak ties in

organisational contexts, especially those which transcend national borders and wide geographical space.

Taken together, these findings have significant ramifications for theorising on social networks as they shed light (and question the applicability) of some of the key network-based theories in international business settings. Indeed, as argued early in chapter 1, bulk of network research and virtual team studies have concentrated on organisations from single industry or single country settings and have therefore ignored MNEs. By demonstrating the influence of the global business environment for the formation of strong and weak ties, it contribute to delineating the contextual effects which inevitably influence theorising about dyadic ties (Granovetter, 1973), structural holes (Burt, 1992), and homophily (i.e. McPherson *et al*., 2001). More specifically, these findings demonstrate that in some ways, relationships and networks function in GVTs in a similar manner as to those previously observed in domestic settings. On the other hand, diversity, distance, CMC interactions (amongst other things) bring about important implications on how these theories generalise into a global business context. Hence, future scholars should be careful when drawing conclusions from these theories in the context of international and global companies, and they should consider the effect of key variables presented here for the phenomenon under investigation.

8.9   Chapter 7: future directions and limitations

Naturally, this chapter is not without limitations and these provide pointers for future research. First, the cross-sectional data utilised in the present study is limited in that temporal effects were not analysed. For instance, it would be an interesting avenue for future research to examine the development of social networks within GVTs longitudinally from inception

(when ties are likely to be moderately weak) through to maturity (when strong ties may be expected to have emerged). Future scholars are encouraged to embrace two important issues in this type of longitudinal analysis: namely, comparison between GVTs and "traditional" domestic teams, and the inclusion of an explicit knowledge dimension in interpersonal interactions. The former would allow researchers to accurately evaluate the dimensions where these contrasting team types deviate from each other. Analysing differences between networks in these types of contexts should give rise to valuable theoretical implications because it could illuminate the extent to which network theories developed at the abstract level are applicable to specific research contexts (see Borgatti and Halgin, 2011). For instance, what GVT members perceive as 'strong ties' may be quite different to those perceived by co-located team members. Hence, it would be an interesting avenue for future research to analyse whether strong and weak ties (i) are perceived differently (i.e. due to CMC), (ii) emerge in the same way, and (iii) have the same consequences for GVTs in comparison to co-located teams.

With regards to the knowledge dimension, there is naturally a high degree of emphasis placed on the knowledge-intensive nature of GVTs, and this links closely to strong and weak network ties (i.e. emotional attachment versus non-redundant information). However, the importance of knowledge could be further highlighted by analysing different types of information flows (i.e. tacit or explicit), how this informaiton is utilised (i.e. changed, shared, retrieved, or applied), and the outcomes of this information exchange (i.e. innovations, new products, and performance). This type of analysis could provide fresh insights to the effects of context (i.e. computer-mediated communications and linguistic differences) and different actor attributes (i.e. cultural intelligence and global mindset) on knowledge flows between team members.

The purpose, key findings, and the primary contribution of each empirical chapter are summarised in the table 20 below.

Table 20 Summary of chapter purpose, findings, and contribution

Chapter number	Purpose	Key Findings	Key contributions
5	Analyse the sources of negative perceptions in Global Teams	Both network structure of a group and individual's network position significant for inducing/reducing negativity	Extends research on MNE networks by introducing intergroup bias into this stream of research through a cross-level analysis. Further contributes to conflict management in IB settings by revealing network mechanisms which can increase/reduce negativity in global teams
6	Develop and test a conceptual model which analyses intra-firm knowledge in GVTs	Knowledge flows are affected to a high degree by network factors (tie content, coordination, clustering, and reciprocity)	Extends knowledge-based view of the firm on network properties which underpin knowledge sharing in GVTs
7	Analyse the basis for forming strong and weak network ties in Global Teams	Global team attributes have little influence for forming of strong network ties. Strong network ties (opposite to weak ones) often bridge between global teams	Provides ramifications for theorising of social networks in in international business settings. Especially for strong and weak tie theory, theory of structural holes and theory of homophily

8.10 Limitations and future research of this dissertation

Naturally, the research reported here has limitations, and these provide pointers for future research. The first issue relates to the cross-sectional nature of the data. While this is one of the most common limitations in network-based research (for an exception, see Mariotti and Delbridge, 2012), it has several important implications for generalisability of my findings. First, a causal direction between variables cannot be established with certainty. For instance, it was demonstrated that multiplex ties (where individuals are connected by an official

workflow as well as friendship) are positively related to knowledge sharing. The causality of this relationship cannot be established here for certainty: the cause of multiplexs tie could be knowledge sharing in the first place – that is, people share information and, as a consequence of extended interactions, also become friends. It is recommended that future studies include longitudinal research designs which are better suited for establishing this type of causal direction. A second benefit of a longitudinal design is that it allows for an in-depth analysis of network dynamics, change, and development. For instance, it would be interesting to examine how different types of ties (i.e. friendship) in GVTs emerge as the team matures and its members become more acquainted with each other. Another interesting avenue for future research using a longitudinal perspective would be to analyse how conflicts emerge and how they are solved in GVTs. This type of analysis could place an emphasis on diversity, distance between actors, and the role that CMC plays in reducing and/or increasing potential for conflict, for example.

Because GVTs are commonly based on high technology and knowledge-based industries, the importance of creativity and innovation should also be highlighted in future research. The present study is limited in that it was not possible to analyse different types of knowledge (i.e. tacit, context-dependent) or their organisational outcomes (i.e. development of new products or innovations). Future research could break down different knowledge dimensions and examine which types of network factors facilitate and hinder the flows and utilisation of these capabilities. Especially relevant network theoretical concepts in this regard include strong and weak tie theory (Granovetter 1973), and the theory of structural holes (Burt, 1992), since they are both highly relate to flow of non-redundant information.

Another potential limitation of this study relates to the generalisability of the findings beyond GVTs. The characteristics of GVTs which are embedded within a knowledge-intensive industries may not be applicable to a wider array of contexts or industries. However, controlling the context in this way can be considered appropriate in order to account for the effects of industry and the form of firm's operations. It is also important to remember that, even when drawing comparisons between this research and other studies on GVTs, there are differences in terms of diversity, distribution, and extent to which CMCs are utilised. Hence, future scholars are encouraged to carefully define what they mean by 'global virtual team'. In line with Connaughton and Shuffler (2007), it is also encouraged that future scholars adopt a more consistent terminology when defining the GVT, especially with regards to definitions such as 'distributed multicultural team', 'transnational team', or distributed team'. By effectively defining the specific types of teams under investigation, we will be able to draw more accurate conclusions about the generalisability of findings. Moreover, future scholars are encouraged to utilise a comparative analyses when examining GVTs. By conducting comparative studies between GVTs and 'traditional' teams, future scholars would be better able to examine the extent to which GVTs truly differ from domestic teams. With regards to network research, comparison between these types of teams would greatly enhance our understanding about the generalisability of network theory to international and global contexts, and it would help to delineate the extent to which networks are similar across different research settings (Borgatti and Halgin, 2011). As well as drawing comparisons between GVTs and traditional teams, future scholars should utilise additional contextual variables in order to control relevant organisational factors. For instance, instead of analysing the effect of national culture, studies could focus on how *corporate culture* influences network formation. For example, a corporate culture which emphasises competition between teams and the distribution of rewards to winners could give rise to intergroup hostilities and

biases (Galinsky 2002). Controlling for these types of contextual factors could provide valuable contributions to both the generalisability of network theory as well as understanding those factors which underpin effective operation of the multinational company.

8.11 Contributions of the dissertation

The research reported in this dissertation provides several insights into the role of intra-firm networks in MNEs from a theoretical, empirical, and managerial perspective. From a theoretical perspective, this study contributes to discerning the extent to which networks and embeddedness play a role in the effective functioning of a global firm (Coviello, 2006; McDermott, 2009; Ellis, 2010). I provide evidence that several key organisational factors in GVTs (i.e. knowledge flows, inter-group negativity, and perceived performance) are contingent upon a myriad of network factors. In contrast to previous studies on relationships and networks in virtual and global teams, this study stands out in several ways. First, I analyse the role of several different types of network interactions (i.e. strong and weak ties, friendship, official work flow, knowledge sharing etc.) in the context of GVTs. By analysing several types of relationships we can better delineate their effects of effective organisations. Second, this study deals with organisational issues beyond a single level of analysis. The three empirical chapters thus contribute to our understanding on the role of networks in GVTs at an individual, dyad, and group level of analysis. Analysis across different levels such as these has become recognised to be an increasingly important future direction in network research (i.e. Brass et al., 2004; Moliterno, 2011; Bizzi, 2013). My study will be of value to future scholars who can better understand the interrelated nature of individuals, dyads, official groups, and social groups in global business settings. This study also shapes they we think about informal communications in teams. Previous authors have devoted significant efforts to understanding the role of informal communications (Ahuja and Carley, 1999;

Gibson and Cohen; 2003). However, such studies have often led to contradictory arguments due to a lack of direct analysis on the formal versus informal communications which would also control issues such as geographical dispersion, cultural diversity, and the hierarchical structure of the unit. My study expands this stream of research by developing several statistical models which effectively control for different contextual variables and simultaneously delineates the importance of informal networks for several key organisational outcomes. Finally, this study answers the call by several authors (Kilduff and Tsai, 2003; Labianca and Brass, 2006; Bizzi, 2013) that more focus should be directed towards investigating the 'darker' aspects of networks. Indeed, mystudy adds to the growing literature of research demonstrating how networks can hinder (Sparrowe *et al.,* 2001), constrain (Bizzi and Langley, 2012), and promote unethical behaviour (Brass *et al.,* 1998). My research complements these studies by highlighting the specific network factors which can increase negative intergroup bias and reduce access to non-redundant resources. By identifying deleterious mechanisms relating to intra-firm social relationships this study should enlighten future scholars about the ambivalent nature of social networks.

8.12 Managerial implications

The results I present in this dissertation also have implications for practitioners in their effort to lead and organise GVTs. The results reported in each empirical chapter generate concrete solutions to problems commonly present in GVTs (i.e. integration problems, conflict, and knowledge sharing). One of the major managerial implications of this dissertation is that the informal dimension has critical implications for GVTs. The results discussed in each empirical chapter demonstrates the power of informal networks in several different ways. For instance, chapter 6 demonstrated that informal networks accounted for over 90 per cent of the total knowledge flows within GVTs. Even though it has been argued that complex informal

organisational networks are difficult to perceive accurately (i.e. Kilduff and Krackhardt, 2008) this study highlights the value of identifying (i) those people who hold key network positions (i.e. brokers and central actors), (ii) the informal structures which facilitate beneficial interactions (i.e. knowledge sharing and positive perceptions), and the different types of connections people share amongst each other (i.e. friendship ties). By identifying these specific network factors, managers should be able to more accurately perceive areas which need improvement as well as help identify the potential causes for existing problems within teams (i.e. conflict or miscommunications). In general, network analysis is also becoming increasingly popular among practitioners for identifying the informal structure of an organisation, and for detecting 'how work really gets done' (Cross and Parker, 2004). Moreover, official structures, diversity, and locations of team members are factors which managers and executives are able to control directly. The findings presented in the empirical chapters of this dissertation demonstrate the specific ways in which these factors are related to team effectiveness from the perspective of networks and informal organisation. For instance, the fact that geographical cultural distance was found to have a positive effect on both complementarity and availability of knowledge implies that managers can have more confidence in their team members' knowledge sharing capabilities, even when the individuals concerned are remotely located and come from dissimilar cultural backgrounds. Therefore, decisions for hiring new team members could be based on the particular capabilities and skills of the individual rather than on geographical location (i.e. how far away that person is located) or cultural background (i.e. a similarity to other team members) of that person. Similarly, it is helpful for managers of GVTs to understand that these attributes do not hamper the creation of strong network ties. The fact that geographically distant and culturally dissimilar people are able to develop strong ties and build strong emotional attachments has important implications for understanding the nature of GVTs in terms of unity, shared norms,

and trust. Even though researchers have emphasised that these are difficult to establish in GVTs (for a review, see Zimmerman, 2011), my findings indicate that these potential impediments for network integration can be overcome.

REFERENCES

Abelson, R.P., Aronson, E., McGuire, W.J., Newcomb, T.M., Rosenberg, M.J., and Tannenbaum, P.H. eds., 1968. *Theories of Cognitive Consistency: A Sourcebook*. Chicago: Rand-McNally.

Adler, N.J., 1997. *International Dimensions of Organizational Behaviour*, Cincinnati, Ohio : South Western College Publishing.

Adler, P.S., and Kwon, S.W., 2002. Social Capital: Prospects for a New Concept. *Academy of Management Review,* 27(1), pp.17-40.

Ahuja, M.K., and Carley, K.M., 1999. Network structure in virtual organizations. *Organization Science*, 10(6), pp.741–757.

Ahuja, M.K., and Galvin, J.E., 2003. Socialization in Virtual Groups. *Journal of Management*, 29(2), pp.161-185.

Al Alam, A., and Soutaris, V., 2008. Network embeddedness and new-venture internationalization: Analysing international linkages in the German biotech industry. *Journal of Business Venturing*, 23, pp.567–586.

Allen, T.J., 1984. *Managing the Flow of Technology*. Cambridge, MA: MIT Press.

Allport, G.W., 1954. *The Nature of Prejudice*, Reading, MA: Addison-Wesley.

Almeida, P., and Kogut, B., 1999. Localization of knowledge and the mobility of engineers in regional networks. *Management Science*, 45(7), pp.905–917.

Amabile, T.A., 1996. *Creativity in context*, Boulder, CO: Westview Press.

Amann, W., and Steger, U., 2007. Breaking down complexity management to the functional level, In: U. Steger, W. Amann, M. Maznevski, eds. *Managing complexity in global organizations*, Sussex: John Wiley & Sons Ltd.

Ancona, D.G., and Caldwell, D.F., 1992. Bridging the boundary—external activity and performance in organizational teams. *Administrative Science Quarterly,* 37, pp.634-665.

Anderson, U., Forsgren, M., and Holm, U., 2002. The strategic impact of external networks : subsidiary performance and competence development in the multinational corporation. *Strategic Management Journal*, 23, pp.979–996.

Ang, S., Van Dyne, L., Koh, C., Ng, K.Y., Templer, K.J., Tay, C., and Chandrasekar, N.A., 2007. Cultural Intelligence: Its measurement and Effects on Cultural Judgment and Decision Making, Cultural Adaptation, and Task Performance. *Management and*

Organization Review, 3(3), pp.335-371.

Arrow, K.J., 1962. The Economic Implications of Learning by Doing. *The Review of Economic Studies*, 29(3), pp.155–173.

Ashforth, B.E., and Mael, F., 1989. Social Identity Theory and the Organization. *Academy of Management Review,* 14(1), pp.20-39.

Bael, M., 2010. The strength-of-weak-ties perspective on creativity: a comprehensive examination and extension. *Journal of Applied Psychology*, 95(3), pp.592-601.

Balkundi, P., and Harrison, D.A., 2006. Times, leaders, and time in teams: strong inference about network structure's effects on team viability and performance. *Academy of Management Journal*, 49(1), pp.49-68.

Baron, R.M., and Kenny, D.A., 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, pp.1173-1182.

Barrera, M., 1980. A method for the assessment of social support networks in community survey research. *Connections,* 3, pp.8-13.

Barsade, S.G., 2002. The Ripple Effect: Emotional Contagion and Its Influence on Group Behavior. *Administrative Science Quarterly,* 47, pp.644–675.

Bartlett, C.A., and Ghoshal, S., 1989. *Managing Across Borders: The Transnational Solution*. Boston, MA: Harvard Business School Press.

Batjargal, B., 2007. Comparative Social Capital: Networks of Entrepreneurs and Venture Capitalists in China and Russia. *Management and Organization Review,* 3(3), pp.397–419.

Batjargal, B., 2010. The effects of network's structural holes: polycentric institutions, product portfolio, and new venture growth in China and Russia. *Strategic Entrepreneurship Journal*, 4(2), pp.146-163.

Batjargal, B., Hitt, M.A., Tsui, A.S., Arregle, J-L., Webb, J.W., and Miller, T.L., 2013. Institutional Polycentrisism, Entrepreneurs' Social Networks, and New Venture Growth. *Academy of Management Journal*, 56(4), pp.1024-1049.

Bell, G.G., and Zaheer, A., 2007. Geography, Networks, and Knowledge Flows. *Organization Science*, 18(6), pp.955-972.

Bello, D., Leung, K., Radebaugh, L., Tung, R.L., and van Witteloostuijn, A., 2009. From the editors: use of student samples in international business research, *Journal of International Business Studies*, 40, pp.361-364.

Benkler, Y., 2006. *The Wealth of Networks: How Social Production Transforms Markets*

and Freedom. New Haven, CT: Yale University Press.

Bergiel, B., Bergiel, E., and Balsmeier, P., 2008. Nature of virtual teams: a summary of their advantages and disadvantages. *Management Research News*, 31(2), pp.99-110.

Bernd, S., and Hamilton, D.L., 1994. Self-stereotyping and social context: The effects of relative in-group size and in-group status. *Journal of Personality and Social Psychology*, 66(4), pp.699-711.

Bian, Y., 1997. Bringing strong ties back in: indirect ties, network bridges, and job searches in China. *American Sociological Review*, 62, pp.366-385.

Birkinshaw, J., 2001. Making sense of knowledge management. *Ivey Business Journal*, 65(4), pp.32–36.

Bizzi, L., 2013. The Dark Side of Structural Holes: A Multilevel Investigation. *Journal of Management*, forthcoming.

Bonacich, P., and Lloyd, P., 2004. Calculating status with negative relations. *Social networks*, 26, pp.331–338.

Boone, C., and Hendriks, W., 2009. Top management team diversity and firm performance: moderators of functional-background and locus-of control diversity. *Management Science,* 55, pp.165-80.

Borgatti, S.P., Everett, M.G., and Freeman, L.C., 2002. *UCINET 6 for Windows: Software for Social Network analysis*. Analytic technologies, Lexington, KY.

Borgatti, S.P., and Foster, P.C., 2003. The network paradigm in organizational research: a review and typology. *Journal of Management*, 29, pp.991-1013.

Borgatti, S.P., and Cross, R., 2003. A Relational View of Information Seeking and Learning in Social Networks. *Management Science,* 49, pp.432-445.

Borgatti, S.P., and Halgin, D.S., 2011. On Network Theory. *Organization Science,* 22(5), pp.1168-1181.

Borgatti, S.P., Mehra, A., Brass, D.J., and Labianca, G., 2009. Network Analysis in the Social Sciences. *Science,* 323, pp.892-895.

Bower, D.J., Hinks, J., Wright, H., Hardcastle, C., and Cuckow, H., 2001. ICTs, videoconferencing and the construction industry: Opportunity or threat? *Construction Innovation*, 1(2), pp.129-144.

Brannen, M.Y., and Doz, Y.L., 2010. From a distance and detached to up close and personal: Bridging strategic and cross-cultural perspectives in international management research and practice. *Scandinavian Journal of Management*, (26), pp.236-247.

Brass, D. J., 1984. Being in the right place: A structural analysis of individual influence in an organization. *Administrative Science Quarterly*, 29, pp.518 –539.

Brass, D.J., 1992. Power in Organizations: A Social Network Perspective. In G. Moore, J.A. Whitt, eds, *Research in Politics and Society*. Greenwich, CT: JAI Press, pp.295-323.

Brass, D., Butterfield, J.K.D., and Skaggs, B.C., 1998. Relationships and Unethical Behavior: a Social Network Perspective. *Academy of Management Journal,* 23(1), pp.14-31.

Brass, D., and Krackhardt, D., 1999. Social Capital for Twenty-first Century Leaders, in J.G. Hunt, and R.L. Phillips, eds. *Out-of-the box leadership challenges for the 21st century army,* Bingley, UK: Emerald Group Publishing Limited, *pp.*179-194.

Brass, D.J., Galaskiewicz, J., Greve, H.R., and Tsai, W., 2004. Taking stocks of networks and organizations: A multilevel perspective. *Academy of Management Journal*, 47, pp.795-817.

Brown, R., 2000. Social Identity Theory: past achievements, current problems and future challenges. *European Journal of Social Psychology,* 30, pp.745-778.

Buckley, P.J., and Carter, M., 1996. The economics of business process design: motivation, information and coordination within the firm. *International Journal of the Economics of Business*, 3, pp.5-25.

Buckley, P.J., 2002. Is international business running out of steam? *Journal of International Business Studies*, 33(2), pp.365-373.

Buckley, P., and Ghauri, P., 2004. Globalisation, economic geography and the strategy of multinational enterprises. *Journal of International Business Studies*, 35(2), pp.81-98.

Buckley, P. J., 2010. The role of headquarters in the global factory. in U. Andersson and U. Holm, eds. *Managing the contemporary multinational—The role of headquarters*. Cheltenham: Edward Elgar, pp.60–84.

Bunderson, J.S., and Sutcliffe, K.M., 2002. Comparing alternative conceptualizations of functional diversity in management teams: Process and performance effects. *Academy of Management Journal*, 45(5), pp.875-893.

Burt, R., and Knez, M., 1995. Kinds of third-party effects on trust. *Rationality and Society*, 7, pp.255-92.

Burt, R.S., 1987. Social contagion and innovation: cohesion versus structural equivalence. *American Journal of Sociology,* 92, pp.1287-1335.

Burt, R.S., 1992. *Structural Holes: The Social Structure of Competition.* Cambridge:

Harvard University Press.

Burt, R.S., 1997. The contingent value of social capital. *Administrative Science Quarterly,* 42, pp.339-365.

Burt, R.S., 2000. The Networks structure of social capital, *Research in Organizational Behaviour, 22, pp.345-423.*

Burt, R.S., 2001. Structural Holes Versus Network Closure as Social Capital, in N. Lin, K. Cook and R.S. Burt, eds. *Social Capital: Theory and Research.* New York: Aldine de Gruyter, pp.31-56.

Burt, R., 2004. Structural holes and good ideas. *American journal of sociology*, 110, pp.349-99.

Burt, R.S., 2007. Secondhand Brokerage: Evidence on the Importance of Local Structure for Managers, Bankers, and Analysts. *Academy of Management Journal*, *50*(1), pp.119-48.

Buskens, V., and van de Rijt, A., 2008. Dynamics of networks if everyone strives for structural holes. *American Journal of Sociology*, 114, pp.371-407.

Cairns, E., Kenworthy, J., Campbell, A., and Hewstone, M., 2006. The role of in-group identification, religious group membership and intergroup conflict in moderating in-group and out-group affect. *British Journal of Sociology*, 45, pp.701-716.

Cantwell, J.A., 1989. *Technological Innovation and Multinational Corporations*. Oxford: Basil Blackwell.

Cantwell, J.A., and Santangelo, G.D., 1999. The frontier of international technology networks: sourcing abroad the most highly tacit capabilities. *Information Economics and Policy*, 11, pp.101-123.

Capaldo, A., 2007. Network structure and innovation: the leveraging of a dual network as a distinctive relational capability. *Strategic Management Journal*, 28, pp.585-608.

Carlile, P.R., 2004. Transferring, translating, and transforming: An integrative framework for managing knowledge across boundaries. *Organization Science*, 15(5), pp.555–568.

Casciaro, T., and Lobo, M.S., 2005, Competent jerks, lovable fools, and the formation of social networks. *Harvard Business Review*, 83(6), pp.92-99.

Casson, M., 1991. *The Economics of Business Culture: Game Theory, Transaction Costs and Economic Performance*, Oxford: Clarendon Press.

Castro, I., and Roldán, J.L., 2013. A mediation model between dimensions of social capital, *International Business Review*, Forthcoming.

Chandra, Y., Styles, C. and Wilkinson, I., 2009. The recognition of first time international entrepreneurial opportunities: Evidence from firms in knowledge based-industries. *International Marketing Review*, 26(1), pp.30-61.

Chang, S-J., Witteloostujin, A., and Eden, L., 2010. From the Editors: Common method variance in international business research. *Journal of International Business Studies*, 41, pp.178-184.

Chapman, M., Gajewska De Mattos, H., Clegg, J., and Buckley, P.J., 2008. Close neighbours and distant friends – perceptions of cultural distance. *International Business Review,* 17, pp.217-234.

Chattopadhyay, P., Tluchowska, M., and George, E., 2004. Identifying the Ingroup: A Closer Look at the Influence of Demographic Dissimilarity on Employee Social Identity. *Academy of Management Review,* 29(2), pp.180-202.

Chevrier, S., 2003. Cross-cultural management in multinational project groups. *Journal of World Business*, 38, pp.141-149.

Chua, R.Y.J., Morris, M.W., and Ingram, P., 2009. Guanxi vs networking: distinctive configurations of affect- and cognition-based trust in the networks of Chinese vs. American managers. *Journal of International Business Studies,* 40(3), pp.490–508.

Cohen, W.M., and Levinthal, D.A., 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35, pp.128–152.

Cohen, D., 1998. Toward a knowledge context: report on the first annual UC Berkeley Forum on knowledge and the firm. *California Management Review*, 40(3), pp.22-40.

Coleman, J., 1986. Social Theory, Social Research, and a Theory of Action. *American Journal of Sociology*, 91, pp.1309-35.

Coleman, J.S., 1988. Social capital in the creation of human capital. *American Journal of Sociology,* 94, pp.95-120.

Coleman, J.S., 1990. *Foundations of Social Theory*. Cambridge: Harvard University Press.

Connaughton, S.L., and Shuffler, M., 2007. Multinational and Multicultural Distributed Teams : A Review and Future Agenda. *Small Group Research*, 38(3), pp.387-412.

Conway, J.M., and Lance, C.E., 2010. What Reviewers Should Expect from Authors Regarding Common Method Bias in Organizational Research. *Journal of Business Psychology,* 25, pp.325–334.

Costa, P.T., and McCrae, R.R., 1992. *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) manual.* Odessa, FL: Psychological Assessment Resources.

Coviello, N.E., and Munro, H.J., 1995. Growing the entrepreneurial firm: Networking for international market development. *European Journal of Marketing*, 29, pp.49-61.

Coviello, N.E., 2006. Network Dynamics in the International New Venture. *Journal of International Business Studies*, 37(5), pp.713-731.

Cox, T. H., 1993. *Cultural Diversity in Organizations: Theory, Research and Practice*. Barrett-Koehler, San Francisco, CA.

Cramton, C.D., 2001. The mutual knowledge problem and its consequences for dispersed collaboration. *Organization Science*, 12, pp.346-371.

Cramton, C.D., and Hinds, P.J., 2005. Subgroup dynamics in internationally distributed teams: Ethnocentrism or cross-national learning? *Research in Organizational Behaviour*, 26, pp.231–263.

Cross, R., Nohria, N., and Parker, A., 2002. Six Myths About Informal Networks — and How To Overcome Them. *MIT Sloan Management Review*, 43, pp.67-75.

Cross, R., and Parker, A., 2004. *The hidden power of social networks*. Cambridge, MA: Harvard Business School Press.

Cross, R., Liedtka, J., and Weiss, L., 2005. A practical guide to social networks, *Harvard Business Review*, 83(3), pp.124-132.

Crowne, K.A., 2008. What leads to cultural intelligence. *Business Horizons*, 51(5), pp.391-399.

Daft, R.L., and Lengel, R.H., 1986. Organizational information requirements, media richness and structural design. *Management Science*, 32(5), pp.554–571.

Daft, R., Lengel, R.H., and Klebe-Trevino, L., 1987. Message Equivocality, Media Selection, and Manger Performance: Implications for Information Systems. *MIS Quarterly*, 11(3), pp.355-366.

Das, T.K., and Teng, B.S., 2000. Instabilities in strategic alliances: An internal tension perspective. *Organization Science*, 11, pp.77-101.

de Nooy, W., Mrvar, A., and Batagelj, V., 2005. *Exploratory Social Network Analysis with Pajek*, Cambridge: Cambridge University Press.

Dekker, D., Krackhardt, D., and Snijders, T.A.B., 2005. Sensitivity of MRQAP tests to collinearity and autocorrelation conditions. *The Heinz School Working Paper Series*, Pittsburgh, PA.

Deutch, M., 1973. *The resolution of conflict: Constructive and destructive processes*, New Haven, Yale University Press.

Dewar, T., 2006. Virtual teams - Virtually impossible? *Performance Improvement*, 45(5), pp.22-25.

Dicken, P., 1998. *Global Shift - Transforming the World Economy*, London: Paul Chapman.

Dietz-Uhler, B., and Bishop-Clark, C., 2001. The use of computer-mediated communication to enhance subsequent face-to-face discussions. *Computers in Human Behavior*, 17, pp.269-283.

Dodd, S.D., and Patra, E., 2002. National differences in entrepreneurial networking. *Entrepreneurship and Regional Development*, 14(2), pp.117-134.

Dong, K., and Ying L., 2010. Cross-cultural management in china. *Cross Cultural Management,* 17, pp.223.

Dougherty, S.R., Salloway, J.C., and Nuzzarello, L., 1988. A questionnaire for the measurement of social networks and social support. *Connections,* 11, pp.20-25.

Dougherty, D., 1992. Interpretive barriers to successful product innovation in large firms. *Organization Science*, 3(2), pp.179–202.

Dovidio, J.F., Gaertner, L., and Validzic, A., 1998. Intergroup bias: Status, differentiation, and a common in-group identity. *Journal of Personality and Social Psychology,* 75, pp.109-120.

Dunning, J.H., 1980. Towards an eclectic theory of international production: some empirical tests. *Journal of International Business Studies*, 11(1), pp.9-31.

Dunning, J.H., and Lundan, S.M., 2008. *Multinational enterprises and the global economy*, Cheltenham: Edward Elgar.

Dyer, J.H., and Naboeka, K., 2000. Creating and managing high-performance knowledge-sharing network: The Toyota case. *Strategic Management Journal*, 21, pp.345-367.

Earley, P.C., and Gibson, C.B., 2002. *Multinational teams: A new perspective*. Mahwah, NJ: Lawrence Erlbaum Associates.

Ebrahim, N.A., Ahmed, S. and Taha, Z., 2009. Virtual Teams: A Literature Review. *Australian Journal of Basic and Applied Sciences*, 3(3), pp.2653-2669.

Edelman, L.F., Bresnen, M.F., Newell, S., Scarbrough, H., and Swan J., 2004. The benefits and pitfalls of Social Capital: Empirical Evidence from two organizations in the united kingdom. *British journal of management*, 15, pp.59-69.

Eisenhardt, K M., 1989. Agency theory: an assessment and review. *Academy of Management Review*, 14(1), pp.57–74.

Ellis, P.D., 2000. Social ties and Foreign market entry. *Journal of International Business Studies*, 31, pp.443-469.

Ellis, P.D., 2010. Social ties and international entrepreneurship: Opportunities and constraints affecting firm internationalization. *Journal of International Business Studies*, 42, pp.92-127.

Emirbayer, M., and Goodwin, J., 1994. Network Analysis, Culture, and the Problem of Agency. *American Journal of Sociology*, 99(6), pp.1411-1454.

Espinosa, J.A., and Carmel, E., 2003. The impact of time separation on coordination in global software teams: A conceptual foundation. *Software Process: Improvement and Practice,* 8(4), pp.249–266.

Everett, M.G., and Borgatti, S.P., 2005. Extending centrality. in P. Carrington, S.J., and Wasserman, S., eds. *Models and Methods in Social Network Analysis*. Cambridge University Press: Cambridge.

Fang, S-R, Chang, Y-S., and Peng, Y-C., 2011. Dark side of relationships: a tensions-based view. *Industrial Marketing Management*, 40, pp.774-784.

Farmer, S.M., and Hyatt, C.W., 1994. Effects of task language demands and task complexity on computer-mediated work groups. *Small Group Research*, 25, pp.331-366.

Feldman, D.C., 1984. The development and enforcement of group norms. *Academy of Management Review*, 9, pp.47-53.

Field, J., 2010. *Social Capital*, New York, NY: Routledge.

Finholt, T., and Sproull, L., 1990. Electronic groups at work. *Organization Science*, 1, pp.41-64.

Fiol, C.M., and O'Connor, E.J., 2005. Identification in Face-to-Face, Hybrid, and Pure Virtual Teams: Untangling the Contradictions. *Organization Science*, 16(1), pp.19-32.

Fiske, S.T., and Taylor, S.E., 1984. *Social Cognition*. Reading, MA: Addison-Wesley.

Flynn, F.J., 2005. Identity Orientations and Forms of Social Exchange in Organizations. *Academy of Management Review*, 30(4), pp.737–750.

Fock, H., and Woo, K.S., 1998. The China Market: Strategic Implications of Guanxi. *Business Strategy Review*, 9(3), pp.33-43.

Foo, M., Wong, P., and Ong, A., 2005. Do others think you have a viable business idea? Team diversity and judges evaluation of ideas in a business plan competition. *Journal of Business Venturing*, 20, pp.385–402.

Foreman, P., and Whetten, D.A., 2002. Members' Identification with Multiple-Identity Organization. *Organization Science*, 13(6), pp.618–635.

Forsgren, M., and Pedersen, T., 2000. Subsidiary influence and corporate learning: centers of excellence in Danish foreign-owned firms. In U. Holm, and T. Pedersen, eds. *The Emergence and Impact of MNC Centers of Excellence*, London: Macmillan, pp.68-78.

Franco-Santos, M., Kennerley, M., Micheli, P., Martinez, V., Mason, S., Marr, B., Gray, D., and Neely, A., 2007. Towards a definition of a business performance measurement system. *International Journal of Operations & Production Management,* 27(8), pp.784-801.

Freeman, L.C., 1977. A set of measures of centrality based on betweenness. *Sociometry,* 40, pp.35-40.

Freeman, L.C., Romney, A.K., and Freeman, S.C., 1987. Cognitive structure and informant accuracy. *American Anthropologist,* 89, pp.310-325.

Freeman, S., and Sandwell, M., 2008. Professional service firms entering emerging markets: the role of network relationships. *Journal of Services Marketing*, 22(3), pp.198 - 212.

Friedkin, N.E., 1980. A test of structural features of Granovetter's strength of weak ties theory, Social Networks, 2, pp.411-422.

Gaertner, S.L., Dovidio, J.F., Anastasio, P.A., Bachman, B.A., and Rust, M.C., 1993. The common ingroup identity model: Recategorization and the reduction of intergroup bias. In W. Stroebe and M. Hewstone, eds. *European Review of social psychology,* NewYork: John Wiley & Sons. pp.1-26.

Gaertner, L., and Insko, C.A., 2000. Intergroup discrimination in the minimal group paradigm: Categorization, reciprocation or fear? *Journal of Personality and Social Psychology,* 79, pp.77-94.

Galagher, J., and Kraut, R.E., 1994. Computer-mediated Communication for Intellectual Teamwork: An Experiment in Group Writing. *Information Systems Research*, 5(2), pp.110-138.

Galinsky, A.D., 2002. Creating and reducing intergroup conflict: the role of perspective-taking in affecting out-group. In H. Sondak, M.A. Neale, and E. Mannix, eds. *Toward Phenomenology of Groups and Group Membership*. Bingley: Emerald Group Publishing Limited.

Gargiulo, M., and Benassi, M., 2000. Trapped in your own net? Network cohesion, structural holes, and the adaptations of social capital. *Organization Science*, 11(2), 183–196.

Gargiulo, M., and Ertug, G., 2006. Dark side of trust, In R. Bachman, and A. Zaheer,

Handbook of Trust Research. Cheltenham, UK: Edward Elgar.

Gibson, C.B., 1999. Do They Do What They Believe They Can? Group-Efficacy and Group Effectiveness Across Tasks and Cultures. *Academy of Management Journal*, 42(2), pp.138-152.

Gibson, C.B., and Zeller-Bruhn, M.E., 2001. Metaphors and meaning: An intercultural analysis of the concept of teamwork. *Administrative Science Quarterly*, 46, pp.274-303.

Gibson, C.B., and Cohen, S.G., 2003. *Virtual teams that work*. San Francisco. CA: Jossey-Bass.

Gibson, C.B., and Manuel, J., 2003. Multi-cultural communication processes in virtual teams. In C.B. Gibson and S.G. Cohen, eds. *Virtual teams that work: Creating the conditions for virtual team effectiveness*. San Francisco: Jossey-Bass.pp.59-86.

Gibson, C.B., and Manuel, J.A., 2003. Building trust. In Gibson, C.B. and Cohen, S.G, eds. *Virtual Teams that Work*. San Francisco: Jossey-Bass, pp.59–86.

Gibbson, C.B., and Grubb, A.R., 2005. Turning the tide in multinational teams. In D.L. Shapiro, M.A. Von Glinov, and J.L. Cheng, eds. *Managing Multinational Teams: Global Perspectives*, Oxford UK: Elsevier/JAI Press, pp.69-96.

Gibson, C.B., and Gibbs, J.L., 2006. Unpacking the Concept of Virtuality: The Effects of Geographic Dispersion, Electronic Dependence, Dynamic Structure, and National Diversity on Team Innovation. *Administrative Science Quarterly*, 51, pp.451–495.

Gibson, C. B., and Earley, P.C., 2007. Collective cognition in action: Accumulation, interaction, examination, and accommodation in the development and operation of group efficacy beliefs in the workplace. *Academy of Management Review*, 32, pp.438-458.

Glassman, O., 2001. Multicultural teams: increasing creativity and innovation by diversity. *Creativity and Innovation Management*, 10(2), pp.88-95.

Global Trade Alert, 2012, Débâcle: The 11th GTA Report on Protectionism, J.J. Evenett , ed, Centre for Economic Policy Research (CEPR).

Gong, Y., Kim, T-Y., Lee, D.R., and Zhu, J., 2013. A multilevel model of team goal orientation, information exchange, and creativity. *Academy of Management Journal*, 56(3), pp.827-851.

Gordon, M.E., Slade, L.A., and Scmitt, N., 1987. Student Guinea Pigs: Porcine Predictors and Particularistic Phenomena. *Academy of Management Review*, 12(1), pp.160-163.

Gould, R.V., Fernandez, R.M., 1989. Structures of mediation: a formal approach to brokerage in transaction networks. In *Sociological Methodology*, San Francisco, CA: Jossey-Bass, pp.89-126.

Gouldner, A.W., 1960. The Norm of Reciprocity: A Preliminary Statement. *American Sociological Review*, 25(2), pp.161-178.

Govindarajan, V., Gupta, A.K., 2001. Building an effective global business team. *MIT Sloan Management Review*, 42(4), pp.63-71.

Granovetter, M., 1973. The strength of weak ties. *American Journal of Sociology,* 6, pp.1360-1380.

Granovetter, M., 1983. The Strength of Weak Ties: A Network Theory Revisited. *Sociological Theory*, 1, pp.201-233.

Granovetter, M.,1985. Economic action and social structure: the problem of embeddedness. *American Journal of Sociology,* 91(3), pp.481-510.

Grant, R.M., 1997. Knowledge–based View of the Firm: Implications for Management Practice. *Long Range Planning*, 30(3), pp.450-454.

Grayson, K., and Ambler, T., 1999. The Dark Side of Long-Term Relationships in Marketing Services. *Journal of Marketing Research*, 36(1), pp.132-141.

Greer, L.L., and van Kleef, G.A., 2010. Equality versus differentiation: the effects of power dispersion on group interaction. *Journal of Applied Psychology*, 95(6), pp.1032-1044.

Greve, H.R., Baum, J.A.C., Mitsuhashi, H., and Rowley, T.J., 2010. Built to last but falling apart: cohesion, friction, and withdrawal from interfirm alliances. *Academy of Management Journal,* 53, pp.302–322.

Griffin, R.W., and Pustay, M.W., 2010. *International Business: Global Edition*, New Jersey: Pearson Education Inc.

Griffith, D.A., Cavusgil, S.H., and Xu, S., 2008. Emerging themes in international business research. *Journal of International Business Studies*, 39, pp.1220-1235.

Gulati, R., 1995. Familiarity breeds trust? The implications of repeated ties. *Academy of Management Journal*, 38(1), pp.85–112.

Guo, Z., D'Ambra, J., Turner, T., and Zhang, H., 2009. Improving the effectiveness of virtual teams: A comparison of video-conferencing and face-to-face communication in china. *IEEE Transactions on Professional Communication,* 50(1), pp.1-16.

Guo, K.L. and Sanchez,Y., 2011. Workplace Communication, in N. Bobrovsky, ed. *Organizational Behaviour in Health Care*, Sudbury, MA: Jones and Bartlett Publishers.

Guzzo, R.A., and Shea, G.P., 1992. Group performance and intergroup relations in organizations. In M. D. Dunnette and L. M. Hough, eds. *Handbook of Industrial and Organizational Psychology,* Palo Alto, CA: Consulting Psychologists Press.

Haines, V.A., 1988. Social Network analysis, structuration theory and the holism individualism debate. *Social Networks*, 10(2), pp.157–82.

Hall, E.T., and Hall, M.R., 1987. *Hidden Differences: Doing Business with the Japanese*. Garden City, NY: Doubleday.

Hambrick, D.C., Cho, T., and Chen, M.J., 1996. The influence of top management team heterogeneity on firms' competitive moves. *Administrative Science Quarterly*, 41, pp.659-684.

Hanneman, R.A., Riddle, M., 2005. *Introduction to Social Network Methods*. Riverside, CA: University of California.

Hansen, M.T., 1999. The search-transfer problem: The role of weak ties in sharing knowledge across organizational subunits. *Administrative Science Quarterly*, 44, pp.82–111.

Hansen, M.T., and Lovas, B., 2004. How do multinational companies leverage technological competencies? Moving from single to interdependent explanations. *Strategic Management Journal*, 25(8–9), pp.801–822.

Harman, H.H., 1967. *Modern Factor Analysis,* Chicago: University of Chicago Press.

Hedlund, G., 1993. Assumptions of hierarchy and heterarchy, with application to the multinational corporation, In S. Ghoshal and D.E. Westney, eds. *Organization Theory and Multinational Corporation*, New York: St. Martin's Press, pp.211-236.

Heider, F., 1958. *The Psychology of Interpersonal Relations*. New York, NY: Wiley.

Heimer, C.A., 1992. Doing your job and helping your friends: Universalistic norms about obligations to particular others in networks. In N. Nohria, R. G. Eccles, eds. *Networks and Organizations: Structure, Form, and Action*. Boston, MA: Harvard Business School Press, pp.143–164.

Hennart, J.M.A., and Zeng, M., 2002. Cross-cultural differences and joint venture longevity. *Journal of International Business Studies*, *33*(4), pp.699-716.

Hewstone, M., Rubin, M., and Willis, H., 2002. Intergroup bias. *Annual Review of Psychology,* 53, pp.575-604.

Hightower, R.T., and Sayeed, L., 1996. Effects of Prediscussion Information Characteristics on Computer Mediated Group Discussion, *Information Systems Research*, 7(4), pp.451-465.

Hinds, P.J, and Mortensen, M., 2005. Understanding conflict in geographically distributed teams: The moderating effects of shared identity, shared context, and spontaneous communication. *Organization Science*, 16, pp.290–307.

Hite, J.M., and Hesterly, W.S., 2001. The evolution of firm networks: from emergence to early growth of the firm. *Strategic Management Journal*, 22, pp.275–286.

Ho, V.T., and Levesque, L.L., 2005. With a Little Help From My Friends (and Substitutes): Social Referents and Influence in Psychological Contract Fulfilment. *Organization Science*, 16(3), pp.275-289.

Hogg, M.A., and Turner, J.C., 1985. Interpersonal attraction, social identification, and psychological group formation. *European Journal of Social Psychology,* 15(1), pp.51-66.

Hogg, M.A., Terry, D.J., 2000. Social identity and self-categorization processes in organizational contexts. *Academy of Management Review,* 25(1), pp.121-140.

Holcomb, T. R., and Hitt, M.A., 2007. Toward a model of strategic outsourcing. *Journal of Operations Managemen*t, 25, pp.464-481.

Holden, N.J., 2002. *Cross-cultural management: a knowledge management perspective*, Essex: Pearson Education Limited.

Homberg, F., and Bui, H.T.M., 2013. Top Management Diversity: A Systematic Review, *Group Organization Management*, 38(4), pp.455–479.

Horwitz, M., Rabbie, J.M., 1982. Individuality and membership in the intergroup system. In H. Tajfel, ed. *Social Identity and Intergroup Relations*, Cambridge: Cambridge University Press.

Horwitz, S.K. and Horwitz, I.B., 2007, The effects of team diversity on team outcomes: a meta-analytic review of team demography. *Journal of Management*, 33, pp.987-1015.

House, R.J., Hanges, P.J., Javidan, M., Dorfman, P.W., Gupta, V., 2004. *Culture, leadership, and organizations: the GLOBE study of 62 societies*, Thousand Oaks, CA: SAGE

Hsu, G., and Elsbach, K.D., 2013. Explaining Variation in Organizational Identity Categorization. *Organization Science*, 24(4), pp.996-1013.

Huber, G.P., 1991. Organizational learning: The contributing processes and the literatures. *Organization Science*, 2, pp.88-125.

Huitsing, G., van Duijn, M.A.J., Snijders, T.A.B., Wang, P., Sainio, M., Salmivalli, S., and Veenstra, R., 2012. Univariate and multivariate models of positive and negative networks: liking, disliking, and bully-victim relationships. *Social Networks*, *articles in advance*

Hummon, N.P., and Carley, K., 1993. Social networks as normal science. *Social networks,* 15, pp.71-106.

Ibarra, H., 1992. Homophily and differential returns: Sex differences in network structure and access in an advertising firm. *Administrative Science Quarterly*, 37, pp.422-447.

Ibarra, H., and Andrews, S.B., 1993. Power, social influence, and sense making: Effects of network centrality and proximity on employee perceptions. *Administrative Science Quarterly,* 38, pp.277–303.

Ibarra, H., 1995. Race, opportunity, and diversity of social circles in managerial networks. *Academy of Management Journal*, 38(3), pp.673–703.

Ichijo, K., 2007. Dealing with Complexity by Managing the Knowledge-Based Competence of the Organization, In U. Steger, W. Amann, and M. Maznevski, eds. *Managing complexity in global organizations*, Sussex: John Wiley & Sons Ltd.

Iles, P., 1995. Learning to Work with Difference. *Personnel Review*, 26(5), pp.44-60.

Iles, P., and Hayers, P.K., 1997. Managing diversity in transnational project teams: A tentative model and case study. *Journal of Managerial Psychology*, 12(2), pp.95-117.

Ingram, P., and Roberts, P.W. 2000. Friendships among competitors in the Sydney hotel industry. *American Journal of Sociology*, 106(2), pp.387–423.

Inkpen, A.C., and Tsang, E.W.K., 2005. Social capital, networks, and knowledge transfer. *Academy of Management Review,* 30, pp.146-165.

Jack S., 2010. An entrepreneurial network evolving: Patterns of change. *International Small Business Journal*, 28, pp.315–337.

Jackson, S., May, K.E., and Whitney, K., 1995. Understanding the dynamics of diversity in decisions making teams. In R. A. Guzzo and E. Salas, eds. *Team Effectiveness and Decision Making in Organizations*. San Francisco, CA: Jossey-Bass, pp.204–261.

Janis, I., 1972. *Victims of groupthink,* Boston, MA, Houghton Mifflin.

Jarvenpaa, S. and Leidner, D., 1999. Communication and Trust in Global Virtual Teams. *Organization Science*, 10(6), pp.791-815.

Javidan, M., Dorfman, P.W., de Luque, M.S., and House, R., 2006. In the eye of the beholder: Cross cultural lessons in leadership from Project GLOBE. *Academy of Management Perspectives*, 20(4), pp.67-90.

Jenssen, J.I., and Greve, A., 2002. Does the degree of redundancy in social network influence the success of business start-ups? *International Journal of Entrepreneurial Behaviour & Research*, 8(5), pp.254-267.

Johanson J., and Vahlne J-E., 1977. The Internationalization process of the firm – a model of knowledge development and increasing foreign market commitments. *Journal of*

International Business Studies, 8(1), pp.23-31.

Johanson, J., and Vahlne, J-E., 2009. The Uppsala internationalization process model revisited: From liability of foreignness to liability of outsidership. *Journal of International Business Studies*, 49(9), pp.1411-1421.

Johnson, J.D., 2004. The Emergence, Maintenance, and Dissolution of Structural Hole Brokerage. *Communication Theory*, pp.212–236.

Jonsen, K., Maznevski, M., and Canney, D.S., 2012. Global virtual team dynamics and effectiveness, in G.K. Stahl, I. Bjorkman, and S. Morris, eds. *Handbook of research in international human resource management*. Cheltenham: Elgar. pp.363-392.

Joshi, A., Labianca, G., and Caligiuri, P., 2002. Getting along long distance: understanding conflict in multinational team through network analysis. *Journal of World Business*, 27, pp.227-284.

Joshi, A., Lazarova, M.B., Liao, H., 2009. Getting Everyone on Board: The Role of Inspirational Leadership in Geographically Dispersed Teams. *Organization Science*, 20(1), pp.240-252.

Kanawattanachai, P, and Yoo, Y., 2002. Dynamic nature of trust in virtual teams. *Journal of Strategic Information Systems*, 11, pp.187-213.

Katzenbach, J.R. and Smith, D.K., 1992. *The Wisdom of Teams: Creating the High-Performance Organization*, New York, NY: Harvard Business Press Books.

Kayworth, T., and Leidner, D., 2000. The global virtual manager: a prescription for success. *European Management Journal*, 18(2), pp.183-194.

Kayworth, T., and Leidner, D., 2001. Leadership effectiveness in Global Virtual Teams. *Journal of Management Information Systems*, 18(3), pp.7-41.

Kiesler, S., Cummings, J., 2002. What do we know about proximity and distance in work groups? A Legacy of Research. In P. Hinds, S. Kiesler, eds. *Distributed Work*. Cambridge: MIT Press, pp.55–81.

Kilduff, M., and Tsai, W., 2003. *Social networks and organizations*. London, Sage.

Kilduff, M., Krackhardt, D., 2008. *Interpersonal networks in organizations: cognition, personality, and culture*. Cambridge university press, Cambridge.

Kirkman, B.L., Rosen, B., Gibson, C.B., Tesluk, P.E., and McPherson, S.O., 2002. Five challenges to virtual team success: Lessons from Sabre, Inc. *Academy of Management Executive,* 16(3), pp.67–79.

Kirkman, B.L., Rosen, B., Tesluk, B.E., and Gibson, C.E., 2004. The impact of team

powerment on virtual team. *Academy of Management Journal*, 47(2), pp.175-192.

Knight, D., Pearce, C.L., Smith, K.G., Olian, J.D., Sims, H.P., Smith, K.A., and Flood, P., 1999. Top management team diversity, group processes and strategic consensus. *Strategic Management Journal*, 20, pp.445-465.

Kogut B., and Singh, H., 1988. The effect of national culture on the choice of entry mode. *Journal of International Business Studies*, 19, pp.411–432.

Kogut, B., and Zander, U., 1992. Knowledge of the firm, combinative capacities and the replication of technology. *Organization Science*, 3, pp. 383-397.

Koput, K.W., 2010. Social Capital: *An Introduction to Managing Networks*, Northampton, MA: Edward Elgar Publishing.

Kossinets, G., 2006. Effects of missing data in social networks. *Social Networks,* 28, pp.247-268.

Kotabe, M., Dunlap-Hinkler, D., Parente, R., and Mishra, H.A., 2007. Determinants of Cross-national Knowledge Transfer and Its Effect on Firm Innovation. *Journal of International Business Studies*, 38(2), pp.259-282.

Krackhardt, D., 1987. QAP partialling as a test of spuriousness. *Social Networks,* 9, pp.171-186.

Krackhardt, D., and Stern, R., 1988. Informal networks and organizational crises: An experimental simulation. *Social Psychology Quarterly,* 51(2), pp.123-140.

Krackhardt, D., 1992. The Strength of Strong Ties: The Importance of Philos in Organizations. In N. Nohria and R. Eccles, eds. *Networks and Organizations: Structure, Form,and Action,* Boston, MA: Harvard Business School Press, pp.216-239.

Krackhardt, D., and Hanson, J., 1993. Informal networks: The company behind the chard. *Harvard Business Review*, 71(4), pp.104-111.

Krackhardt, D., 1994. Constraints on the Interactive Organization as an Ideal Type. In: C. Heckshcher and A., Donellan, eds. *The Post-Bureaucratic Organization*. Beverly Hills, CA: Sage.

Krackhardt, D., 1999. The ties that torture: Simmelian tie analysis in organizations. *Research in the Sociology of Organizations*, 16, pp.183–210.

Krebs, S.A., Hobman, E.V., and Bordia, P., 2006. Virtual Teams and Group Dissimilarity: Consequences for Development of Trust. *Small Group Research*, 37(6), pp.721-741.

Labianca, G., Brass, D.J., and Gray, B., 1998. Social networks and perceptions of intergroup conflict: The role of negative relationships and third parties. *Academy of*

Management Journal, 41, pp.55– 67.

Labianca, G., and Brass, D.J., 2006. Exploring the social ledger: negative relationships and negative asymmetry in social networks in organizations. *Academy of Management Journal,* 31(3), pp.596-614.

Lam, S.S.K., Chen X.P., and Schaunroeck, J., 2002. Participative decision making and employee performance in different cultures: The moderating effects of allocentrism/idiocentrism and efficacy. *Academy of Management Journal*, 45, pp.905-914.

Latané, B., Liu, J.H., Nowak, A., Bonevento, M., and Zheng, L., 1995. Distance Matters: Physical Space and Social Impact. *Personality and Social Psychology Bulletin*, 21(8), pp.795-805.

Lau, D., and Murnighan, J.K., 1998. Demographic diversity and faultlines: The compositional dynamics of organizational groups. *Academy of Management Review*, 23, pp.325–340.

Leana, C.R., and Van Buren, H.J., 1999. Organizational social capital and employment practices. *Academy of Management Review,* 24(3), pp.538-555.

Lechner, C., Dowling, M., and Welpe, I., 2006. Firm networks and firm development: The role of the relational mix. *Journal of Business Venturing*, 21, pp.514– 540.

Lee, K.-H., Yang, G., and Graham, J.L., 2006. Tension and trust in international business negotiations: American executives negotiating with Chinese executives. *Journal of International Business Studies,* 37, pp.623-641.

Leffler, A., Krannich, R.S., and Gillespie, D.L., 1986. Contact, support and friction: three faces of networks in community life. *Sociological Perspective*, 29, pp.337-355.

Lei, D., and Pitts, R., 1997. Building cooperative advantage: managing strategic alliances to promote organizational learning. *Journal of World Business,* 32, pp.203-223.

Leinhardt, S., 1977. *Social networks: a developing paradigm*, New York, Academic press.

Leonard, A.S., Mehra, A., and Katerberg, R., 2008. The social identity and social networks of ethnic minority groups in organizations: A crucial test of distinctiveness theory. *Journal of Organizational Behaviour*, 29, pp.573-589.

Levin, D.Z., and Cross, R., 2004. The Strength of Weak Ties You Can Trust: The Mediating Role of Trust in Effective Knowledge Transfer. *Management Science*, 50(11), pp.1477–1490.

Levine,S.S., and Prietula, M.J., 2012. How Knowledge Transfer Impacts Performance: A Multilevel Model of Benefits and Liabilities. *Organization Science*, 23(6), pp.1748-1766.

Levitt, T., 1983. The globalization of markets. *Harvard Business Review*, pp.92-102.

Lin, C., Standing, C., and Liu, Y., 2008. A model to develop effective virtual teams. *Decision Support Systems*, 45(4), pp.1031-1045.

Lin, N., 2000. *Social Capital: A theory of social structure and action*. New York, NY: Cambridge university press.

Lind, M., 1999. The Gender Impact of Temporary Virtual Work Groups. *IEEE Transactions on Professional Communication*, 42(4), pp.276-285.

Litchfield, R.C., 2008. Brainstorming reconsidered: a goal-based view. *Academy of Management Review*, 33(3), pp.649-668.

Locke, E.A., 1999. Some reservations about social capital. *Academy of Management Review*, 24(1), pp.8-9.

Locke, E.A., 2000. Motivation, cognition, and action: An analysis of studies of task goals and knowledge. *Applied Psychology: An International Review*, 49, pp.408–429.

Lundby, K., and Jolton, J., 2010. Foreword. In K.M. Lundby, ed. *Going Global: Practical Applications and Recommendations for HR and OD Professionals in the Global Workplace*. San Francisco: Jossey-Bass.

Luo, Y., Shenkar, O., 2006. The multinational corporation as a multilingual community: Language and organization in a global context. *Journal of International Business Studies,* 37, pp.321-339.

Lyles, M.A., and Salk, J.E., 2007. Knowledge acquisition from foreign parents in international joint-ventures: an empirical examination of Hungarian context. *Journal of International Business Studies*, 38, pp.3-18.

McAllister, D.J., 1995. Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of Management Journal*, 38, pp.24–59.

Malhotra, A., Majchrzak, A., and Rosen, B., 2007. Leading virtual teams. *Academy of Management Perspectives*, pp.60–70.

Mannix, E.A., Griffith, T.L., Neale, M.A., 2002. The phenomenology of conflict in virtual work teams. In P.J. Hinds and S. Kiesler, eds. Distributed work. Cambridge: MA: MIT Press.

Marchand, D., Kettinger, W., and Rollins, J., 2001. *Making the Invisible Visible*, Chichester, West Sussex: John Wiley & Sons, Ltd.

Marchand, D., Hykes, A., 2007. The Role of Information in Creating Value Efficiently, In Managing complexity in global organizations, In U. Steger, W. Amann, and M. Maznevski,

eds. *Managing Complexity in Global Organizations*, Sussex: John Wiley & Sons Ltd.

Marsden, P.V., Campbell, K.E., 1984. Measuring Tie Strength. *Social Forces*, 63, pp.482-501.

Mardsen, P.V., 1990. Network data and measurement. *Annual Review of Sociology,* 16, p.435-463.

Mardsen, P.V., 2005. Recent Developments in Network Measurement. In J.S. Carrington, and S. Wasserman, eds. *Models and Methods in Social Network Analysis*. Cambridge University Press, New York.

Mariotti, F., and Delbridge, R., 2012. Overcoming Network Overload and Redundancy in Interorganizational Networks: The Roles of Potential and Latent Ties. *Organization Science* 23(2), pp.511–528.

Martin, L.L., Gilson, L.L., and Maynard, M.T., 2004. Virtual Teams: What do We Know and Where do We Go From Here? *Journal of Management*, 30(6), pp.805-835.

Mathien, T., 1988. Network analysis and methodological individualism. *Philosophy of Social Science*, 18, pp.1-20.

Maurer, I., Ebers,M., 2006. Dynamics of social capital and their performance implications: lessons from biology start-ups. *Administrative Science Quarterly,* 51, pp.262-292.

Maznevski, M. and Chuboda, K., 2000. Bridging Space Over Time: Global Virtual Team Dynamics and Effectiveness. *Organization Science*, 11(5), pp.473-492.

Maznevski, M.L., and Athnanassiou, N.A., 2006. Guest Editors' Introduction to the Focused Issue: A New Direction for Global Team Research. *International Management Review,* 46(6), pp.631-345.

Maznevski, M., and Jonsen, K., 2007. Managing complexity with diversity management, In U. Steger, W. Amann, and M. Maznevski, eds. *Managing Complexity in Global Organizations*, Sussex: John Wiley & Sons Ltd.

Maznevski, M., Steger, U., Amann, W., 2007. Managing complexity in global organizations as the meta-challenge, In *Managing complexity in global organizations*, U. Steger, W. Amann, M. Maznevski, eds. Sussex: John Wiley & Sons Ltd.

McDermott, G.A., and Corredoira, R.A., 2010. Network composition, collaborative ties, and upgrading in emerging market firms: Lessons from the Argentine autoparts sector. *Journal of International Business Studies,* 38(3), pp.387–403.

McDonough, E., Kahn, K. and Barczak, G., 2001. An Investigation of the Use of Global, Virtual, and Collocated New Product Development Teams. *The Journal of Product Innovation Management*, 18(2), pp.110-120.

McEvily, B., Perrone, V., and Zaheer, A., 2003. Trust as an organizing principle. *Organization Science*, 14, pp.91–103.

McGrath, J.E., 1984. *Groups: Interaction and Performance*. Englewood Cliffs, NJ: PrenticeHall.

McPherson, J.M., and Smith-Lovin, L., 1987. Homophily in voluntary organizations: Status distance and the composition of face-to-face groups. *American Sociological Review* 52(3), pp.370-379.

McPherson, J.M., Smith-Lovin, L., and Cook, J., 2001. Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, 27, pp.415-445.

Mehra, A., Kilduff, M., and Brass, D.J., 2001. The social networks of high and low self-monitors: Implications for workplace performance. *Administrative Science Quarterly*, 46, pp.121-146.

Milgrom, P., and Roberts, J., 1990. The economics of modern manufacturing: Technology, strategy, and organization. *American Economic Review*, 80(3), pp.511–528.

Miller, G.A., 1956. The magical number seven, plus or minus two: some limits on our capacity for processing information. *Psychological review*, 81-97.

Moe, N.B., and Smite,D., 2008. Understanding a lack of trust in global software teams: a multiple-case study. *Software Process Improvement and Practice*, 13, pp.217–231.

Moerbeek, H.H.S., and Need, A., 2003. Enemies at work: can they hinder your career. *Social Networks*, 25, pp.67-82.

Molinsky, A., 2007. Cross-cultural code-switching: the psychological challenges of adapting behaviour in foreign cultural interactions. *Academy of Management Review*, 32(2), pp.622-640.

Moliterno, T.P., and Mahony, D.M., 2011. Network theory of organization: A multilevel approach. *Journal of Management*, 37, pp.443-467.

Monge, M., and Contractor, N., 1998. Emergence of communication networks. In F. Jablin, L. Putnam, eds. *Handbook of Organizational Communication*, Thousand Oaks, CA: SAGE.

Mort, G.S., and Weerawardena, J., 2006. Networking capability and international entrepreneurship: How networks function in Australian born global firms. *International Marketing Review,* 23(5), pp.549-572.

Mortensen, M. Caya, O., and Pinsonneault, A., 2009. Virtual Teams Demystified: An Integrative Framework for Understanding Virtual Teams and Synthesis of Research. *MIT Sloan School Working Paper.*

Moskowitz, G.B., 2005. On Schemas and Cognitive Misers: Mental Representations as the Building Blocks of Impressions. In G.B. Moskowitz, ed. *Social Cognition: Understanding Self and Others, London:* The Guilford Press, pp.153-192.

Mudambi, R., and Navarra, P., 2004. Is Knowledge Power? Subsidiary Power and Rent-Seeking within MNCs. *Journal of International Business Studies*, 35(5), pp.385-406.

Muethel, M., Hoegl, M., 2010. Cultural and societal influences on shared leadership in globally dispersed teams. *Journal of International Management,* 16, pp.234–246.

Mummendey, A., Simon, B., Dietze, C., Gruenert, M., Haeger, G., Kessler, S., Lettgen, S., and Schaferhoff, S., 1992. Categorization is not enough: Intergroup discrimination in negative outcome allocation. *Journal of Experimental Social Psychology,* 28, pp.125-144.

Nahapiet, J., Ghoshal, S., 1998. Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review,* 23, pp.242-266.

Neely, A., Gregory, M., and Platts, K., 2005. Performance measurement system design. *International Journal of Operations & Production Management,* 25(12), pp.1228-1263.

Nelson, R.E., 1989. The strength of strong ties: social networks and intergroup conflict in organizations. *Academy of Management Journal,* 32(2), pp.377-401.

Newcomb, T.M., 1961. *The Acquaintance process* Holt, Winston NY: Rinehart.

Newell, S., Tansley, C., and Huang, J., 2004. Social Capital and Knowledge Integration in an ERP Project Team: The Importance of Bridging AND Bonding. *British Journal of Management,* 15, pp.43-57.

Newman, M.E.J., 2005. A measure of betweenness centrality based on random walks. *Social Networks,* 27, pp.39-54.

Nordberg, M., Camplbell, A.J., and Verbeke, A., 1996. Can Market-Based Contracts Substitute for Alliances in High Technology Markets? *Journal of International Business Studies,* 27(5), pp.963-979.

O'Leary, M.B., Mortensen, M., 2010. Go (Con)figure: Subgroups, Imbalance, and Isolates in Geographically Dispersed Teams. *Organization Science*, 21(1), pp.115-131.

Obstfeld, D., 2005. Social networks, the tertius iungens orientation, and involvement in innovation. *Administrative Science Quarterly*, 50, pp.100-130.

Ocker, R.J., Hiltz, S.R., Turoff M., and Fjermestad, J., 1995-96. The effects of distributed group support and process structuring on software requirements development teams. *Journal of Management Information Systems*, 12(3), pp.127-154.

Oddou, G., Osland, J.S., and Blakeney, R.N., 2009. Repatriating Knowledge: Variables

Influencing the "Transfer" Process. *Journal of International Business Studies*, 40(2), pp.181-199.

Oh, H., Chung, M-H., and Labianca, G., 2004. Group social capital and group effectiveness: the role of informal socializing ties. *Academy of management journal*, 47(6), pp.860-875.

Oh, H., Labianca, G., and Chung, M-H., 2006. Multilevel model of group social capital. *Academy of Management Journal,* 31(3), pp.569-582.

Oshri, I., Fenema, P.V., and Kotlarsky, J., 2008. Knowledge transfer in globally distributed teams : the role of transactive memory. *Information Systems Journal*, 18, pp.593-616.

Owen-Smith, J., and Powell, W.W., 2004. Knowledge networks as channels and conduits: The effects of spillovers in the Boston biotechnology community. *Organization Science*, 15(1), pp.5–21.

Obzilgin, M., 2009. *Inequality, diversity, and inclusion at work: a research companion*. Cheltenham, UK: Edward Elgar Publishing

Pagel, M.D., Erdly, W.W., and Becker, J., 1987. Social networks: We get by with (and in spite of) a little help from our friends. *Journal of Personality and Social Psychology,* 53, pp.794-804.

Parkhe, A., 1993. Strategic alliance structuring: a game theoretic and transaction cost examination of interfirm cooperation. *Academy of Management Journal,* 36, pp.794-829.

Paul, S., Samarah, I.M., Seetharaman, P., and Mykytyn, P.P., 2005. An Empirical Investigation of Collaborative Conflict Management Style in Group Support System-Based Global Virtual Teams. *Journal of Management Information Systems*. 21(3), pp. 185-222.

Perry-Smith, J.E., 2006. Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of Management Journal*, 49, pp.85-101.

Pescosolido, A.T., 2002. Emergent leaders as managers of group emotion. *The Leadership Quarterly*, 13(5), pp.583-599.

Pettigrew, T.F., 1998. Intergroup contact theory. *Annual Review of Psychology,* 49, pp.65–85.

Pettigrew, A.M., and Fenton, E.M., 2000. *The innovating organization*, London: SAGE. p.78.

Pfeffer, J., 1981. *Power in organizations*. Marshfield, MA: Pitman.

Pickering, J.M., and King, J.L., 1995. Hardwiring Weak Ties: Interorganizational Computer-mediated Communication, Occupational Communities, and Organizational

Change. *Organization Science*, 6(4), pp.479-486.

Podolny, J.M., and Page, K.L., 1998. Network forms of organization. *Annual Review of Sociology*, 24, 57–76.

Podsakoff, P., MacKenzie, S., Lee, J., and Podsakoff, N., 2003.Common method biases in behavioural research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, pp.879–903.

Polanyi, M., 1966. *The Tacit Dimension*, New York: Anchor Day Books.

Portes, A., and Sensenbrenner, J., 1993. Embeddedness and immigration: Notes on the social determinants of economic action. *American Journal of Sociology,* 98, pp.1320-1350.

Portes, A., Landolt, P., 1996. The Downside of Social Capital. *The American Prospect,* 7, pp.18-21.

Powell, A ., Piccoli, G., and Ives, B., 2004. Virtual teams: a review of current literature and directions for future research. *The Data base for Advances in Information Systems*, 35, pp.6-36.

Provan, K.G., Skinner, S.J., 1989. Interorganizational Dependence and Control as Predictors of Opportunism in Dealer-Supplier Relations. *Academy of Management Journal,* 32(1), pp.202-212.

Provan, K.G., 1993. Embeddedness, Interdependence, and Opportunism in Organizational Supplier-Buyer Networks. *Journal of Management*, 19, pp.841-856.

Putnam, R.D., Leonardi, R., and Nanetti, R.Y., 1993. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton University Press: Princeton, NJ.

Rabbie, J.M., Schot, J.C., and Visser, L., 1989. Social identity theory: A conceptual and empirical critique from the perspective of a behavioural interaction model. *European Journal of Social Psychology,* 19, pp.171-202.

Raush, H.L., 1965. Interaction sequences. *Journal of Personality and Social Psychology,* 2, pp.487-499.

Reagans, R.E., Zuckerman, E.W., and McEvily, B., 2004. How to Make the Team: Social Networks vs. Demography as Criteria for Designing Effective Projects in a Contract R&D Firm. *Administrative Science Quarterly,* 49, pp.101-133.

Reagans, R.E. and Zuckerman, E.W., 2008.Why knowledge does not equal power: the network redundancy trade-off. *Industrial and Corporate Change*, 17(5), pp.903-944 .

Rindfleisch, A. and Moorman, C., 2001. The Acquisition and Utilization of Information in New Product Alliances: A Strength of Ties Perspective. *Journal of Marketing*, 65, pp.1-18.

Roberts, K.H., and O'Reilly, C.A., 1979. Some correlates of communication roles in organizations. *Academy of Management Journal*, 22, pp.42-57.

Roberts, J., 2004. *The Modern Firm: Organizational Design for Performance and Growth.* Oxford, UK: Oxford University Press.

Robey, D., Khoo, H., and Powers, C., 2000. Situated Learning in Cross-Functional Virtual Teams. *IEEE Transactions on Professional Communications*, 43(1), pp.51-66.

Rogers, E.M., and Kincaid, D.L., 1981. *Communication networks: Toward a new paradigm for research*. New York: Free Press.

Rosen, B., Furst, S., and Blackburn, R., 2007. Overcoming Barriers to Knowledge Sharing in Virtual Teams. *Organizational Dynamics*, 36, pp.259-273.

Rowley, T., Behrens, D., and Krackhardt D., 2000. Redundant governance structures: an analysis of structural and relational embeddedness in the steel and semiconductor industries. *Strategic Management Journal*, 21, pp.369–386.

Ruef, M., Aldrich, H.E., Carter, N.M., 2003. The Structure of Founding Teams: Homophily, Strong Ties, and Isolation among U.S Entrepreneurs. *American Sociological Review*, 68(2), pp.195-222.

Sabatelli, R.M., and Shehan, C.L., 1993. Exchange and resource theories. In P.G. Boss, W.J. Doherty, R. LaRossa, W.R. Schumm, and S.K. Steinmetz, eds. *Sourcebook of family theories and methods: A contextual approach*, New York: Plenum Press.

Sachdev, I., and Bourhis, R.Y., 1994. Power and status differentials in minority and majority intergroup relations. *European Journal of Social Psychology,* 21, pp.1-24.

Sahlins, M., 1972. *Stone Age Economics*, Chicago, IL: Aldine-Atherton.

Salas, E., Dickinson, T.L., Converse, S.A., and Tannenbaum, S.I., 1992. Toward an understanding of team performance and training in teams. In R.W. Swezey and E. Salas, eds. *Teams: Their training and performance*, Norwood, NJ: Ablex.

Salk, J.E., and Brannen, M.Y., 2000. National Culture, Networks, and Individual Influence in a Multinational Management Team. *Academy of Management Journal,* 43(2), pp.191-202.

Salk, J.E., and Shenkar, O., 2001. Social Identities in International Joint Venture: An Exploratory Case Study. *Organization Science*, 12(2), pp.161-178.

Saunders, C.S., van Slyke, C., and Vogel, D.R., 2004. My time or yours? Managing time visions in global virtual teams. *Academy of Management Executive*, pp.19–31.

Scherer, C.W., and Cho, H., 2003. A Social Network Contagion Theory of Risk Perception. *Risk Analysis*, 23(2), pp.261-267.

Schrader, S., 1991. Informal technology transfer between firms: Cooperation through information trading. *Research Policy*, 20, pp.153-170.

Schulte, M., Cohen, N.A., and Klein, K.J., 2012. The coevolution of network ties and perceptions of team psychological safety. *Organization Science,* 23(2), pp.564-581.

Scott, J., 1991. *Social Network Analysis: A Handbook,* Newbury Park: Sage.

Seibert, S.E., Kraimer, M.L., and Liden, R.C., 2001. A social capital theory of career success. Academy of Management Journal, 44(2): 219–247.

Shaw, J.B., and Barrett-Power, E., 1998. The effects of diversity on small work group processes and performance. *Human Relations*, 51(10), pp.1307-1325.

Shenkar, O., 2001. Cultural distance revisited: Towards a more rigorous conceptualization and measurement of cultural differences. *Journal of International Business Studies*, 32, pp.519–535.

Shenkar, O., 2012. Cultural distance revisited: Towards a more rigorous conceptualization and measurement of cultural differences. *Journal of international business studies*, 43, pp.1-11.

Sherman, D.J., Keller, R.T., 2011. Suboptimal Assessment of Interunit Task Interdependence: Modes of Integration and Information Processing for Coordination Performance. *Organization Science*, 22(1), pp.245-261.

Sidhu, J.S., and Volberda, H.W., 2011. Coordination of globally distributed teams: A co-evolution perspective on offshoring. *International Business Review*, 20, pp.278-290.

Siegel, P.A., and Hambrick, D.C., 2005. Pay Disparities Within Top Management Groups: Evidence of Harmful Effects on Performance of High-Technology Firms. *Organization Science*, 16(3), pp.259-274.

Simmel, G., 1950. *The sociology of George Simmel*. Glencoe, IL: Free Press.

Soldan, Z., and Bowyer, K., 2009. The influence of individual factors on cognitive process variables within a diverse group context. *International Journal of Business and Management,* 4(6), pp.3-12.

Soo, C., Devinney, T., Midgley, D., and Deering, A., 2002. Knowledge management: Philosophy, process, and pitfalls. *California Management Review*, 44(4), pp.129–150.

Sparrowe, R.T., Liden, R.C., Wayne, S.L., and Kraimer, M.L., 2001. Social networks and the performance of individuals and groups. *Academy of Management Journal,* 44(2), pp.316-325.

Sproull, L., Kiesler, S., 1986. Reducing social context cues: Electronic mail in organizational communication. *Management Science*, 32(11), pp.1492-1512.

Stahl, G.K., Maznevski, M.L., Voigt, A., and Jonsen, K., 2010. Unravelling the effects of cultural diversity in teams: a meta-analysis of research on multicultural work groups. *Journal of International Business Studies,* 41, pp.690-709.

Stajkovic, A.D., and Luthans, F., 1998. Social cognitive theory and self-efficacy: Going beyond traditional motivational and behavioural approaches. *Organizational Dynamics*, 26(4), pp.62-74.

Stanko, M., Bonner, J., and Calantone, R., 2007. Building commitment in buyer-seller relationships - A tie strength perspective. *Industrial Marketing Management*, 36, pp.1094-1103.

Stark, E.M., and Bierly, I.P., 2009. An analysis of predictors of team satisfaction in product development teams with differing levels of virtualness. *R&D Management*, 39(5), pp.461-472.

Steger, U., Amann, W., and Maznevski, M., 2007. *Managing complexity in global organizations.* Sussex: John Wiley & Sons.

Stonehouse, G.H., and Pemberton, J., 1999. Learning and knowledge management in the intelligent organization. *Participation and Empowerment: An International Journal*, 7(5), pp.131-144.

Stonehouse, G., Campbell, D., Hamill, J., and Purde, T., 2004. *Global and Transnational Business: Strategy and Management*, Chichester: John Wiley & Sons, Ltd.

Straus, S.G., 1996. Getting a clue: The effects of communication media and information distribution on participation and performance in computer-mediated and face-to-face groups. *Small Group Research*, 27(1), pp.115-142.

Struch, N., and Schwartz, S.H., 1989. Intergroup Aggression: Its Predictors and Distinctness From In-Group Bias. *Journal of Personality and Social Psychology,* 56, pp.364-373.

Syed, J. and Ozbilgin, M., 2009. A Relational Framework for International Transfer of Diversity Management Practices. *International Journal of Human Resource Management*, 20(12), pp.2435-2453.

Syson, F., and Perks, H., 2004. New service development: a network perspective. *Journal of Services Marketing,* 18(4), pp.255-266.

Szulanski, G., 1996. Exploring stickiness: impediments to the transfer of best practice within the firm. *Strategic Management Journal*, 17, pp.27-43.

Tajfel, H., 1978. *Differentiation between social groups: Studies in the social psychology of intergroup relations*. London: Academic Press.

Tajfel, H., and Turner, J.C., 1979. An integrative theory intergroup conflict. In W.G. Austin, S. Worchel, eds. *The Social Psychology of Intergroup Relations*. Monterey, CA: Brooks/Cole, pp.33-48.

Tajfel, H., and Turner, J.C., 1985. Social identity theory of intergroup behaviour. In A. Worchel, W.G. Austin, eds. *Psychology of Intergroup Relations*, Chicago: Nelson-Hall, pp.7–24.

Taylor, S.E., 1991. Asymmetrical effects of positive and negative events: The mobilization-minimization hypothesis. *Psychological Bulletin,* 110, pp.67–85.

Thomas, D.C., 1999. Cultural diversity and work group effectiveness: An experimental study. *Journal of Cross-Cultural Psychology*, 30, pp.242-263.

Thorndike, E., 1920. A Constant Error in Psychological Ratings. *Journal of Applied Psychology,* 4, pp.469-477.

Thurnwald, R., 1932. *Economics in Primitive Communities*, London: Oxford University Press, p.106.

Tichy, N., 1973. An Analysis of Clique Formation and Structure in Organizations. *Administrative Science Quarterly*, 18(2), pp.194-208.

Tortoriello, M., Reagans, R., and McEvily, B., 2012. Bridging the Knowledge Gap: The Influence of Strong Ties, Network Cohesion, and Network Range on the Transfer of Knowledge Between Organizational Units. *Organization Science*, 23(4), pp.1024-1039.

Townsend, A., DeMarie, S., and Hendrickson, A., 1996. Are You Ready for Virtual Teams? *HR Magazine*, pp. 122-126.

Triandis, H.C., Kurowski, L.L., and Gelfand, M.J., 1994. Workplace Diversity, in H.C. Triandis, M.D. Dunette and L.M. Hough, eds. *Handbook of Industrial and Organizational Psychology,* Palo Alto, CA: Consulting Psychologists, pp.769-827.

Triandis, H.C., and Gelfand, M.J., 1998. Converging measurement of horizontal and vertical individualism and collectivism. *Journal of Personality and Social Psychology*, 74, pp.118-127.

Tsai, W., and Ghoshal, S., 1998. Social capital and value creation: The role of intrafirm networks. *Academy of Management Journal,* 41, pp.464-476.

Tsai, W., 2001. Knowledge Transfer in Intra-organizational Networks: Effect of Network Position and Absorptive Capacity on Business Unit Innovation and Performance. *Academy of Management Journal*, 44(5), pp.996-1004.

Tsai, W., 2002. Social Structure of "Coopetition" Within a Multiunit Organization: Coordination, Competition, and Intraorganizational Knowledge Sharing. *Organization Science*, 13(2), pp.179-190.

Turner, J.C., Hogg, M., Oakes, P.J., and Reicher, S.D., 1988. *Rediscovering the social group: a self-categorization theory*. Oxford: Basil Blackwell.

Udehn, L., 2002. The changing face of methodological individualism. *Annual Review of Sociology*, 28, pp.479-507.

United Nations Conference on World Trade and Development (UNCTAD): World Investment Report. 2005.

Uzzi, B., 1996. The Sources and Consequences of Embeddedness for the Economic Performance of Organizations: The Network Effect. *American sociological review*, 61, pp.674-698.

Uzzi, B., 1997. Social structure and competition in inter-firm networks: The paradox of embeddedness. *Administrative Science Quarterly,* 42, pp.35-67.

Uzzi, B., 1999. Embeddedness in the making of financial capital: How social relations and networks benefit firms seeking financing. *American Sociological Review*, 64, pp.481–505.

Uzzi, B., and Lancaster, R., 2003. Relational Embeddedness and Learning: The Case of Bank Loan Managers and Their Clients. *Management Science*, 49(4), pp.383-399.

Uzzi, B., and Dunlap, S., 2012. Making Your Enemies Your Allies. *Harvard Business Review*, 90(5), pp.133-138.

Valacich, J.S., Paranka, D., George, J.F. and Nunamaker, J.F., 1993. Communication concurrency and the new media: A new dimension for media richness. *Communication Research*, 20(2), pp.249-276.

Valente, T.W., 1995. *Network models of the diffusion of innovations*. Cresskill, NJ: Hampton Press, Inc.

Van De Bunt, G.G., and Groenewegen, P., 2007. An actor-oriented dynamics network approach. *Organizational research methods*, 10, pp.463-482.

Van den Bulte, C., and Moenaert, R.K., 1998. The effects of R&D team co-location on communication patterns among R&D, marketing, and manufacturing. *Management Science,* 44(11), pp.1–18.

van der Leij, M., and Goyal, S., 2011. Strong Ties in a Small World, *Review of Network Economics*, 10(2), pp.1-22.

van Knippenberg, D., and Schippers, M.C., 2007. Work group diversity. *Annual Review of Psycholog*y, 58, pp.515-541.

Van Ryssen, S., and Godar, H., 2000. Going International Without Going International: Multinational Virtual Teams. *Journal of International Management*, 6, pp.49-60.

Verbeke, W., and Bagozzi, R.P., 2000. Sales call anxiety: exploring what it means when fear rules a sales encounter. *Journal of Marketing,* 64, pp.88-101.

Verbukke, L.M., 1979. Multiplexity in Adult Friendships. *Social Forces*, 57(4), pp.1286-1309.

Villena, V.H., Revilla, E., and Choi, T.Y., 2011. The dark side of buyer-supplier relationships: A social capital perspective. *Journal of Operations Management,* 29, pp.561-576.

Von Hippel, E., 1988. *The Sources of Innovation*, New York: Oxford University Press.

Walther J.B., 1996. Group and interpersonal effects in international computer-mediated collaboration. *Human Communication Research*, 23, pp.342-369.

Wassermann, S., Faust, K., 1994. *Social network analysis: methods and applications*. New York: Cambridge University Press.

Watson, D., Clark, L.A., and Tellegen, A., 1988. Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54(6), pp.1063-1070.

Weber, C., and Weber, B., 2011. Exploring the antecedents of social liabilities in CVC triads - A dynamic social network perspective. *Journal of Business Venturing*, 26, pp.255-272.

Wegner, D.M., 1986. Transactive memory: A contemporary analysis of the group mind. In B. Mullen and G. R. Goethals, eds. *Theories of group behaviour,* New York: Springer-Verlag, pp. 185-208.

Welch, C., Piekkari, R., Plakoyiannaki, E., and Paavilainen-Mantymaki, E., 2011. Theorising from case studies: Towards a pluralist future for international business research. *Journal of International Business Studies*, 42(5), pp.740–762.

West, M.A., and Anderson, N.R., 1996. Innovation in top management teams. *Journal of Applied Psychology*, 81(6), pp.680–693.

Wiesenfeld, B.M., Raghuram, S., and Garud, R., 2001. Organizational identification among virtual workers: The role of need for affiliation and perceived work-based social support. *Journal of Management*, 27, pp.213–229.

Williams, K.Y., and O'Reilly, C.A., 1998. Demography and diversity in organizations: A review of 40 years of research. *Research in Organizational Behaviour*, 20, pp.77-140.

Williamson, O.E., 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: The Free Press.

Wood, R., and Bandura, A., 1989. Social cognitive theory of organizational management. *Academy of Management Review*, 14, pp.361-384.

Wright, S.C., Aron, A., McLaughlin-Volpe, T. and Ropp, S.A., 1997. The extended contact effect: Knowledge of cross-group friendships and prejudice. *Journal of Personality and Social* Psychology, 73, pp.73-90.

Xiao, Z., Tsui, A.S., 2007. When Brokers May Not Work: The Cultural Contingency of Social Capital in Chinese High-tech Firms. *Administrative Science Quarterly,* 52, pp.1–31.

Yamin, M., and Ghauri, P.N., 2010 A critical assessment of the business network perspective on HQ control in multinational companies. In U. Andersson and U. Holm, eds. *Managing the Contemporary Multinational Corporation*, Cheltenham: Edward Elgar, pp.125-137.

Yin, R.K., 2003. *Case study research: design and methods*, London, Sage Publications.

Yli-Renko, H., Autio, E., and Sapienza, H., 2001. Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms. *Strategic Management Journal,* 22, pp.587-613.

Yuan,Y.C., and Gay, G., 2006. Homophily of network ties and bonding and bridging social capital in computer-mediated distributed teams. *Journal of Computer-Mediated Communication,* 11(4), pp.1062-1084.

Zaheer, A., Gözübüyük, R., and Milanov, H., 2010. It's the connections: The network Perspective in Interorganizational research. *Academy of Management Perspectives,* 24, pp.62-77.

Zahra, S.A., Sapienza, H.J., and Davidsson, P., 2006. Entrepreneurship and Dynamic Capabilities: A Review, Model and Research Agenda. *Journal of Management Studies,* 43(4), pp.917-955.

Zand, D.E., 1972. Trust and managerial problem solving. *Administrative Science Quarterly*, 17, pp.229–39.

Zander, L., Mockaitis, A.I. and Butler, C.L., 2012. Leading Global Teams. *Journal of World Business*, 47, pp.592-603.

Zhang J., 2010. The problems of using social networks in entrepreneurial resource acquisition. *International Small Business Journal*, 28, pp.338-361.

Zimmerman, A., 2011. Interpersonal relationships in transnational, virtual teams: Towards a configurational perspective. *International Journal of Management Reviews*, 13, pp.59-78.

APPENDICES

Appendix A: Project description for potential case companies

CENTRE FOR INTERNATIONAL BUSINESS

UNIVERSITY OF LEEDS

Title**: "Development of social capital and social liabilities in multicultural team networks: a longitudinal study"**

"Executives often preach that relationships are an important part of their business, but do they know what

relationship networks look like?"

Project Overview

I am researching how employees participate in inter-personal networks in cross-cultural cultural contexts. To do this, I will investigate relationship development of multinational enterprises (MNEs) in teams consisting of different nationalities. The main objective of the research is to study how problems in creation of social capital might be overcome, and what individual-level actor attributes underlie building of these cross-cultural networks.

Aims of the study

My study will answer the following research questions:

- Is network development different in different cross-cultural contexts?
- What are the benefits to a worker of participation in a network and what are the pitfalls?
- How do workers overcome problems when they participate in inter-personal networks?
- What is the role of personality in network participation?

In sum, this research will reveal the underlying processes of how successful networks are established in cross-cultural settings. By mapping the patterns of relationship between employees, I will identify issues in network participation that are often invisible to senior managers, and if you can't see it, you can't manage it! This research will use social network analysis (a technique used by many leading consultancies and multinational corporations such as Deloitte, HP, IBM, and Microsoft to investigate the effects of relationships) to map the development of networks in an organisation.

Expected outputs

A detailed written report will be provided to all participating companies. The report will reveal the balance between the formal (hierarchical) and informal (network) structures that exist in the organisation, and the findings will help senior managers to maximize the benefits derived from networks, and to avoid possible pitfalls. In particular, I expect the findings of this research to be helpful to participating organisations in a number of ways:

i.   Employee engagement: by revealing workflow-, communication-, and informal-networks in order to optimize employee interaction and involvement in the organisation.
ii. Collaboration: by mapping and understanding better how workers collaborate within and between work teams and with external partner organisations in order to improve communication
iii. Employee selection: by identifying those personality attributes which are needed for positions that require strong networking and relationship-building skills

iv.   <u>Work satisfaction</u>: by analyzing team dynamics which enhance satisfaction within the workplace.

Support and resources requested

If your company decides to take part in this research project, individual people in a preselected workgroup or team will be asked to fill in a survey questionnaire (which will take no longer than 15 minutes to complete) to indicate with whom they communicate and how often. At most, respondents will be asked to complete the same questionnaire four times over a span of twelve months. This will enable me to capture shifting network dynamics over time. Workgroup or team members will also be asked to complete a second questionnaire just once in the twelve month period in order to identify how personality traits influence network participation.

Confidentiality Statement

At no time will respondents be asked to provide confidential or private information. All efforts will be made to ensure that the data provided cannot be traced back to participants in reports, presentations and other forms of dissemination. Confidentiality of the records will be ensured and discussions between employees and the researcher will remain confidential and no names will be mentioned in the final report. In other words, all details of the business of participating organisations will be kept private by the researcher and will not be disclosed to any third party.

About me

I am a doctoral researcher at the Centre for International Business at the University of Leeds (CIBUL) in the UK. CIBUL is one of the world's premier research centre in international business. This project forms part of my doctoral thesis which is being funded by Finnish Cultural Foundation. Prior to my PhD studies, I graduated as top of my class from University of South Australia, where I also worked as a Research Assistant in Division of Business. In addition, I have extensive industrial experience from human resources, sales, and hospitality industry.

Contact information: Pekka Vahtera, bnpjv@leeds.ac.uk, +447599475334

Appendix B: Survey instrument

Introduction

The purpose of this research project is to identify the value of network relationships. We are looking to understand what factors hinder and promote worker interaction within groups. The results of our study will help teams to improve communication in areas which need it. The questionnaire survey should take no longer than 15-20 minutes for you to complete.

At the beginning of the survey we will ask for your name so that we can map the nature of network relationships across your team. The results should look something like this visualized network:
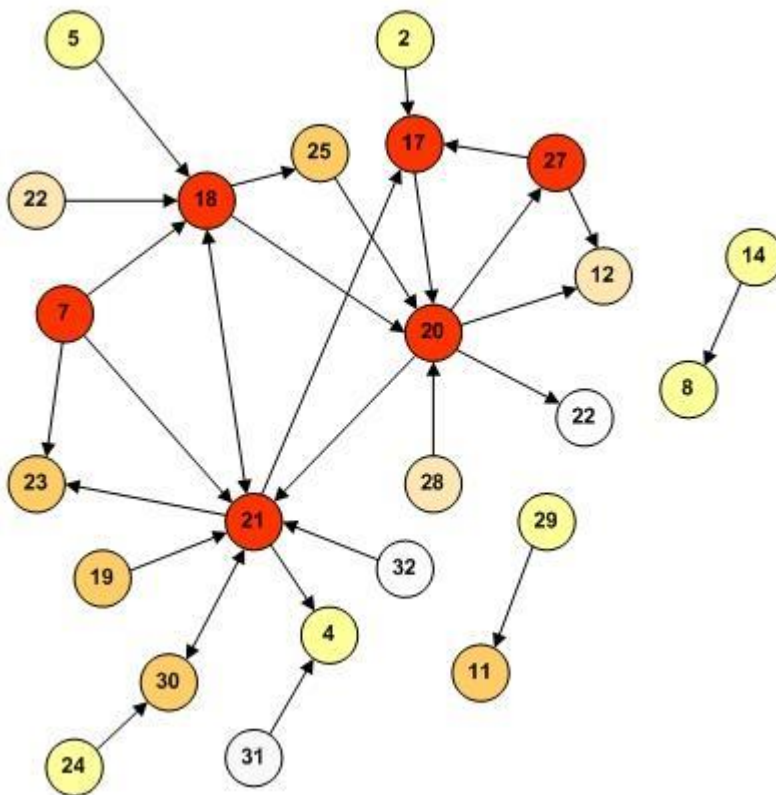
Note that all the names are given a random number and data is handled anonymously. All information collected will therefore be treated in the strictest confidence, and no individual will be identified in person in any scholarly work that results from this study. The results will be used for academic publications, but all names will be anonymised so that no particular individual can be identified from the data.

Please type your name here:

Next

0%

Please indicate your answer by placing a check in the space to the left of the names of people you have regular mutual dealings, exchanges, or communications with.

- Check up to 20 names as appropriate

- If there is only one person who fills these criteria, then just check that one person's name

- If there are several people, then check these several names

☐ John Smith

☐ Jane Smith

☑ Julia Jameson

☐ Jack Jones

☑ Jane Jones

☐ Peter Peterson

☐ Matt Mattson

…

…

…

This person shares similar values, ways of thinking, and understanding to my own:

2. This person shares similar values, ways of thinking, and understanding to my own:	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Julia Jameson	○	○	○	○	○	○
Jane Jones	○	○	○	○	○	○

You can add more people to your network here if you wish

	Name	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1	-- Please Select -- ▼	○	○	○	○	○	○
2	John Smith	○	○	○	○	○	○
3	Jane Smith / Julia Jameson / Jack Jones	○	○	○	○	○	○
4	Jane Jones / Peter Peterson / Matt Mattson	○	○	○	○	○	○
5	-- Please Select -- ▼	○	○	○	○	○	○

Dropdown list options:
-- Please Select --
John Smith
Jane Smith
Julia Jameson
Jack Jones
Jane Jones
Peter Peterson
Matt Mattson

This person holds different organizational objectives to me:

3. This person holds different organizational objectives to me:	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Julia Jameson	○	○	○	○	○	○
Jane Jones	○	○	○	○	○	○

You can add more people to your network here if you wish

	Name	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1	-- Please Select -- ▼	○	○	○	○	○	○
2	-- Please Select -- ▲	○	○	○	○	○	○
	John Smith						
	Jane Smith						
3	Julia Jameson	○	○	○	○	○	○
	Jack Jones ≡						
	Jane Jones						
4	Peter Peterson	○	○	○	○	○	○
	Matt Mattson						
5	-- Please Select -- ▼	○	○	○	○	○	○

Appendix C: Correlations between positive and negative tie items

	Trust	Resources	Similar goals
Trust	1.00	0.82	0.64
Resources	0.82	1.00	0.69
Similar goals	0.64	0.69	1.00

	Hindrance ties	**Self-interest**	**Relational tension**
Hindrance	1.00	0.25	0.34
Self-interest	0.25	1.00	0.22
Relational tension	0.34	0.22	1.00

Appendix D: Comparison of group densities between social groups and official teams

	1	2	3	4	5	6	7		1	2	3	4	5	6	7
1	**0.00**	0.00	0.00	0.00	0.06	0.06	0.06	1	**0.00**	0.33	0.17	0.11	0.00	0.00	0.00
2	0.00	**1.00**	0.00	0.25	0.24	0.00	0.00	2	0.33	**0.00**	0.17	0.11	0.07	0.22	0.22
3	0.00	0.00	**1.00**	0.00	0.21	0.00	0.00	3	0.17	0.17	**0.33**	0.21	0.15	0.42	0.08
4	0.00	0.25	0.00	**1.00**	0.09	0.00	0.00	4	0.11	0.11	0.21	**0.47**	0.10	0.22	0.11
5	0.06	0.24	0.21	0.09	**0.25**	0.03	0.14	5	0.00	0.07	0.15	0.10	**0.20**	0.27	0.00
6	0.06	0.00	0.00	0.00	0.03	**1.00**	0.00	6	0.00	0.22	0.42	0.22	0.27	**1.00**	0.00
7	0.06	0.00	0.00	0.00	0.14	0.00	**1.00**	7	0.00	0.22	0.08	0.11	0.00	0.00	**0.00**

Group densities of social groups are displayed in the left matrix and official teams on the right matrix. Note that these are excerpts from a larger data set which for social groups was 27x27 groups and teams 34x34 membership groups.

Appendix E: Moderating effect of negative ties and brokerage on shred values

Variable effecting relationship between shared out-group values and intergroup bias	Shared values - Team	Reduction in regression coefficient	Shared values - Social Group	Reduction in regression coefficient
Direct effect	-0.25	-	-0.39	-
Negative ties in-group	-0.15	-0.09	-0.28	-0.11
Negative ties out-group	-0.19	-0.06	-0.39	0.00
Negative ties total	-0.16	**-0.09**	-0.22	**-0.17**
Brokerage out-group (consultant)	-0.22	-0.02	-0.35	-0.04
Brokerage in-group (coordinator)	-0.23	-0.02	-0.33	-0.06
Brokerage total	-0.20	**-0.05**	-0.29	**-0.10**
Negative ties + brokerage	-0.143	**-0.10**	-0.164	**-0.22**

Appendix F: Measuring strong and weak ties

Strong ties are separated from weak ties by utilizing a following classification based on unions and intersections between the variables.

Very strong ties = emotional intensity $\cap$ intimacy $\cap$ reciprocity . *Strong ties* = emotional intensity $\cup$ intimacy $\cap$ reciprocity . *Weak ties* = communication ties – Strong ties

Where $i, j \leq 3$ denotes that relationship between i and j is stronger than 3 (on a scale of 1 to 6) as perceived by i. There is a reciprocal relationship if both i and j perceive a tie between them, in which case , otherwise i, j =0. In this classification, $\cap$ represents the intersection between variables and $\cup$ is the union.

The Crohnbach's alpha between emotional intensity, intimacy and reciprocity was >0.75, which indicates relatively good internal consistency. I chose to measure reciprocity through two-way interaction in "dealings, exchanges and communications" rather than in intimacy and emotional intensity, as it would have led to considerable reduction on the number of observations in these dimensions and poorer internal consistency between items. Reciprocity in emotional intensity was 30 per cent, and 15 per cent in intimacy. Hence, the final measurement of neither *very strong* nor *strong* ties need not be reciprocal – but actors need to have a reciprocal tie in dealings, exchanges and communications underlying both types of ties.

Geographical location of the team members only explained 8.5 per cent of variance in individuals' meeting outside of work. Thus, there was no particularly strong tendency to form social ties (which extend into friendship domain) with only co-located members. This became even more evident when the same comparison was made exclusively with strong social ties (dichotomized so that ties >3 are zero), as the variance explained decreased to only 3 per cent.

Factor analysis revealed tie strength items do not significantly load on a single common factor. Eight common factors are found, and the most dominant factor covered only 29 per

Bellocent of variance between items. Moreover, the items belonging to three major categories are mostly negatively related to each other. Thus, common method bias should not be a major problem in the present study (see appendix for more details). Further, As noted by many scholars, common method bias is less of a problem in studies which have an interaction effect (as is the case for the present study) as it reveals whether respondents have (on purpose or unthinkingly) rated all items high or low (Levin and Cross, 2004; Brockner *et al*., 1997).